Minimal Running Footwear.

A case study in ‘enabling design’/ reid douglas for tobe:

This Thesis is submitted to Auckland University of Technology for the Degree of Master of Art & Design, [Product].

Reid Allan Douglas
Bachelor of Art and Design (hons) [Product]

Minimal Running Footwear: A case study In enabling design.

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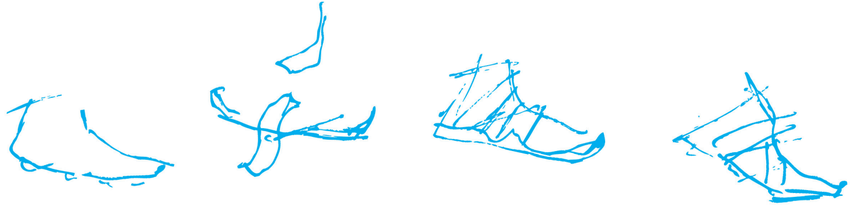
Attestation of Authorship

'I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of a university or other institution of higher learning, except where due acknowledgement is made in the acknowledgements.'

January 29 2013



Acknowledgements:

I would like to thank the business partners at 'Tobe:' Tim brown and Michael Wilson, for their support and advice. Also, Jamie Mclellan for the expertise shared during my summer internship.

Abstract:

A dramatic shift in how we design is required in order to move toward sustainable production and consumption. Such a paradigm shift is daunting and often seems inaccessible to young designers. This conceptual exploration of minimal running footwear, is a case study in developing a personal sustainable framework termed 'enabling design.' It is claimed that design purely for comfort and convenience is having adverse affects on our planet. 'Enabling design' focuses on how behavioral change might encourage pragmatic approaches to sustainability such as design for disassembly and stewardship schemes.

This thesis maps my journey through an early research phase, concept development process and project evaluation. This is a highly visual document that draws four key reflections around, design process, design research, industry learning and enabling design.

p8

p13

p21

p39

p151

p160

Research Question

How can product design enable sustainable living in the field of minimal running footwear?

Specifically exploring user behavioral change, design for disassembly and stewardship schemes.

Introduction

Young designers have been confronted with a interesting tension: respond to the mandate for radical, sustainable change, while developing industry standard design skills.

Confronting sustainability in product design often seems unrealistic and somewhat overwhelming for both professional and student designers. This masters project has sought to develop a tangible design outcome that responds to the need for pragmatic, more sustainable solutions in the chosen field of minimal running footwear.

'Our dependence on convenience is at an all time high' and is having a direct impact on the well-being of the planet (Dioffa, 2012). My focus has been on how design might foster behavioral change, and encourage more resilient and sustainable attitudes in a product user. Morelli (2007) argues that comfort and convenience based design disconnects a user from the skills and knowledge that are vital for sustainable living. How might design enable a transition to more sustainable, empowering interactions with products? Can product design act as an instigator for meaningful behavioral change? This personal framework termed 'enabling design' has been explored through a series of practical design briefs, stretching back to 2009. This project investigates behavioral change in the field of minimal running footwear and implements practical methods such as design for disassembly and stewardship schemes.

Minimal running footwear is based on research by advocates such as Daniel Lieberman (2010). It is claimed that conventional padded footwear weakens the foot and keeps a runner dependent on expensive overly technically running footwear (Mcdougall, 2009). By 'correcting' the heel strike tendency in runners, and encouraging forefoot strike technique, it is believed that muscles will be dramatically strengthened and injuries reduced. On the back of these claims, minimal running footwear is an interesting case study for investigating behavioral change and enabling design.

A summer internship with New Zealand Footwear company 'Tobe:' was the foundation for an exploration into minimal footwear. The internship inspired me to consider how my personal design philosophies and values interface with industry realities.

My journey through this year can be divided into 4 key learning strands:

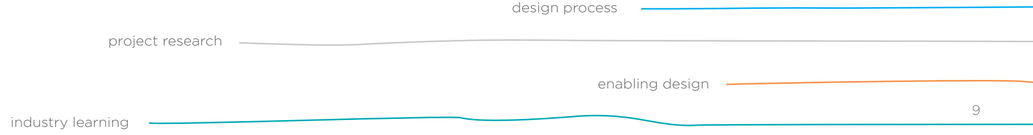
Design process: The development of a minimal running footwear solution.

Project research: Learning in the field of barefoot running and minimal footwear.

Enabling design: Further developing this framework through a practical design project.

Industry learning: Reflections on a summer internship with 'Tobe:' and my industry interactions throughout the project.

This is a highly visual thesis that draws four key reflections for each of the identified learning strands.



[cyclic action research methodology]

Introduction

Project background and outline

Better by design CEO summit

1.0 Methodology

Planning methods

Discussing action research

Critical Frameworks

2.0 Research Methods

Expert Interviews

Existing product analysis

Character profiles

Literature review

2011 study reflection

Reflective Journal

Observations

Performance footwear Inspiration

3.0 Process Journal

Initial design methods

Historic footwear

Concept sketching

Rough prototyping

Company feedback

Expert feedback

Final prototypes

formulating insights

Observations

Working prototypes

Eco system design

Concept evaluation

Project brief

Resin casting experiments

Material sourcing

internship reflection

4.0 Enabling design

Final industry feedback

Strengthening the runner

Undergraduate project reflections

Sustainability and young designers

Conclusion

design process conclusion

design research conclusion

Enabling design conclusion

industry learning conclusion

Key learning strands

1.0

1.1 Action research 1.2 Research methods 1.3 Design methods 1.4 Frameworks 1.5 Ethics

Action Research Methodology 1.1

Qualitative research is that which deals with elusive or subjective data, personal opinions or experiences of individuals involved in a study. Action research is a qualitative methodology which aims to close the deficit between research and practice (Collins, 2010 p10). It is particularly effective in understanding, researching and experimenting in real-life social situations. The researcher collects, reflects and analyses collected data in order to facilitate change (Gray, 2009).

Action research is a cyclic process whereby the researcher passes through four main phases of planning, action, observation and reflection (Figure 2). Although these cycles of investigation may continue indefinitely, it is vital that the researcher has a clear sense of purpose and direction as the exploration leads toward taking action in response to the area of inquiry (Groundwater-Smith, 2009) (Swann, C. (2002).

The cyclic nature of the action research methodology allows a project's methods and frameworks to change and grow as new information is collected. Lawson (2005) believes designers should allow for an explorative dimension to their process, which might include intuitive or non-goal-oriented activities.

Action research allows the designer to engage with a structure for the enquiry, without forecasting a fixed path for the project. The 'action' to be taken in response to the multiple research phases will ultimately manifest in the development of a minimal running shoe. This defined research outcome acts to focus the theoretical enquiry into minimal running.

Figure 1 Gibbs reflective framework(Gibbs, 1998)

Project reflection is a vital stage before planning a new cycle of research. My reflections throughout the process have been based on the Gibbs (1988) reflective cycle (figure 1).

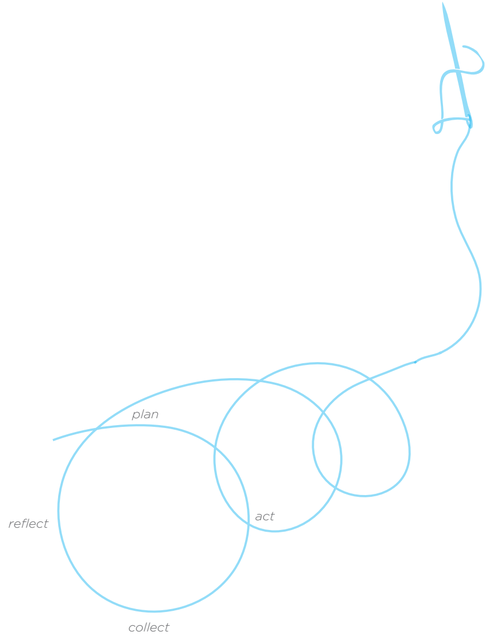


Figure 2 Action Research cycles (Collins, 2010)

Key Research Methods 1.2

Literature review:

A literature review is a summarising text that embodies the theoretical component of the research topic. The review allows a researcher to combine the insights and understanding gained from sources such as books, journal articles or dissertations and synthesise this information in a cohesive piece of writing (Collins, 2010 p.108). This text should include a critical analysis and summary of a number of sources in a specific field, identifying any potential gaps for further enquiry. (Manalo & Trafford, 2004, p. 45)

A literature review has been used to explain and clarify the philosophy of barefoot running and its impact on the performance footwear market. The work of field experts Daniel Lieberman, Lee Saxby and Christopher McDougall, provided in-depth insight into the barefoot running philosophy and were the main academic contributors to the literature review. Benno Nigg and Robert Kornfeld provided a skeptical opinion of this running philosophy, helping to summarise current views in this academic field. Alongside these scholars, an extensive enquiry into newspaper articles regarding barefoot running proved to be invaluable in discussing current opinions on this subject.

Expert Interviews:

Interviews have been used to gain insight into the perspectives of experts who have studied extensively in the field of enquiry. A Millennium Institute podiatry professor provided a critical perspective on the barefoot running philosophy. Interviews were also undertaken with a second physiotherapist to attain multiple expert opinions within the practise of sports medicine.

'Do-it-yourself' Reflective Journal.

This practical design research tool requires the researcher to simulate or participate in the scenario they are designing for, "Fostering a reflective approach...has the effect of encouraging deep, rather than surface learning" (McGuinness, 2007, p.28). The researcher experiences the real life constraints, opportunities and affordances present in the user's environment, allowing them to gain true insight into real (as oppose to perceived) opportunities. The IDEO (2010) method cards suggest that by 'enacting the activities within a real or imagined context, the [designer] can trigger empathy for actual users and raise other relevant issues.' In order to receive a first hand experience of the minimal running philosophy, regular running sessions were undertaken to graduate toward sound, forefoot strike technique. Understanding the barefoot philosophy in both theory and practice allowed me to approach the design phase with rigour and empathy.

Observations:

This research practise involves gathering and documenting insights discreetly, by closely observing a person or scenario (Pearson, 2005). The researcher not only focuses on the literal facts of a situation, but absorbs the environment, body language and the behavior of those involved. Observations offer a glimpse into the real behaviors and factors at play in a situation and often differ from a person's verbal responses in an interview. This research method is not bound to recording notes, but utilises film, sound sampling and photographs to form a holistic review of the scenario at hand (Bakeman, 1986).

