Set in Concrete? Crafting Innovation

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Abstract
This paper draws on the experience of practice-led research based in academia, which investigates the possibility of making hard surfaces soft.

So far the project, in its fifth year of development, has led to three patents being filed on technology allowing manufacturers to embed textile technologies onto the surface of precast concrete surfaces resulting in hybrid but integral finishes.

The work was initially understood as decorative but as the project has moved into testing and analysis phases a better understanding of the resultant altered characteristics of precast concrete surfaces has emerged – ie the resultant hybrid concrete surfaces overcome some of the negative characteristics of concrete to become colourful, warm, acoustically soft, thermally less variable and people friendly. In short, this design-led research process has extended the characteristics and hence potential of a global material.

Following on from a brief outline of the project and evidence of its innovation, the paper will be structured around two central sections examining some of the strategies that have evolved in this hybrid process and examining potential tactics that have led to innovative outcomes. The first section will examine how conceptual and theoretical thinking, generated out of a user-centred critique of the built environment and an understanding of the relationship between architecture and textiles, can demonstrably lead to pragmatic, innovative and marketable solutions. The second section will look at the interrelationships between creativity, innovation and collaboration and address some potentials and challenges.

The paper represents an early attempt to make sense of this design–led project. It aims to capture and contextualize some possible transferable tactics that might lead to more conscious and explicit processes for <u>crafting innovation</u>.

1.0 Introduction
This paper is based on an ongoing collaborative project called 'Tactility Factory' between a textile designer and an architect. Other than the first few years of the project, the primary author of the paper (the architect) had been principally involved in design pedagogy, helping to establish new design studios and undergraduate architecture courses in the UK. Much of that pedagogy was informed by an interest in what at times felt like two diametrically opposed areas ie how to teach design to first year students;

and, how to address critical theories that surround architectural education and practice, namely, inclusive and feminist theories. Between these two areas sits a seldom-voiced and rather rudimentary question; do design practices that seek people-sensitive outcomes result in *ugly* outcomes? (An Architektur and Heyden, 2010)

The project offered a place to explore this tension and an opportunity to practice and test what the architect had previously taught. It has therefore become a place to theorize socio-politically whilst making innovative and aesthetic products, and reflecting on the efficacy of previous pedagogical practices.

The project however was not initiated within the format of a traditional research project ie to test a research question. Rather it began with the design intentions of *making hard things soft,* in order *to mainstream tactility in the built environment.* The means by which this was to be achieved was through the application of textile approaches and techniques to the design and manufacture of built environment materials (see section 3.1.1 for the theoretical justification of this 'methodology'). The results of this design-led approach are regarded as highly innovative and much external attention has fallen on the project (see section 2.0 for indicators of innovation).

Within the context of this research paper, we will examine and question: *what tactics within the project led to an innovative outcome*? The hope is that by doing so we might identify transferable practices to other situations, leading to a conscious and explicit process for crafting innovation.

The possible tactics that craft innovation will be examined under the following areas:
- Cultivating a Distinct Context
- Creativity, Innovation and Collaboration

The paper will examine each of these in turn, acknowledging the overlaps and challenges. Firstly, there is a necessity to scope out the nature of the project and its outcomes in the following section, allowing the reader to get a sense of the nature of the project.

2.0 Project Outline

The Tactility Factory project combines the hard properties of concrete with the softness of textiles by designing innovative processes that deliver beautiful and sensorial engaging surfaces. The approach of applying 'textile thinking' to hard materials used in the built environment, is one that is not necessarily concrete-specific and could, we believe, be eventually applied across a range of materials. However for the moment we have focused on combining concrete and textiles.

It has taken four years of testing and development to identify the appropriate materials and resolve the technologies that can be used to combine textile and concrete manufacturing processes to create pre-cast concrete surfaces with an integrated and permanent textile surface. The textiles are designed and manufactured to incorporate voids, meaning that surface patterning is created as much by the concrete as by the textiles. The resultant surfaces convey an antique feel, despite being principally created using the latest digital technologies and processes. The end result is described conceptually as the 'fossilisation of textiles'.