Observations were used to gather insight during the research phase to help form a suitable design brief; but also occurred during the design phase of the project. While testing minimal footwear prototypes, observations allowed me to capture the a users interaction with the concept in an unobtrusive manner.

Existing Product Analysis:

An existing product analysis generates an understanding of how a specific product is made, alongside a review of its successes and drawbacks (Fasciato, 2004). Such an enquiry includes mapping the existing market trends on a product matrix and specific product reviews. The minimal footwear market is a rapidly growing industry (McDougall, 2011), showcasing an array of functions and design styles. A current product matrix allowed me to investigate a variety of shoes currently available in this field and drew focus to a number of

more specific product reviews. The following principles were used to prompt a reflection on key areas of the shoe's design: form, function, materials, branding, innovation, ergonomic considerations, and underling sustainable frameworks.

Character Profiles:
Fictional character profiles were constructed based on a literature review, field observations, existing product reviews and expert interviews. This exercise helped me understand the potential users of a new minimal footwear design. The fictional users provided focus and direction to the design process, reminding me of the key insights to be addressed in the products development (IDEO, 2010). Character profiles also allow a designer to forecast the potential users of a new product, and pitch a specific innovation or design language to a niche in the market. In an area fast becoming saturated with minimal running solutions, this tool also acted to refine and clarify how the design will be set apart from what currently exists.

Key Design methods: 1.3

A number of design methods have been practised throughout the year to generate, critique and test ideas. *Brainstorming* and *The Lotus Blossom* (VanGundy, 2005) ideation technique were used to form cohesive, potential concepts based on the insights that were gathered from research. A high volume of new ideas were produced in a short space of time, providing a creative platform on which to develop a concept (Creating Minds, 2010). *Sketching* (Do, 1996) was key to the development of specific design responses and allowed for free flowing exploration around potential solutions. A highly portable A6 sketch book (figure 3), was an effective method of documenting spontaneous ideas. The sketch book stayed with me during lunch breaks and on the weekends, facilitating casual feedback sessions from, colleagues, friends, practising designers and potential users

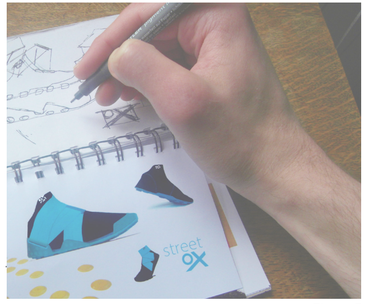


Figure 3

While *quick, rough models* (IDEO, 2010) were useful for capturing a core ideas; accurate *prototyping* (Diegel, 2010) proved to be the most difficult design method encountered during the project. My inexperience in areas such as rubber sole moulding and sewing, forced me to learn quickly, and *outsource* (Alesina, 2010) tasks where possible. As my skills developed in this area, tools such *Photoshop and illustrator* (Diegel, 2010) refined concept prototypes.

CAD software (Diegel, 2010) such as Solidworks and Rhino were used to resolve and finalise the design. Undergraduate and previous postgraduate tuition has emphasised the importance of practising design methods in the correct order. I have come to understand that CAD programmes can often stifle the creativity of my design work by forcing overly pragmatic analysis too early on in my design process. Manual techniques such as sketching or rough model making help me to realise a 3D form prior to the intervention of CAD software.

Rapid Prototyping (Diegel, 2010) processes such as laser cutting, laser sintering, and CNC routing have been used to resolve the details of the design and develop realistic prototypes. With minimal project funding, these highly precise and expensive tools were only used once the design had a clear, promising direction.

Key Frameworks: 1.4

Self-reliance:
The idealistic notion of self-reliance was the theme of study in my honours project, Kinetic Connections. This study questioned the breakdown of communication products and systems in the context of the Christchurch earthquake. I was interested in how products might disable a user when their dependence replaces personal survival skills.

This master enquiry set out to further investigate how traditional running products alledgedly compensate for bad technique and weak muscles, instead of actively strengthening the runner. How can design be used to explore a market based on these claims? Could an investigation into minimal running footwear allow a user to move away from highly protective, cushioned running shoes? I have been interested in how a product might make accessible the proposed benefits of minimal running; enabling an enjoyable running experience and meaningful product interaction.

Human Centred Design:
Human centred design is the principle of designing with the user at the heart of an enquiry. More than an efficient formula, this framework is an uncompromised attitude toward designing not only for the user, but along side the user (Greenhouse, 2011). Research techniques such as observations, character profiles and role-play are centred around the goal of understanding people, their behaviors and their environment. Designers go to the lengths necessary to capture an empathy for the people they aim to design for, genuinely caring about their needs and opinions. (Patnaik, 2009).

'For thousands of years, people made things for other people they knew...cobblers made shoes for people who lived down the street. That intimacy helped a cobbler know whether you had flat feet, liked to walk, or sprained your ankle last summer' (Patnaik, 2009 p.45).

Establishing empathy in the design process through human centred design research and practise, reconnects the designer with the users real needs and opinions. The designer is accountable to a set of well researched and relevant constraints that truly engage with the user (Patnaik, 2009).

Sustainable Design:
Sustainability deals not only with the ecological component of a product's story, but with how it fits into society and business (Munasinghe, 2008). Products should be developed with regard to environment, social considerations, and economy. The internship undertaken during the summer of 2011/2012 and the subsequent relationship with 'Tobe:' has helped to instill these realities into my thinking. Exposure to industry practice has highlighted the need for integration across all three areas of sustainability. I have been challenged to consider how the design project could fit into the current business positioning of 'Tobe:', but also how to employ more radical thinking around social impact. For example, the potential for local manufacture and material sourcing has a direct relationship to how the designer deals with construction techniques and material. If a product was designed specifically to be easily made, potential jobs could be generated by a small, onsite design and manufacture outfit here in New Zealand.

More direct possibilities for sustainable development can be found in principles such as:

Design for disassembly:
This principle deals with the material construction of a physical product (Sodhi, 1998). Before the engineering and production phase of a product, the object needs to be designed with its subsequent disassembly in mind. The end goal of this framework is to develop a product that can be easily taken apart and recycled at the end of its life (Sodhi, 1998). Product disassembly deals with man-made materials that are considered to be part of the world's closed-loop technosphere (McDonough, 2002). Shedroff (2009 p.183) identifies a number of techniques to help facilitate the design and construction of a product that lends itself to disassembly and recycling. For example:

-Fewer parts: Perhaps the most effective disassembly technique, design in such a way as to reduce the amount of components or materials required to fulfil the design objective.

-Fasteners: Using non-adhesive fasteners, or reduce the need for fasteners altogether allowing for easy disassembly.

-Standardised components: Using parts that cant be easily replaced or repaired to maintain a functioning and high quality product.

-Pure parts: Where possible, mono-materials parts should be used in order to maximise the potential for successful recycling. (Shedroff, 2009)

Design for re-use:
"In order to be truly sustainable, solutions need to both last longer and have a life after their normal use period" (Shedroff, 2009 p.176). In our society of over-consumption and disposability, products have lost their material value (Papanek, 1984), and deliberately designed reuse is very rare. There was difficulty in applying this principle to footwear design, however, applications such as packaging and branding tags, were potential opportunities to embrace the mandate for material re-use.

Minimalism:
Minimalism is a suitable framework to consider in light of the barefoot, minimal running movement. This design brief had the goal of executing a beautiful and functional minimal running solution. Minimalism as a design principle is rooted in 'an awareness of the fundamental, the building blocks of...design (Walker, 2009 p.9).' There is a certain mystery to minimalist notion that 'Less is more,' where there are no set criteria for achieving a minimal design outcome. But it is unmistakably clear from the work of industrial designers such as Dieter Rams (Klemp, 2009) and Naoto Fukasawa (Fukasawa, 2007) that minimalism produces objects with an honest and attractive presence.

Minimal design transcends the notion of trend or fashion. The ten design principles of Dieter Rams emphasise the reduction of all non-essential features, focussing on what is truly important about an object (Klemp, 2009). 'Unlike fashionable design, [a product] lasts many years – even in today's throwaway society' (Vitsoe, n.d). There is quality in simplicity. In the opinion of Japanese design company MUJI, true quality is found when a product's simplicity lends itself to a variety of users and environments (Hara, 2007 p.272).

Minimalism places specific emphasis on pure form and well executed details. This framework inspired the following intentions for the design of a minimal running shoe:
-The celebration of inherent material qualities before adding complexity.
-A focus on the profile silhouette of the shoe with special focus on the interface between the sole and the upper materials.
-Careful consideration of seams of the upper construction and its relationship to the geometry of upper.
-Restraint in branding the product, allowing the form and details to create personality and identity.

1.5

Ethics:

Ethical approval would be a requirement in order to test and validate the design with real users. This project has used personal reflection and expert interviews as a method of concept validation. Also, The cyclic, 'reflect and respond' nature of the action research methodology saw many of my research and design methods evolve with the project.

2.0

2.1 Literature review 2.2 Expert interviews 2.3 Reflective journal 2.4 Observations 2.5 Existing product review 2.6 Character profiles

For the sake of clarity, my reseach methods have been grouped together in one chapter. In practice however, these methods have built on each other and have been woven into the cyclic design development process.

barefoot key points:

Heel cushioned running shoes place more strain on joints than...

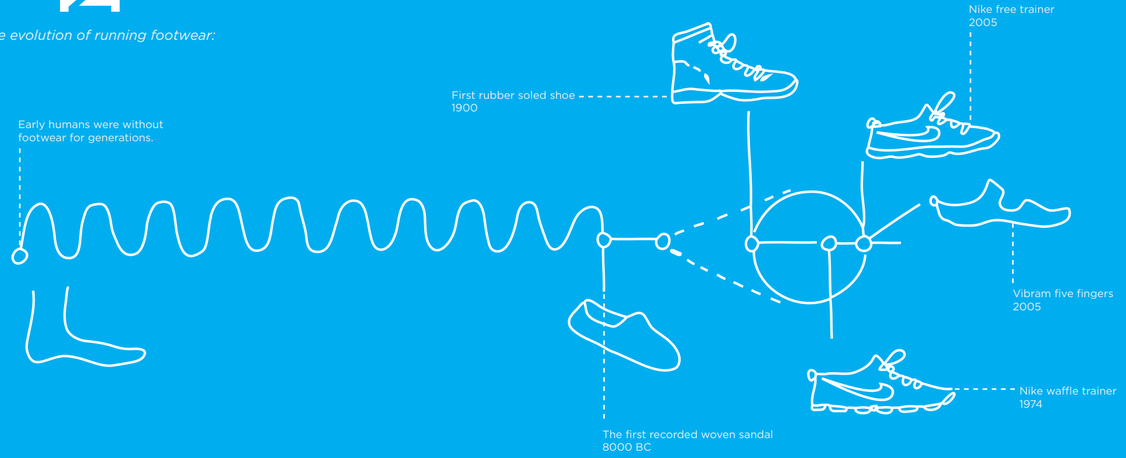
walking in high heels.

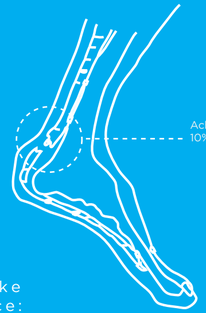
high heel: 1

Modern running shoe heels:

time line: 2

The evolution of running footwear:

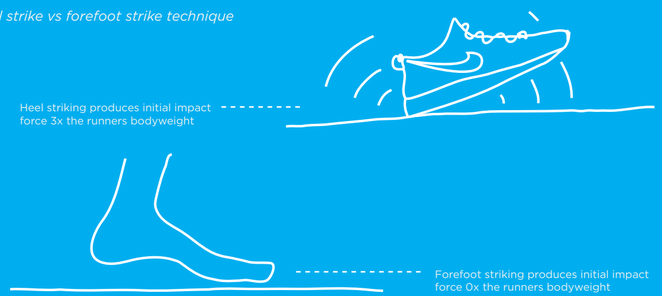




Achilles tendon blow outs have increased 10% since the rise of modern running shoes.

strike force: 3

Heel strike vs forefoot strike technique



Studies claim that modern running footwear produces significant increases in joint torque:

54%
Hip flexion torque

38%
Knee Varus torque

36%
Knee flexion torque

joint stats: 4

Shod running joint torque compared to going barefoot:

(XrayTechnicianSchools, n.d).

Literature review: 2.1

An outline:

According to evolutionary biologist Daniel Lieberman, the human race has been engaged in long distance running from its origins. In early human history, running occurred barefoot or in lightweight sandals without cushioning or the elevated heels that are characteristic of modern running shoes (Lieberman, 2010). In a recent study ('Foot strike patterns and collision forces in habitually barefoot versus shod runners'), Lieberman (2010), documents how runners prior to the 1970's coped with strike forces without modern protective footwear. The enquiry found these runners struck the ground with their forefoot, drastically reducing the impact force typically present in a heel striking motion.

The barefoot running philosophy is built on the simple claim that humans have forgotten correct running technique (Saxby, 2011). Modern running shoes overprotect the foot from real forces that are present in running locomotion and are responsible for dulling the impact force of heal striking. Thick foam and motion controlling technologies foster incorrect and damaging technique; Heel striking sends immense forces through the body as the runners whole weight is transferred into the ground (Saxby, 2011). Studies also claim that unnatural torque at the hip and knee joints are caused by traditional running footwear; The internal hip rotation torque was found to increase 54%, knee flexion torque increased 36% and knee varus torque increased 38% in comparison to the practise of barefoot running (Spine-health, 2010).

Forms of Human Locomotion:

The human foot is a elaborate and precise arrangement of springs and levers (Saxby, 2011) made up of more than 26 bones, 33 joints and over 100 muscles, tendons and ligaments. This design allows the foot to perform a range of complex movements (Elftman, 1969), including the locomotion of walking, running and sprinting. These movements distribute a persons mass in different ways across the foot, illustrated by the typical 'heel toe' walking gait pattern and the sprinting motion that occurs on the ball of the foot.

The locomotion of sustained distance running is the subject of conflict in the modern running debate. In their pivotal paper on 'Running-related injury prevention through barefoot adaptation,' Robbins and Hanna (1987) make a number of controversial claims against the use of modern running shoes. Similar to the perspective of Saxby, they argue that shod running has been successful in diminishing 'sensory feedback without diminishing the injury inducing impact.' The study states that the superior mechanism of the arch for shock absorption is stifled by highly supportive footwear. A running shoe gives the illusion of protection, while in reality, interferes with the finely balanced arrangement of muscles bones and joints that make up the human foot. The study concludes with the suggestion that modern running foot wear should allow the foot to behave in the way it was designed to move; encouraging the runner to rely on their innate shock absorption system (Robbins,1987), and develop correct technique and strengthen their muscles.

Proprioception

Transitioning from walking to running motion, the foot is designed to inform the move from landing on our heel to our forefoot. We feel pain when we heel strike barefoot and that is our cue to adjust our strike technique (Saxby, 2011). Sensory feedback is key to the decisions we make with our body but is only part of the body's propriceptive system. Propriception is commonly referred to as our 'sixth sense' and is related to the sensation of muscle movement, feelings of balance, navigation in an environment and the exertion of effort. Input from sensory nerves found in muscles and joints are transmitted from parts of our body, through the spinal cord to the brain (IADMS, N.D). Running barefoot allows the body to fully engage with an environment, drawing maximum feedback from the bodies propriceptive system.

The enquiry by Robbins and Hanna has not been highly regarded in literature with experts claiming excessive bias in the tests on which the paper is based (Davis, 2011). In recent years however, the credibility of the ideas proposed by Robbins and Hanna are gaining traction amongst former skeptics. Established biomechanist and podiatrist Irene Davis (2011) believes that although their is no hard proof linking barefoot running to a reduction in injuries, it makes biomechanical sense not to overly protect the foot in running. She has

come to agree with barefoot fundamentalists, that modern running shoes are weakening foot muscles and decreasing proprioception.

Barefoot Running Summary

Barefoot advocates claim that forefoot/midfoot strike technique is superior to shod running for the following reasons:

-Muscles, tendons and ligaments in the foot become stronger by practising a more natural gait pattern.

-Eliminates the tendency to heel strike, therefore allowing the foot to absorb shock through the arch as it was designed to.

-Develops a smooth and efficient running style by landing gently on the fore foot.

-Allows the body's proprioceptive system to function properly and improve balance and coordination.

-Reduces the unnatural torque present at the knee and hip joints, improving the bodies alignment.

-Reduces injuries (including Achilles tendonitis, calf strains, shin splints and ankle injuries) brought on by incorrect technique, weak muscles in the foot, and tight tissue in the calf muscles.

-Barefoot running philosophy is consistent with the running technique of humans in ages past and superior running cultures in the world today (Quinn, 2011), (Lieberman, 2010).

Further criticism

These ideas contrast years of running shoe research by large performance shoe manufacturers and podiatrists. 'The Runners Repair Manual,' (Burr, 1980) explicitly instructs runners to 'land on your heels - not on the balls of your feet,' linking forefoot strike technique to a number of severe injuries. Burr claims that the calf muscle becomes short and tight in forefoot running, preventing the knee joint from fully extended and leaving the calf muscle in a contracted position. Although persuasive, barefoot running arguments face tough criticism from established and well regarded experts in this field. (Nigg, 2010, p.195).

Benno Nigg (2010) dedicates a chapter of his recent book to unpacking and critiquing the claims of barefoot fundamentalists. He questions the Lieberman study (2010) on the notion of an evolutionary superior running technique, proposing that the runner simply adjusts their landing pattern for different surfaces, depending on comfort and preference. Landing pattern may have some influence on the performance of an athlete, however, their is insufficient evidence to support Lieberman's claims in this area (Nigg, 2010, p.195). Nigg believes that the impact of landing technique on the rate of injury is speculation and lacks scientific backing.

Although he is unconvinced by the revolutionary hype of the barefoot movement, Nigg is quick to give credit to barefoot training as a means of muscle strengthening. Barefoot training sessions may provide performance increases to some athletes in a similar way to the 'wobble board' exercises that encourage balance and strengthening of the foot (Nigg, 2010 p195). There is a danger in runner's purely buying into the hype of the barefoot running movement by assuming the proposed benefits will apply to every runner. Kornfeld (2010) believes that only very few people should wear minimal running shoes under the close monitoring of a trained podiatrist. He recommends runners do not disregard conventional shoes designed and made by companies with decades of research into the biomechanics of running.

Nigg concludes his analysis of barefoot running by reviewing products that propose to offer the benefits of barefoot running in a shod solution. Consistent with his view of barefoot running as an occasional training method, he believes minimal running shoes that have a 'functional basis' will exist for a long time (Nigg, 2010 p195).' Ultimately, he forecasts the current barefoot fashion trend will be short lived.

Born to run

The ideas supporting minimalist running have existed for decades in research circles but have become popular by the release of well received titles such as Chris McDougall's (2009) 'Born To Run.' The book follows McDougall's journey to

the Tarahumara Indians of Mexico and learn the secrets behind the world's greatest long distance runners. McDougall studies the barefoot running technique and the lifestyle of this remote Indian tribe, coming to believe that everything western society understands about distance running is incorrect (McDougall, 2009). He believes that as it was central to human existence in ancient times, distance running is core to the lifestyle and existence of this Mexican tribe. McDougall claims that not only are there biomechanical benefits in the practise of barefoot running, but that their running centred community exists free from crime, high cholesterol, heart disease, cancer and warfare. His discoveries lead to the pursuit of his own distance running goals, training for an ultra marathon through the Mexican Copper canyons (McDougall, 2009).

The book sparked an international phenomenon, spreading the barefoot craze to the mainstream public. 'Born to Run' was a New York Times best seller, appealing to disenfranchised shod runners and aspiring athletes alike. The 'Vibram' barefoot running shoe (worn by McDougall and other influential barefoot runners) and has also had a significant impact on the communication of barefoot running to the western world (Jarosky, 2011).

Footwear:
The barefoot running philosophy has also been made popular by other successful footwear products. Manufacturers believe that the benefits of barefoot running can be translated into the performance footwear medium; capturing the shape of the barefoot, the kinematics of barefoot movements and the feeling of running barefoot (Nigg, 2010). Models such as the New Balance Minimus range (New Balance, 2012) are an example of how manufacturers are designing for a spectrum of users in the barefoot market. Many potential barefoot runners are adjusted to conventional footwear and the issue of 'graduating' towards barefoot running is a significant challenge. It is becoming common practise for manufacturers to release minimal solutions with degrees of support and cushioning, allowing the user to moderate their journey towards super minimal footwear. This new industry has inspired designs from leading sporting companies such as Nike, Adidas and Newbalance; but has also provided an opportunity for small footwear companies such as 'ToBe:', to release minimal running solutions into the performance footwear market.