Three technologies have been perfected to date

1. 'linen concrete': Varieties of linen weights and colours are used. Voids are created through which seeps the concrete, leaving an integrated and robust surface of concrete and linen. Linen is chosen since it survives in alkaline environments
2. 'stitched concrete': A variety of technologies is used to allow the stitched surfaces to remain on the surface. Yarns in a range of colours, weights etc can be used to create endless variations in pattern and design.
3. 'flocked concrete': short flocking fibres are integrated onto the surface of the concrete resulting a highly tactile and 'stroke-able' finish.

Fig1: 'linen concrete'- linen textile allows concrete mix to flow through to surface creating visual and tactile patterns

Fig2: 'stitched concrete'- textile, digitally stitched and imbedded into concrete surface gives an appearance of an embroidered surfaces

Fig3: 'linen concrete' panels used in private commission

The level of innovation residing in the processes and products is indicated by the external interest the project has drawn. This includes a number of awards for innovation, invitations to exhibit nationally and internationally and features in international design journals and magazines. The work is also cited in publications on trend forecasting and innovative products and forms of practice (see www.tactilityfactory.com/publicity.html) Recently Tactility Factory has been successful in winning two major competitions related to the next 'Big Idea' and the project is now in the early stages of forming a spin-out company.

So the question is what has caused these innovative outcomes to emerge. The next section will consider some of the possible conditions or tactics to craft innovation.

3.0 Possible Tactics that Craft innovation

3.1. Cultivating a Distinct Approach
The question: *why do this*? has echoed throughout the lifetime of the project. More particularly, *why place delicate, beautiful fabrics into harsh alkaline environments?* The most direct answer is – *why not?*. But more profoundly, because the project is a response to observations and critiques that have occurred throughout the careers of the collaborators and increasingly throughout the progress of the project. The process

therefore is far from the usual process of product development that addresses an identified customer need or a specific gap in the market. Instead the Tactility Factory process begins from a conceptual range of critiques and seeks to exemplify, <u>through</u> a product development, an approach, indeed an ethos, that addresses wider critiques.

These critiques act as sources of motivation or investigation and are:

3.1.1 A sensory approach to technology (textile context)
The textile designer's skill in creating rich tactile surfaces through the application of appropriate technologies has led to an examination of how effectively this is achieved within the discipline of architecture.

Tactility is certainly referenced in wider critiques (Levin, 1993 and Pallasmaa, 1996) of modernism in architecture that challenge the dominance of the visual and call for the corporal and psychological experience of space to be better understood and elevated in significance. In addition, many phenomenologists that influence and practice architecture (Maurice Merleau-Ponty, Christian Norberg-Schulz, Steen Eiler Rasmussen, Juhani Pallasmaa, Steven Holl, Peter Zumthor) also position tactility and sense of touch within their wider concerns for the 'experience of architecture' and its material manifestations.

Juhani Pallasmaa whose own relationship to the senses and architecture are well documented across a range of publications (Pallasmaa,1994 and 2005), states in his most recent publication: *The Thinking Hand*, that:
> The boundary line between the self and the world is identified by our senses. Our contact with the world takes place through the skin of the self by mean of specialized art of our enveloping membrane. All the sense, including vision, are extensions of the tactile sense; the senses are specialisations of skin tissue, and all sensory experiences are modes of touching and thus related to tactility'
> (Pallasmaa, 2009 p….)

Pallasmaa understands the centrality of touch within the body's sense of itself and the world around it, but also accepts that architecture falls short of delivering a full response; *"Our architecture may entice and amuse the eye, but it does not provide a domicile for the touch of our bodies, memories and dreams'*

He does cite some examples where architectural detail offers tactile sensations. However such work represents only the elite output of the profession and in general whilst architects may want and believe architecture to deliver a full mind/body/ soul experience, in the practice of everyday architecture, it all too rarely does.