Newspaper review:
A review of local and internationally based newspapers including the New Zealand Herald, Dominion Post and the New York Times, provided valuable opinions and advice on the subject of barefoot running:

Small Steps at a Time:
A number of articles addressed the issue of shod runners adopting the practice barefoot running. A Colorado-based running coach, Micheal Sandler, stresses that patience and small steps is the key to process of going barefoot (Baby Steps to Barefoot Running, 2011). Ultimately, barefoot running is not about speed, but a smooth, even running technique that focuses the runner on all aspects of the runners form (McDougall, 2011). The benefits of the barefoot pursuit are endorsed by experts who propose that strengthening the foot muscles drastically reduces the need for the excessive cushioning of expensive running shoes. Overly protective shoes are compared to having the foot trapped in a plaster cast; Muscles atrophy as they depend on material to hold the foot in place during walking/running gait (Work Out and Bare Your Soles, 2012).

Critics claim that the barefoot running craze has produced a large number of serious injuries. Barefoot experts do not deny such statistics but attribute these injuries to the overly zealous who do not gradually adjust to the new technique (Work Out and Bare Your Soles, 2012). The advice to slowly graduate toward barefoot running finds support an article from the New Zealand Hearld: Recent research argues that the average running shoe does more damage to the body's joints than wearing a pair of high heels. Due to a highly elevated heel, traditional shoes damage to the ankle, knee and hip joints more than running without footwear (Laurance, 2010). Transitioning away from such products requires focus and patience, as the runner must adjust both their footwear and technique simultaneously.

Nike and the culture.
The barefoot running movement is not exempt from its ties to fashion and market trends, prompting comparisons to footwear movements in decades past (Nigg, 2010 p195). New Zealander Andreas Harlow, worked as the world-wide director for running shoe design at Nike from 2007-09. He believes that culture of excess promoted in the 1980s and 1990s was mirrored in the eccentric (often gimmicky) design and engineering of running shoes. He suggests that the increasingly popular culture of organics and connecting with nature is reflected in the current shift toward barefoot running and minimal footwear (Macdonald, 2012). The reality of Harlow's views can be seen in the increasingly popular 'Nike free' range. Nike has turned 180 degrees in the last decade to accommodate both customers with a genuine interest in natural running and appeal to those keen to lace up the latest trend (Jarosky, 2011).

Born to run.
It is clear from the diverse range of articles discusses the concept of minimal footwear and the barefoot movement, that Chris McDougall has inspired much of this craze by the release of 'Born to Run' in 2009 (Kenworthy, 2009). The book has been powerful in communicating the ideals of a small running community to the mainstream, instigating widespread shifts in running culture and its products. His firm convictions around barefoot running have fuelled an assault on the modern running shoe industry, convincing followers to ditch their traditional shoes and get back to running in the way we were designed to (Kilgallon, 2009).

Conclusion:
Currently, there is no decisive evidence to either support or negate the claims of the barefoot running philosophy, bringing into question much of what we have come to accept as 'necessary' to the practise of running. The persuasive argument of barefoot advocates, scientists and biomechanists have caused significant shifts in modern running theory and practise, forcing the footwear industry to take notice of their ideas. This reality can be seen through the responses of international companies such as Nike and Newbalance who have built entire product ranges around barefoot philosophy. It seems that regardless of the skeptics, barefoot running has made a lasting impression on modern running culture; and has provided an exciting opportunity for designers to reinterpret the boundaries of performance running footwear.

Run out of Time (June, 2012).

Above: A recent article contrasting a modern running shoe with a asics model from the 1950's

Expert Interview Summaries: 2.2

Two key experts were interviewed in order to attain an accurate understanding of the constraints and opportunities afforded by the barefoot running movement. The following statements summarise the discussions with these experts:

Kelly Sheerin:
AUT Millennium Institute Running and Cycling Mechanics Clinic Manager.

Key findings:

Research into barefoot running science is currently fuelling the craze of minimal running footwear. Market trends often occur very quickly.

In the same way that Nike frees are interpreted for uses other than those they were designed for, there is the potential to explore the functional flexibility of minimal running footwear.
Every major shoe company has begun to explore the minimalist footwear movement. Lesser known companies have been able to capitalise on the popularity of barefoot running.

We have come full circle. Minimalist shoes are resembling the iconic original running shoes of the 1960's and 1970's. In many ways the minimalist movement undercuts the research and design development of conventional running footwear.

In light of this, their will always be a majority of users who are unable to run in barefoot shoes due to poor biomechanics, severe injuries or a lack of general fitness. The sustained success of companies such as Asics illustrate that conventional running footwear will not be superseded by this movement.

The sharp peak in impact force recorded in heel the striking motion is said to be dangerous; A large amount of force is generated over a short period of time, leaving the body unable to dissipate force effectively. Barefoot advocates claim that removing this 'peak' by forefoot striking, will result in a reduction in serious running injuries.

Daniel Lieberman and his evolutionary approach to arguing the barefoot running movement has received a lot of criticism from established biomechanists. Not everyone agrees with his forthcoming research claims and findings. Irene Davis, of the University of Delaware provides a much more level headed approach to this field, and has a significant level of credibility amongst biomechanists.

Kelly believes, that this area is much more about running technique than a certain style of footwear. Running shoes behave as tools to take a runner in different directions. His main focus is to increase the running efficiency of his patients.

Kelly has had patients who have experienced much success with minimal running footwear that has eliminated longstanding injuries. Regardless of the situation, it is vital that a person graduates slowly toward minimal running footwear.

While initial shock waves are absorbed through the arch of the foot, ultimately, shock absorption occurs throughout the whole body.

Barefoot running is far from an exact science; new research is constantly surfacing, and no simple diagram can be drawn to summarise the pros and cons of a particular running style.

The ankle joint cannot be separated from the motions of the foot. When discussing the role of the ankle, we are dealing with pronation and supination and there relationship to different strike patterns.

The development of running footwear over the last 30 years has perhaps been misguided in its attempts to avoid over-pronation - building up excessive cushioning on the medial side of the shoe. The raised foot position combined with the severe heel toe drop of conventional running shoes has essentially created a lever at the ankle joint.

With all running shoe, there must be significant consideration given to how long they are designed to last, and how the wear of the shoe is communicated to the user.

With durable, long lasting materials, there is a danger of the upper remaining intact, while the sole rubber perishing, or over compresses without the user being aware of the damage.

Lacing is very traditional method of securing footwear. There is real opportunity to create a shoe that performs a particular task-such as providing a form of lightweight support-through an alternative securing method. If such a system was also easier to use, that would be of further benefit to the user. This is definitely an area that has hardly been explored, and would be very interesting to develop.

The proposed exploration of minimalism and support in running footwear was well received by Kelly; It was agreed that there was much inspiration to be drawn from historic minimal footwear.

Kelly also encouraged me to explore solutions that might be modifiable for the individual's biomechanical needs, as well as their level of minimal running experience. A forefoot strap for example, would allow the runner to adjust tension accruing to their specific needs. Or perhaps the issue of washability - considering that minimalist shoes should be designed to wear barefoot.

A company such as 3M, might also fuel exploration into different types of lock mechanisms and provide tangible solutions for the footwear application.

The undefined and slightly hectic state of the current running footwear market is a perfect opportunity to propose new design solutions, and ask questions of what might be useful as minimal running footwear.

Physiotherapist
MNZSP BHSC (PHYSIO)

Key findings:

Heel striking is the most common technique in running and is usually seen in amateur /recreational runners. Whilst maybe not the 'ideal' technique, most people do not have too many issues with conventional footwear.

Barefoot running philosophy does not negate the decades of footwear engineering and podiatry research. This research is still very necessary for the main percentage of runners who do heel strike. They need this dampening force on the heel as changing running technique is too difficult for most amateur runners to attain.

In its extreme form, barefoot running is claimed to be a lifestyle and much more than good technique. We live far too sedentary a life to return to 'running as it was in ages gone by.' We are no longer walking and running constantly in daily life and most commonly, physical activity occurs on the weekends. Also, man made running surfaces are very different to sand, grass etc.

Currently, barefoot running seems solely a fashion movement in the footwear industry. However, in the same way that 'free range eggs' or 'organic' food brought changes to industry - consumer driven movements are able force big industries to accept new philosophies and provide their own variant of a 'fashion' trend. This can be seen in the Nike Free range of shoes, developed so as not to miss out on the market share.

The key characteristics of a minimal running shoe are as follows: Lightweight, minimal support, flexibility.

The main injuries attributed to the activity of minimal running can be broken into a few key areas:

-Foot injuries - 5th MT stress #, 5thMT-T jt strains,
-Ankle injuries - tibialis posterior tendonitis
-Knee injuries - Patella-femoral joint pain (most common)
-Thigh - ITB overuse tightness

Moving towards barefoot running should be a gradual transition - 6-18months worth of transition phase: including Hip, knee and ankle strengthening and stability exercises and focus on mid/forefoot running rather than heel striking.

Sound technique is very important - unfortunately not many of us have it; nor do we or have the time or the passion to attain such technique. Therefore, correct shoes to aid with your technique is very important. The type of shoe currently in use is one of the first questions asked to any new patient with a running related issue.

There is a significant reduction in all supporting material in a minimal running shoe, especially around the heel and ankle; This has an impact of the frequency of ankle injuries such as tibialis posterior tendon overloading. But there is probably more impact on knee injuries than anywhere else.

Potential benefits of a running shoe that embodied the minimalism of barefoot running, whilst providing a form of lightweight support are as follows:

-Faster for race day performance - i.e. like track shoes,
-Encourage intrinsic (internal) muscle strength of the foot.
-Encourage hip, knee and ankle strength and control.
-Cheaper to make and hence cheaper cost.
-Possible less reduction in injuries than complete minimalist running shoes.
-Possible use as a bridge for athletes wanting to progress to barefoot running over a few years.

Video journal 2.3

A nine minute video journal summary can be found on the CD supplied with this Thesis.

Reviewing a range of conventional running footwear.

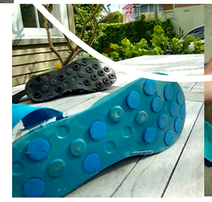
i

Graduating toward minimal running footwear.

ii

Testing minimal footwear concepts.

iii

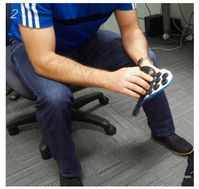


Reviewing and reflecting on the design direction.

iv

Observations 2.4

Early observations took place through viewing barefoot running blogs and video footage. This method established a clear understanding of barefoot running locomotion. A second, more fluid stage of observations took place through expert and user feedback. As the prototyping phase developed, concepts were tested and observed to gather functionality and usability Insights.



1
An online clip comparing heel striking with barefoot technique. (Fitness footwear, 2010).

2
Observing an Expert testing a modular sole prototype.

3
Observation photography from a user testing the strapping harness prototype.

Existing Product Analysis 2.5

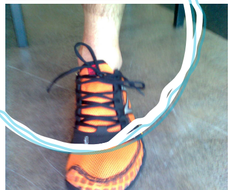
Product Matrix

By graphing a number of minimal running shoe designs on a set of axes, a market gap was more easily identified. In this case, I have used the headings 'lightweight' and 'super minimal' along the horizontal, to cover a broad range of barefoot running solutions. The headings 'supportive' and 'no support' allowed me to organise these solutions across the vertical axis to reveal a market gap. This exercise helped to inspire an exploration into the notion of minimalism and its relationship to lower leg support.

Shoe Retailers:

Visiting local running shoe clinics was helpful to my understanding of this market. Each visit consisted of a conversation with the shop assistant on his views of the barefoot running movement, as well as their thoughts on my area of research. Shop assistants explained the features of different products, as well as their opinion on how to begin wearing minimal running footwear.

> in-store reviewals



Character Profiles 2.6

Age: 30
Fitness level: Moderate to high
Minimal running experience: New to minimal running footwear, this persona runs a 7km route from his apartment four nights a week after work. He has worn a prescribed pair of Adidas Supernova running trainers (2) from Shoe Science for five years. He replaces the shoes every 200km due to compressed EVA foam, and worn tread pattern.

The thick soles of his current footwear leaves him feeling unstable in running gait, and he wears support braces on his weak ankles. He has read a lot about the benefits of the barefoot running movement, and has decided to begin the process of graduating to minimal footwear. He is yet to find a footwear solution that both allows a gradual introduction to barefoot running, while providing a form of lightweight support for his weak ankles.

1

Age: 23
Fitness level: Moderate
Minimal running experience: This persona has spent the last two years working on her forefoot strike technique in a pair of Nike Frees (2). She runs three lunchtimes a week in the CBD and competes in social races 3 times a year.

She is often frustrated by how quickly her tread wears down across the forefoot of her shoes, while other areas remain in good condition. She feels guilty when she throws out these shoes, and wishes there was a way they might be resoled. With regard to cleaning, she has recently damaged a pair of expensive running shoes by machine washing, and wonders why shoes are so difficult to clean.

She has also begun to consider how to adjust to more radical minimal footwear solutions, but is unsure how often she will have to replace her shoes.

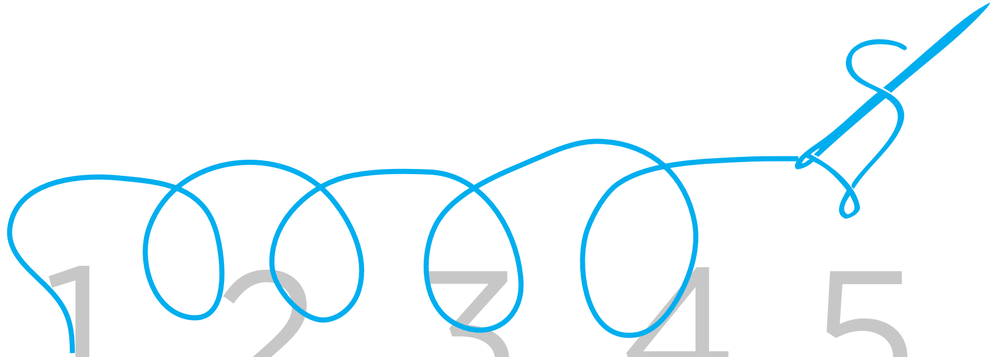
2

3.0

3.1 Supervision cycles 3.2 Insights 3.3 Design brief 3.4 Internship reflection 3.5 Design evaluation

3.1

plan act collect reflect



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Supervision cycles:
Twelve supervision meetings provided structure to the action research methodology. At each meeting, research and practical work was presented and discussed. The recorded notes from these meetings, where translated into a project plan. *Acting* on this plan, new research and practical work was collected to present at the next supervision meeting. *Reflecting* on the feedback and discussion points informed the planning stages of the subsequent cycle.

Inspiration


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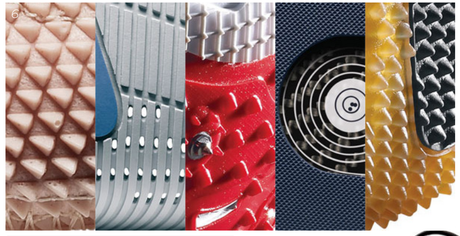
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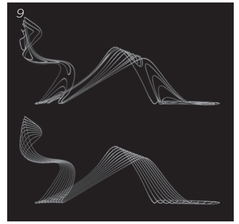
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10

1 (Yan, 2011)
2 (Smith, n.d.)
3 (Run Ran Run, 2012)
4 (Free Run Shoes, 2012)
5 (3M, 2012)
6 (Notcot, 2008)
7 (EU Kicks, 2012)
8 (Tine-Beres, 2011)
9 (Deep, 2009).
10 (Fischer, 2012)

3.2 Insights:

The following categories synthesise research into a set of key Insights.

design insights

An interesting market gap exists that explores the tension between minimalism and support in footwear.

A runner should have control over their graduation to minimal footwear. Too much, too soon is dangerous.

Design cues on the sole could be used to help runners gauge where they are landing.

One footwear solution could be designed to cater to different needs in minimal footwear users.

Minimal running footwear has clear tie-ins to historic sandal-like structures.

Minimal footwear should embrace simple shoe construction techniques and use less materials. Nasty adhesives should be designed out of a shoe where possible.

Lacing is very traditional method of securing footwear. There is real opportunity to develop innovative securing systems for minimal footwear.

technical insights

The shock associated with Heel striking is claimed to be very damaging to a runners body. Minimal footwear eliminates the shock absorbing heel, fostering sound forefoot strike pattern.

Running footwear is much less scientific than what is marketed to the user. The barefoot running movement has opened the doors for new interpretations of running footwear.

Conventional running footwear has overcomplicated the practise of running.

While interrogating the role of lightweight support in minimal footwear; two characteristics of minimal footwear should be honoured:

1. Zero drop: no rise in the sole from heel to toe.
2. Wide toe box: the foot should be free to move for maximum sensory feedback.

There is a significant reduction in all supporting material in a minimal running shoe, especially around the heel and ankle; This has an impact on the frequency of ankle injuries.

theory insights

Minimal footwear could be used to foster more resilient runners, who do not depend on excessive technologies in order to run.

Modular parts could act as a catalyst for a long term, sustainable, business-user relationship.

The minimal running movement has identified that running is a skill that all people should possess.

In order to tell the story of this product effectively, considerations such as branding and packaging should be carefully thought out.

The design project should propose radical, playful solutions for minimal running, however, there is a tension here between radical thinking and usability.

Pure barefoot running involves no footwear interventions. With this in mind, what is the role of design in this field?

While running footwear is important for the majority of modern runners, correct technique is the core mantra of the barefoot running movement.

Brief 3.3

Introduction:
This design project will be based around three key areas of performance footwear:
i. Unpacking the footwear design opportunities afforded by the barefoot running philosophy.
ii. Exploring the relationship between minimalism and support in running footwear.
iii. Exploring how the 'Tobe:' 'fitwool' could be integrated effectively into running footwear.

i. Running shoes have evolved to become thick soled and shock absorbent over the last 40 years. The recent publicity of the barefoot movement has forced the running shoe market to explore the claims of the philosophy and develop products accordingly. This market shift has opened the door to new design solutions that challenge how we define performance footwear.

ii. The balance between support and minimalism is a significant area for exploration in the barefoot shoe market. There is the potential to challenge how a form of lightweight support may be present in a design solution whilst staying true to both a minimalist aesthetic and function.

iii. A material exploration of the 'Tobe:' wool fibre is an opportunity to further unpack and challenge the definition of modern running footwear. The natural and honest aesthetic of the 'Tobe:' 'fitwool', provides an exciting medium for capturing new forms and structures in the upper construction of a running shoe.

Key Objectives:
-Design a super minimal running solution with specific consideration given to a lightweight upper form, a simple support system and a minimal, replaceable sole.
-Design how the product acts to establish a sustainable customer business relationship through the development of modular, replaceable parts.
-Demonstrate the relationship between lightweight, close-fit support and minimalist footwear construction.
-Use design to interpret historic footwear inspiration in a contemporary and innovative fashion.
-Primarily, the design should work effectively as a running shoe, but also have the capacity to function as casual attire.