On the other hand, technology does occupy a central position in architectural practice. Many conceptual and stylistic shifts in architecture have been interdependent on technological advancements. There exists a long tradition and strong culture of architecture that pushes the development and celebrates the use of technology. However, whilst such architecture often has strong visual impact, the experience of occupying, using or passing through such spaces can be cold and alienating. As Perez Gomez fears "Technology substitutes a 'picture' for the world of our primary experience." (Perez Gomez, 1994, p5)

In contrast, interacting with a textile is personal and unique; a *cosy, cuddly, slippy, scratchy, warm* encounter. Simultaneously, one experiences an intimate physical and

aesthetic reaction. Behind this emotive experience of textiles lies as much technical expertise as is required in the making of space. It is therefore the remarkable achievement of textile designers to use 'hard-core', chemical and mechanical processes (abrasive/ corrosive technologies) to transform and combine yarns into an artifact that evokes strong emotional responses. In other words, technology may be core at the textile designer's process but it is rarely present in the user's interface with the product.

The Tactility Factory project draws on such reflections and seeks to apply a textile approach to the technological development of building products in ways that respond to these concerns. In addition, the project seeks to echo Peter Rice's ethos of *Trace de la Maine, to*, "..make real the presence of the material in use in the building, so that people warm to them, want to touch them, feel a sense of the material itself and of the people who made and designed it." (Rice, 1994)

3.1.2 politics of inclusion. (Inclusive context)
The architect in Tactility Factory has been involved in inclusive design (evolving from disability studies) over a longer time span. As such, concerns for a people centred design approach are also reflected in the processes and products of Tactility Factory.

Products and components used in constructing the Built Environment are designed, almost exclusively, to meet technical specifications only. It requires the skill of the architect to use these building products in such ways as to create environments suitable for people. Tactility Factory brings a 'human' specification to the development of its surfaces, considering it to have equal importance as the technical performance. Indeed the profoundest challenges do not lie with meeting technical specifications (since much of that work has been done by technologists before us), but rather to apply technological understanding in such a way as to make artifacts and surfaces that people wish to interact with. In the shadow of this apparently pragmatic statement sits a real concern for multi-sensory experience, design quality and beauty.

The process of Tactility Factory is built on a belief in transparency and sharing. This frequently challenges the cultures of intellectual property protection and in-house academic politics, however we understand it as an instinctive and core politic to the work processes of Tactility Factory and feel compelled, as pedagogues and members of wider design professions, to demystify processes and products through active dissemination. We use traditional and electronic media (blogs/ websites) to make links, reveal our inspirations and chart tactics. Naturally, dissemination invites response and Tactility Factory has benefited by the links, suggestions and collaborative relationships that have evolved because of these disclosures.

3.1.3 A context of historical and contemporary precedents and theory
As we work practically on the project we are at the same time party to wider academic discourses. Defining and researching contexts for the work helps contextualize Tactility Factory within a range of theoretical contexts and architectural legacies.

In particular, we have become interested in the enduring and ever-evolving relationship between architecture and textiles and adjacent relationships such as fashion and surface. Starting with Gottfried Semper's (1803-1879) theories on the interconnection between textiles and the origins of architecture itself and his development of the

'Principle of Dressing' in relation to architecture, through to the work of architects such as Hoffman and Van de Velde's who simultaneously designed clothing and architecture at the end of the 19th Century. Followed by modernism's rejection of all things decorative, influenced by Loos's 1913 text 'Ornament is Crime' (Kinney, 1999) and onward to those architects whose work has engaged creatively with surface, for example Rudolf's seminal surface treatments in the Art and Architecture Building at Yale (Rohan, 2000) and the work of the Spanish architect Miguel Fisac in 1970's and 1980's [i]. More recently the developments in nano and smart textiles covered in the work 'Architextiles' by Mark Garcia (2006) also informs the work of Tactility Factory.