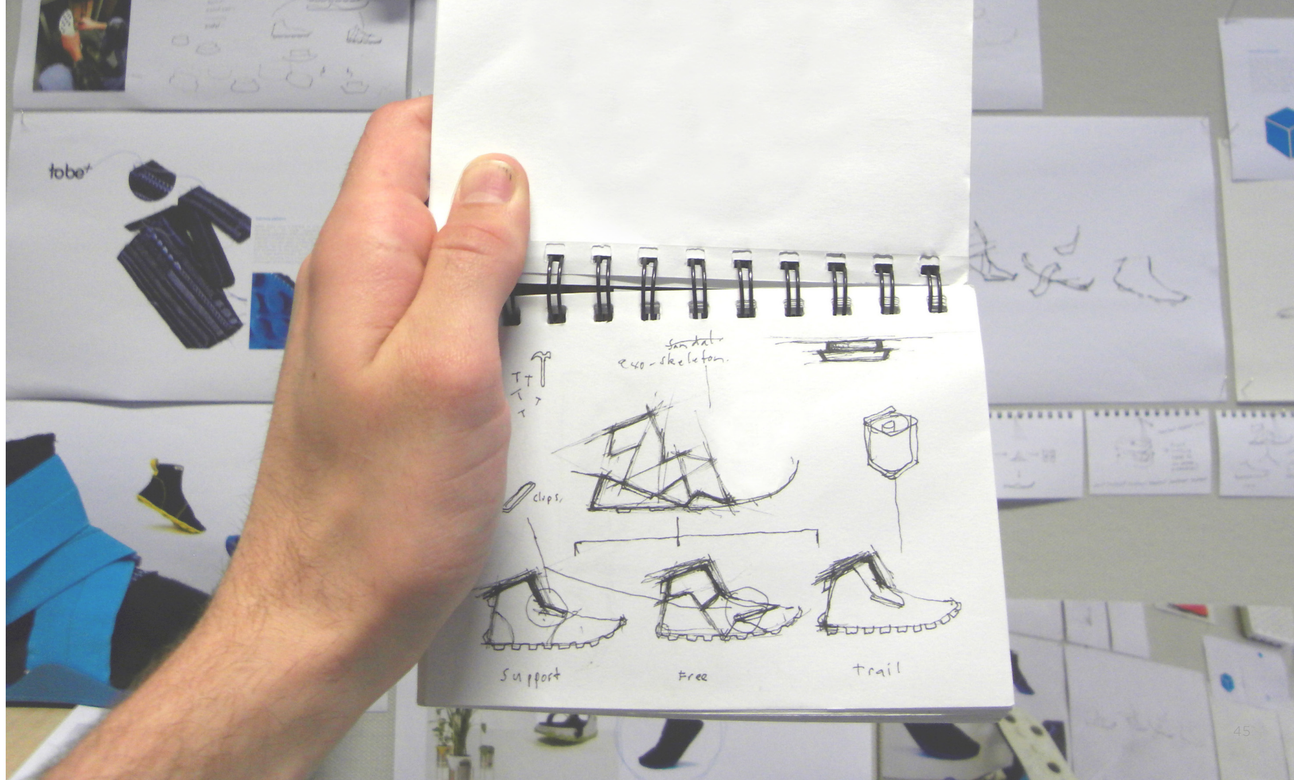
Constraints:
-The design must not include features that are impossible to manufacture. Within the over arching context of the research project, business and manufacturing realities should be well considered.
-Materials used in the design must be readily accessible for prototyping and testing, to attain a true understanding of the product and its function.
-The design should be fashionable and effective as both male and female footwear.

Target user:
This design project is aimed at both established, minimally shod runners and those intrigued by the current publicity of the barefoot running movement. The relationship between support and minimalism embodied in the shoe's design will attract those interested in barefoot running, but may feel uncomfortable in typically unsupportive minimal footwear. Potentially, those suffering with unstable joints from ankle sprains and Achilles tendon issues may find minimal running accessible through this design intervention.

Ultimately the design will be aimed at those who are between the age of 20-40, have an interest in minimal running and a healthy lifestyle. Although the product will be suitable for a performance application, the target user will not be focussed on professional competition.

Market:
The running shoe market has been forced to respond to the recent rise of the barefoot running movement and its views on minimal footwear. This market shift has provided an opportunity for reinterpreting performance footwear, challenging the exclusive and technical practises surrounding this field. The simple and empowering claims of the barefoot philosophy should inspire new ideas, previously unsuitable for running shoe applications.

The design will also target a market that overlaps casual and sporting footwear.



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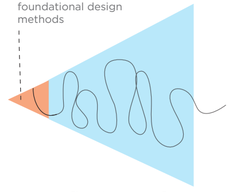

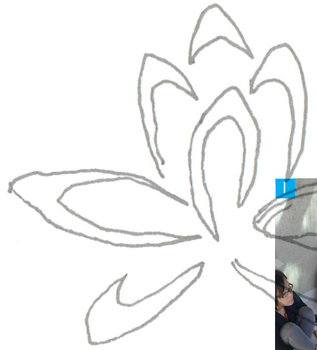

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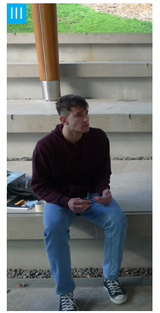


IV

V

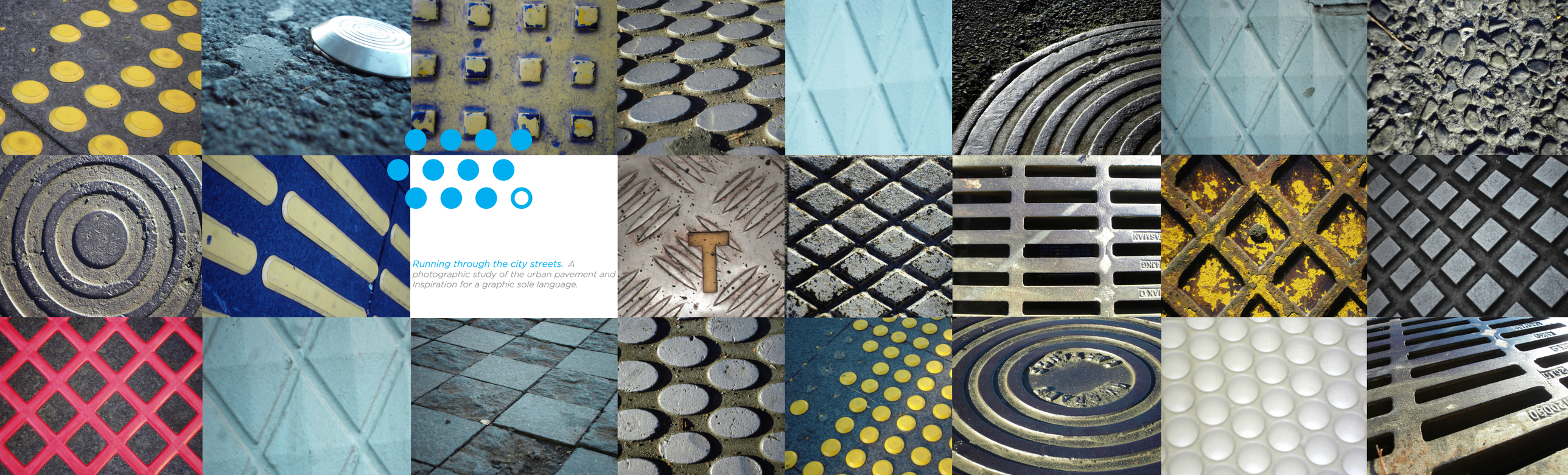
lotus blossom

Facilitating an ideation session with Masters and Honours students.

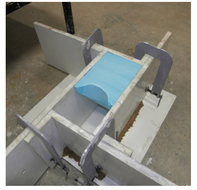
introduction *project brief* *reflect* *respond* *listen*

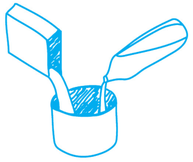
VI

A group brainstorming session generated a large number of creative ideas around; a) The concept of a sole, b) The concept of a strapping system.
The initial brainstorming phase provided a foundation for a more systematic lotus blossum exercise. Ideas were grouped into sub headings such as usability, construction, aesthetics and comfort. This exercise proved to be effective in mapping out the creative potential of individual concepts.



Running through the city streets. A photographic study of the urban pavement and Inspiration for a graphic sole language.





plaster foot last ***construction:***

Conventional running shoes are built on a 'last'; a plastic form that dictates the shape of the finished shoe. Because the foot is very malleable, it is important that the true shape of the human foot is referenced in minimal shoe construction: The toe box should provide room for the forefoot to move without restriction. Often, traditional shoe lasts force the forefoot into cramped and unnatural positions, directly affecting the shape of the human foot.

Honours Year and summer Internship reflection:

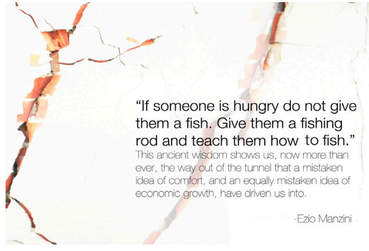
3.4

Honours enquiry

The 2011 research project, Kinetic Connections, looked into self-reliant living in Christchurch after the devastating earthquakes. The year was based around the academic goal of testing out a design thinking approach where solutions arise from rigorous and immersive field research (Papanek, 1984). This approach became a near 'anti-design' exercise as I discovered how an over-dependence on product and services in the urban context leaves us passive and disabled in a disaster zone. We become a 'population of incapables,' (Manzini, 2008) unable to look after ourselves when services such as mains power or clean water fall over.

Expert interviews, observations, reflections and photographic analysis lead to a number key insights into self-reliance and communication. A design brief was formed around the need for offgrid communication. I developed to draft prototype stage an emergency phone that used the more resilient land line network, could be used to charge USB devices, and had a built-in radio. The device could be charged through an innovative cranking mechanism.

This project brief addressed the practical need for powerless communication in Christchurch; but the project was also a canvas for deeper reflections. In particular, I continued to develop a personal design framework centered on design for empowerment rather than simply convenience. I began to question how design might be used to 'enable' product users; teaching skills and fostering knowledge for sustainable living.



2011-12 Internship with 'Tobe:'

Over summer I worked alongside product designer Jamie McLellan on a pair of minimal running shoes for Wellington based company 'Tobe:'. I was required to fulfill the following job description:

'Break down traditional shoe design and structure, and find innovative ways to best incorporate [ToBe's new composite merino wool] fabric... and produce a portfolio of artwork at the end, that will be used by our factory to sample the first range of running shoes for market."

The the majority of my input was centered around the sole design and a number of secondary briefs including color ways, sizing research, packaging, tags, and branding. The work also helped segue into Masters research by suggesting a new arena for me to develop my interest in design for empowerment.

This project set out as conceptual exploration of minimal running; an industry based project that provided an interesting comparison to the more theoretical enquiry undertaken in honours study.

Internship learning:

Under the following headings I have reviewed the experience of the honours year with reference to the realities of industry based practice:

Research:

Rigorous and applied research is becoming an inseparable component of the modern design process (Collins, 2010). Research should be woven into the life of designer and a natural instinct when confronted with new design challenges. The valuable field work conducted in Christchurch in 2011 was an intense yet essential phase of the honours enquiry. However the pressing reality of a highly time constrained creative industry, often deems an extensive

research phase impractical. There is pressure for all tasks to be conducted efficiently and productively.

"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success" (Brown, 2012). Taking on research responsibilities in the internship has sparked a new understanding of the value of quick fire design thinking techniques. The IDEO (2010) method cards provide a high volume of hands on exercises for quickly generating insights. These insights can be further distilled and refined to form design objectives for a project. Although these exercises may seem trivial and simplistic in an academic context, the industry time constraints transform these methods into highly valuable research tools.

Tim Brown (2012) recently spoke at the Better by Design CEO Summit about the value of converting the researcher's empathy (realised through design research) into design insight. These insights inform new design possibilities to then be prototyped, tested and refined into useful and meaningful product solutions. Although Brown is quick to point out the danger of oversimplifying complex problems using the design thinking philosophy, there is much value in using this approach as a foundational problem solving tool.

During the internship, I was allocated the task of researching and generating ideas for the packaging brief. Acting out the retail experience of trying on a pair of shoes, coupled with a still photo survey, was a useful tool for gathering insights. Rapid ethnography in a number of leading sport shoe retailers allowed me to attain a deeper understanding of the shop assistant and their relationship with the packaging.

These industry encounters with quick fire research lead me to reflect on my approach to honours design research. The internship has exposed me to the value of efficient decision making for the cause of project momentum. Without the time and pressure constraints of the industry environment, students often over-analysis decisions that should be made quickly. Feedback from my examiner regarding my hesitant transition from research to practical work supports this goal of efficient decision making.

- Factory:
The internship also brought new understanding to the interface between design and manufacture.
Throughout the internship, I was in direct contact with the agent for the Chinese shoe factory. The factory's initial interpretation of the design failed to capture the concept: we were forced to completely re-instruct the design for a second prototype attempt. This refining process continued through a number of phases before the concept was fully realised. This open conversation served to clarify and finalise the concept as the process moved forward. The transition from conceptual design work, to real world manufacture has inspired significant learning; specifically the importance of maintaining healthy and open relationships with the factory and the New Zealand liaison.

The experience of these industry relationships has highlighted the importance of designing with manufacturer in mind. Issues with the off shore factory highlighted the benefits of onsite design and manufacture.

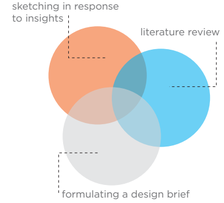
- Methods of design:
In the absence of an immediate 'design problem', the challenge of exploring and developing a unique minimal running shoe offers a new set of design experiences to learn from. Apple's Jonathan Ive (2012) recently responded to a question on 'problem solving' in design:

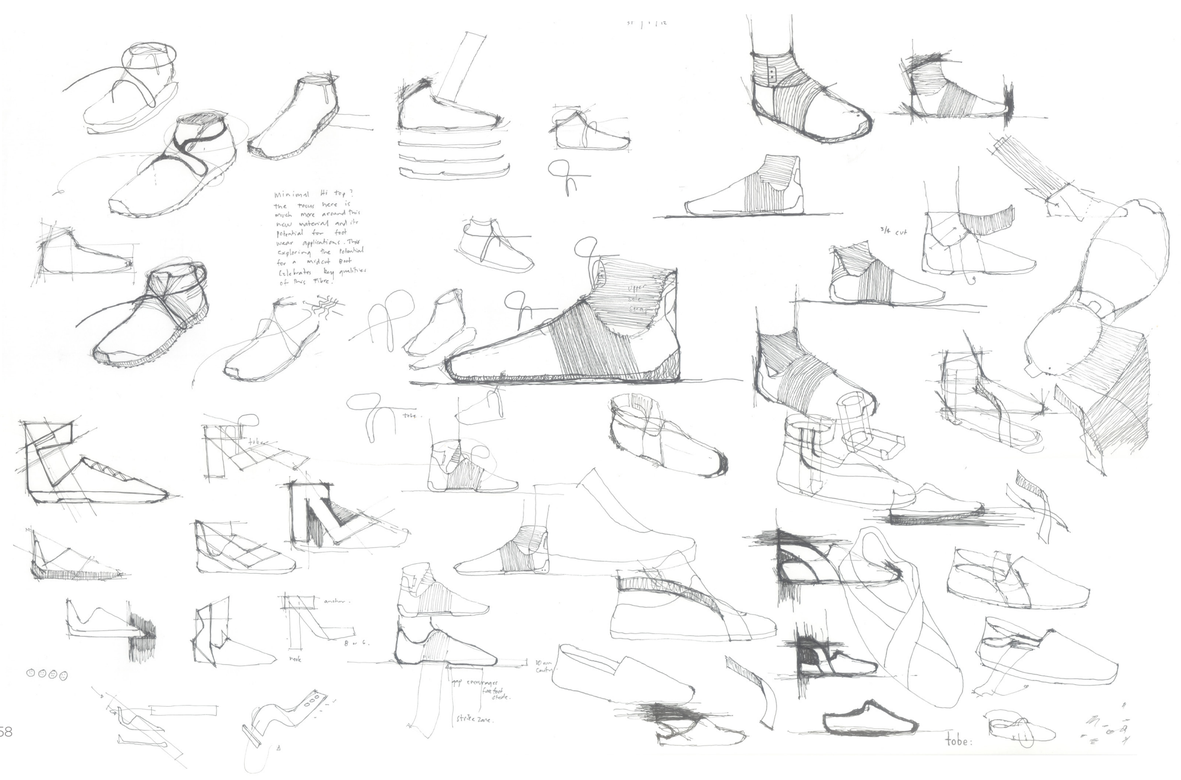
"There are different approaches - sometimes things can irritate you so you become aware of a problem, which is a very pragmatic approach and the least challenging.

What is more difficult is when you are intrigued by an opportunity. That, I think, really exercises the skills of a designer. It's not a problem you're aware of, nobody has articulated a need. But you start asking questions, what if we do this, combine it with that, would that be useful? This creates opportunities that could replace entire categories of device, rather than tactically responding to an individual problem. That's the real challenge, and that's what is exciting."

2011 honours enquiry played out a problem focused, pragmatic approach to design, In the realm of performance footwear, my goal has been to explore how innovative and new design approaches could be discovered in the minimal running shoe market.

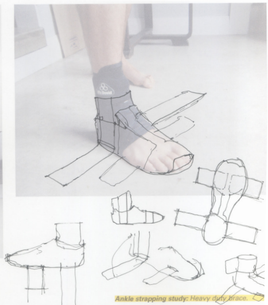
cycle two
march 5 - march 19



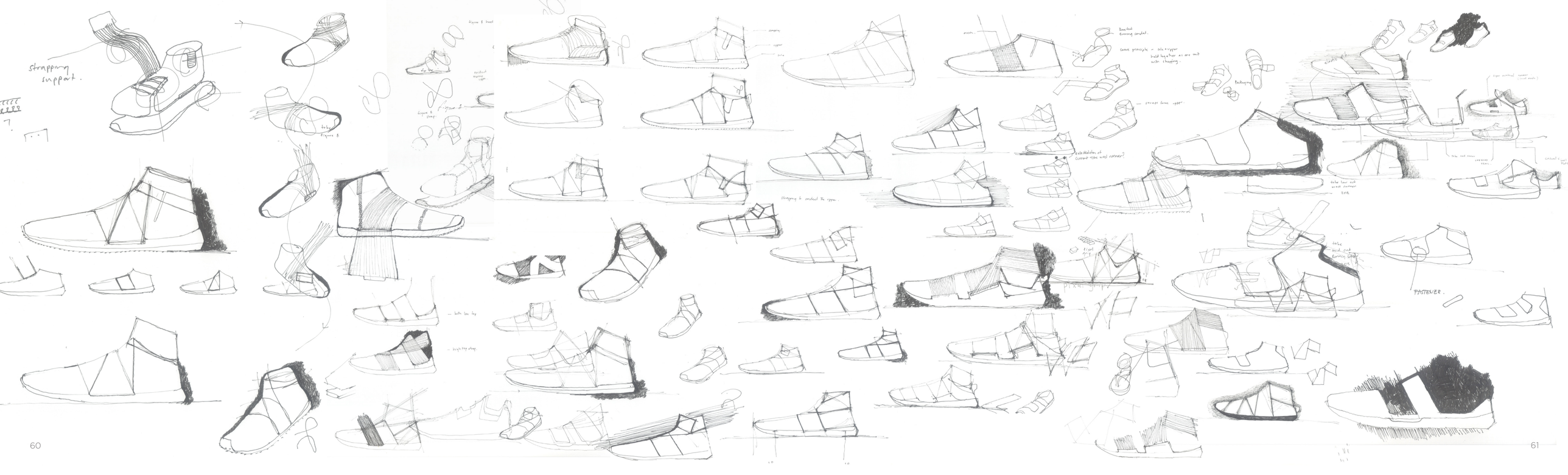


Ankle strapping study: Light weight brace.

Ankle strapping study: "Figure 8" strapping.

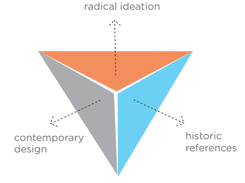


Ankle strapping study: Heavy duty brace.


strapping support.
FASTENER.