We have found through this process of contextualization and analysis, examples of architecture where textiles are used either literally or conceptually. When used literally, textiles are typically used within framed and strictly regulated structures; taut, stretched and controlled; they are the 'smart' petrochemical constituents of space-age lightweight structures, seen but not touched. Where there are used conceptually, it is their characteristics of *'lightness, surface, complexity and movement'* that mirrors *'architecture's shifts towards a more fluid state'* (Garcia, 2006). Overall the result is architecture that may **look like** and indeed may even appropriate textile technologies, but rarely **feels like** textiles. (Authors, 2008). (There are of course some interesting exceptions to this rule that serve as guide points for the project.)

An awareness of existing precedents has helped Tactility Factory advance through a critically aware process. By creating a clear and distinct line of theoretical intent, which alongside logistics helps to define and order the pragmatic investigation, Tactility Factory hopes that this reduces the changes of replication and builds what Yair, Tomes, and Press (1999) call 'immunity to imitation'.

There are in the end many ways to tackle any problem, but we endeavor to choose a route forward through an informed 'creative opportunism' (Cross, 2007) rather than a random one. Our aims therefore remain focused on **mainstreaming tactility in the built environment** and whilst that may be perceived as utopian it helps guide and formulate the project, even within the scope of a business plan or the text of a patent.

Interestingly while we argue that the development of the hybrid surfaces is not a direct consequence of responding to a market need, the utopian goal closely reflects what Kim and Mauborgne (1999) in the *Harvard Business Review on Breakthrough Thinking* identify as one of the strategies of 'value innovation' ie 'the ability to pursue a quantum leap in value'. It could be argued that *value innovation* naturally arises because at the centre of Tactility Factory is the *value-laden* methodology of design.

3.2. Creativity, Innovation and Collaboration

In its early stages, Tactility Factory was driven by a singular collaboration between a textile designer and an architect. This remains at the core of its development but as it has progressed the project has drawn on and been tangibly informed by collaborations with pre-cast concrete specialists, mould makers, digital textile designers, weavers, embroiderers, graphic designers, marketing consultants, business advisors and patent attorneys.

Whilst many of those who contribute to the project do not come from a creative profession per sec they all contribute to *the application of creative ideas*; and since this is regarded as one definition of innovation (McKeown 2008), we acknowledge the contribution of all those involved in driving forward innovation in Tactility Factory.

Within Tactility Factory therefore we work hard to recognise and give space to the personal motivations of all involved. Motivations range from wishing to experiment with a familiar technology, to holding true to a certain ethic or work process. The importance and relevance of these motivations are discussed and where possible time is set aside for them to occur. However we also recognise that what motivates most creative practitioners is time for play, creative experimentation or risk-taking. Whilst this can be personally fulfilling and result in highly creative outcomes (a Tactility Factory strap line is "creativity is our currency") it can sometimes cause us to avoid the obvious, more direct routes and choose instead to explore new territories at the cost of moving the programme forward in an efficient and effective manner. This applies not only to the material manipulation of the surfaces but also the strategic direction of the project as a whole.

It is also important within such a context to value the strengths that each person brings to the process. So for example it's understood that the textile designer brings a wealth of knowledge and experience from the textile design industry. She therefore offers
- Profound technical skills, a natural curiosity and a confidence to experiment within new and unfamiliar technologies.
- An acute sensibility in creating rich tactile surfaces through the application of appropriate technologies.
- A fastidiousness about *the fabrication of the aesthetic*; trialing, testing and ultimately crafting and controlling each technical move to ensure quality outcomes.
- A pragmatic approach to product development and a track record in delivering.
- An ability to lead in trend sensitive markets

By comparison, the architect / academic brings
- A strategic clarity to the process
- A strong belief in the 'concept' / design intention mapping to the detailed level
- A confidence that large problems can be broken down into logical steps and managed.
- Skills in communicating across 'languages' and cultures ie from visual to verbal, from conceptual to operational, from creative to pragmatic

The intensity of learning around collaboration has been due in no small part to the hybrid nature of the project. Bringing concrete and textile cultures together in one project has been a challenge. Of course much has been written about the strength of working collaboratively across cultures or professional disciplines (Paulus and Arian, 2003), less is said about how to cope where cultures appear to be antithetical to one another, such as concrete and textiles.

"Where attempts are made to create diversity, the effort is often incomplete because people with varied backgrounds and thinking styles tend to have difficulty understanding one another. In practice, their differing viewpoints tend to lead to personal disputes and the creative process breaks down."

Given that this is a multi-layered project, the chance of experimentation across the material technology of concrete moulds, concrete mix, multiple textile techniques and also across a strategic direction means that the potential for diversion, confusion and ultimately error is multiplied many times over. Communication and documentation is therefore key. We aim where possible to build diaries, schedules of materials and recipes, tables of trials and critiques collectively and over time we have renamed processes and products in a third language, specific to Tactility Factory and non-discipline centred. The creation of this 'third' nomenclature is a symptom of collaboration across a wide stretch of cultures and is a necessary outcome of a hybrid collaborative practice.

Naming is also part of the categorization and critique of design trials. We aim for bi-weekly round-table discussion about the artifacts produced. All collaborators in Tactility factory regardless of their background or role take part in these sessions, and it is at these moments that we witness what Cross describes as the 'co-evolution of problem and solution', where 'Designing appears to be an 'appositional' search for a matching problem-solution pair, rather than a propositional argument form problem to solution'. Given that this project has not sought to address a defined need in the market place but rather to respond to a conceptual gap, this act of 'crafting' the problem, categorizing and re-categorizing the potential solutions relates not just to making a product but also defining an as-yet unrealized market-scape. As we categorize and name we also ask: why would anyone need this product? what purposes could it serve? what other problems does it relate to? The design process therefore appears to be in flux, almost uncertain of its own rationale. To some extent this also echoes Lawson's study of the architectural design process where, after observing the processes of many architects, he argues that the only thing one can be certain of is that ".. designers have to gather information about a problem, study it, devise a solution and draw it, though not necessarily in that order." (Lawson, 2006). The one chief difference here is that architects traditionally accept that however convoluted the design process, the solution to the problem will ultimately be a building. For Tactility Factory, however, there is no foregone conclusion.

4.0 Conclusion

The Tactility Factory project has opened up many lines of enquiry. The work of making sense of its processes and outcomes is ongoing and this paper is an initial attempt to capture and contextualize some of the tactics used during its development that seem to have resulted in, or crafted, innovative outcomes.

In terms of Cultivating a Distinct Approach, there is little doubt that the project has benefited from having a clear intellectual context to respond to (3.1.3 historical and contemporary precedents and theory); a justifiable and defined methodology (3.1.1 a sensory approach to technology); and perhaps less obviously, an alignment to a set of values that help to sustain and focus ongoing development (3.1.2 politics of inclusion)

Even before the technology to produce the surfaces had been fully resolved this Distinct Approach had given the project a unique identity and had drawn sympathetic collaborators and interested parties to it. It would seem therefore that innovation can be supported not only through a crafting of the process but also a crafting of the intention, approach and context.

In terms of Creativity, Innovation and Collaboration it is clear that understanding the different approaches and modes of creativity that each contributor brings to the process is crucial. Tactility Factory's regular round table discussions are convened in front of the surfaces produced. The very tactility of the surfaces causes the meetings to take on a less conventional format and contributors interact directly with the surfaces and each other; humanity in combination with creativity, are part of the discussion. This interaction is further underpinned by the ongoing development of a hybrid language used in the naming, categorizing and re-categorizing of design and surface outcomes. This third nomenclature becomes another form of representation, opening up new perspectives on processes, possible markets and new relationships. It helps define actions, present and future.

Finally, understanding the context, the extant skills and motivations of the team, the nature of materials, process of fabrication and the extent of resources; combined with a critical confidence in the design process, may not only allow for the evolution of new products but also unexpected results.

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[i] Miguel Fisac Foundation website www.fundacionfisac.org (accessed 13th May 2010)