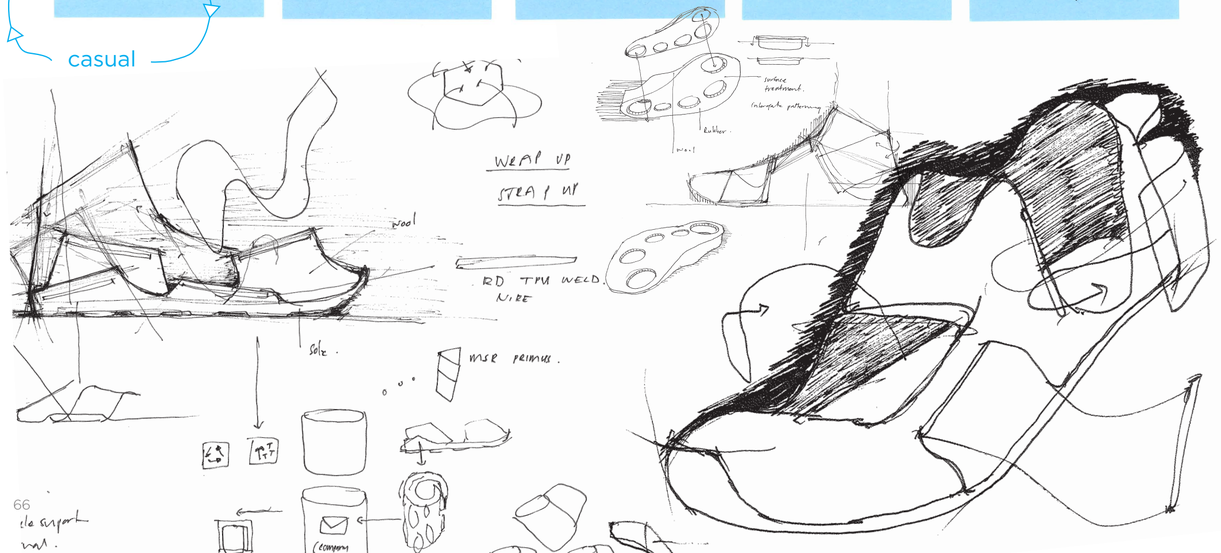

negative space at upper

cycle three
march 19 - april 23



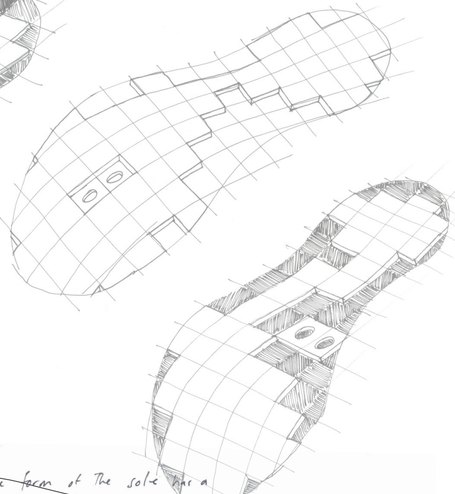
running shoe

casual



Sole

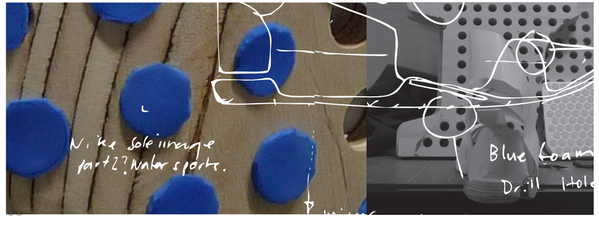
The sole needs to accommodate for a spacious toe box, allowing the forefoot to move without restriction. While fulfilling this requirement, I must be careful to balance the proportions of the forefoot with the heel and mid foot shaping.



The form of the sole has a direct impact on the shape and style of the upper. From early prototypes, it has been clear that the upper behaves in very different ways in relationship to different footprints.

The sole may also be a replaceable or customisable component: those with a narrow foot / wide foot could use a different sole to those with a more regular foot shape...

Origami models



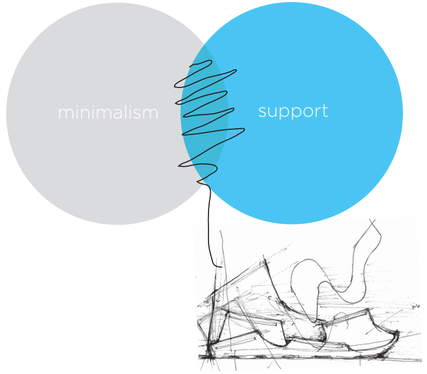
Quick prototyping:
A perforated wooden sheet found in the design studio was left over from a colleagues design project.. The sheet sparked the development of a modular sole form.

1 2 3 4

Historic footwear

Inspiration:
How might the simple 'sole, strap' language represented in these images translate into running shoe design? Is it possible to move away from sandal connotations while working with such traditional elements?

1. (Pratt, February, 2012)
2. (Whitney, n.d)
3. (Barefoot Ted, March, 2006)
4. (Acabado Imperfecto, July, 2012)



concept direction

Innovation is found in the tension (Hobcraft, 2011). Designers should develop a tolerance for ambiguity (Katelle, 2011), understanding that often the most innovative and creative ideas are discovered through investigating contradictions (Apple, 2012).

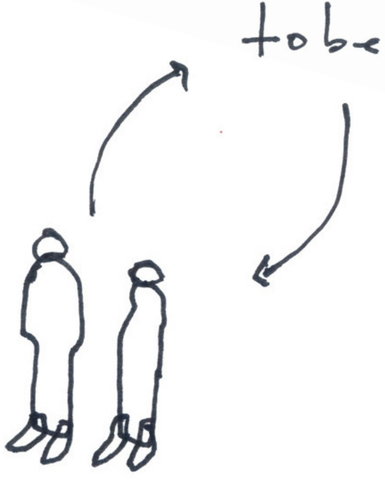
This project explores how a running solution might embrace minimalism yet incorporate lightweight support for the foot and ankle. Using this tension as a driver for innovation, I sought to develop a creative footwear solution that would: a) function effectively for the minimal running application, b) propose a unique interpretation of minimal footwear.

The prototyping phase:
An exercise for guiding the prototyping process was trialed early in the prototyping phase. This method used a matrix (Diegel, 2010) for measuring components of the design against set critera (see appendix 1).

Sustainable Relationships:

Spangenberg (2010) beleives we can trancend eco design, or design for the environment 'by offering [people] opportunities to get involved, [and] express [their] own identity beyond consuming standardised mass products.'

In what ways could footwear design be used to establish a lasting customer, business relationship? Perhaps recyable, replacable, repairable parts could be used to empower the customer to 'maintain' the product.



[flexible ankle support]

[less supportive version]

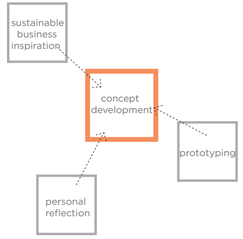
Foot and Ankle injuries:

Podiatrists claim that barefoot running has been producing an increasing amount of foot and ankle injuries. Such injuries occur due to poor technique and patients who jump into minimal running too quickly (Kuzel, n.d.). One researcher claims that in barefoot running technique, 'the ground reaction force torques the foot around the ankle,' increasing the risk of injury (Anderson 2010). As was concluded through my literature review and expert interviews, this area is not an exact science. there is an opportunity to ask questions of performance footwear industry. For example:

How might a shoe design ease the transition to radically minimal footwear?

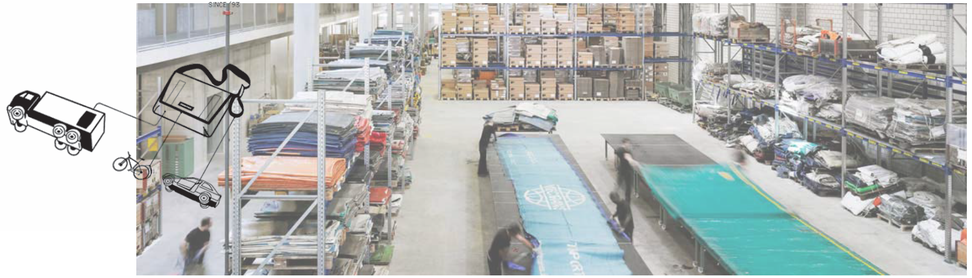
cycle four

april 23 - may 7



Running reflection:
The experiential learning component of this project was essential to the development of a minimal running shoe design. New ideas often occurred to me during my runs; leading to spontaneous prototyping sessions when I returned home. This exercise in an example of a research method that developed from the action research cycles.

FREITAG®



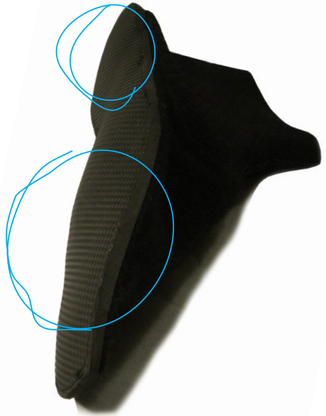
(Freitag, 2012)

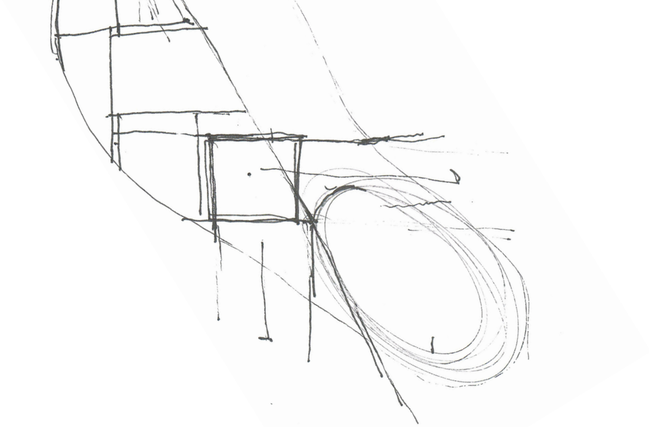
Business Model Inspiration:

German Bag company Frietag, has established a inspiring mix of creativity, environmental/ social responsibility and economic success over the last two decades. Truck tarpaulins , inner tubes and seat belts are upcyled to create highly functional and fashionable bags, wallets and purses for a range of users. Frietag has built a local, sustainable business with a focus on steady growth (DeFranza, 2011) and has been successful in closing the gap between the end user and manufacture.

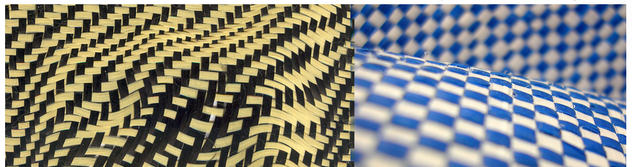
This company exemplifies Spangenberg's (2010) mandate for empowering design, that enables customers to participate in their own unique story of material reuse. Bag design is used as a medium to foster resourcefulness amongst customers; encouraging people to buy into where their product has come from and how it was made.

Sole form:
Running in this prototype has created some interesting depressions across the surface of the sole. The forefoot has held the most significant impressions from wear, while a subtle curvature can been seen across the heel. These cues may be useful for informing the shape and textures of the sole design.





Strap weaving:
Conceptually, perhaps the securing straps could 'grow' from an upper form. The weaving inspiration would integrate the strap function into the core of the objects 'woven' aesthetic. Alternatively, plotting a simple functional strapping path across the upper may best communicate the over arching concept of lightweight, close-fit support.



(Materials Lab, 2012)

Sole design:
How might a sole design be developed around the pavement studs photographed on a earlier city run? What can be learned from existing performance shoe soles?

The replaceable insole/outsole:
Based on two key insights:

1
Main areas of wear: Compressed EVA insoles, tread pattern deterioration.

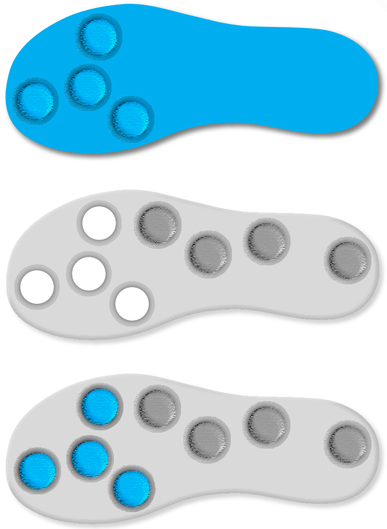
2
Minimal running promotes forefoot strike pattern. Tread pattern wear indicates where the foot is striking the ground most often.

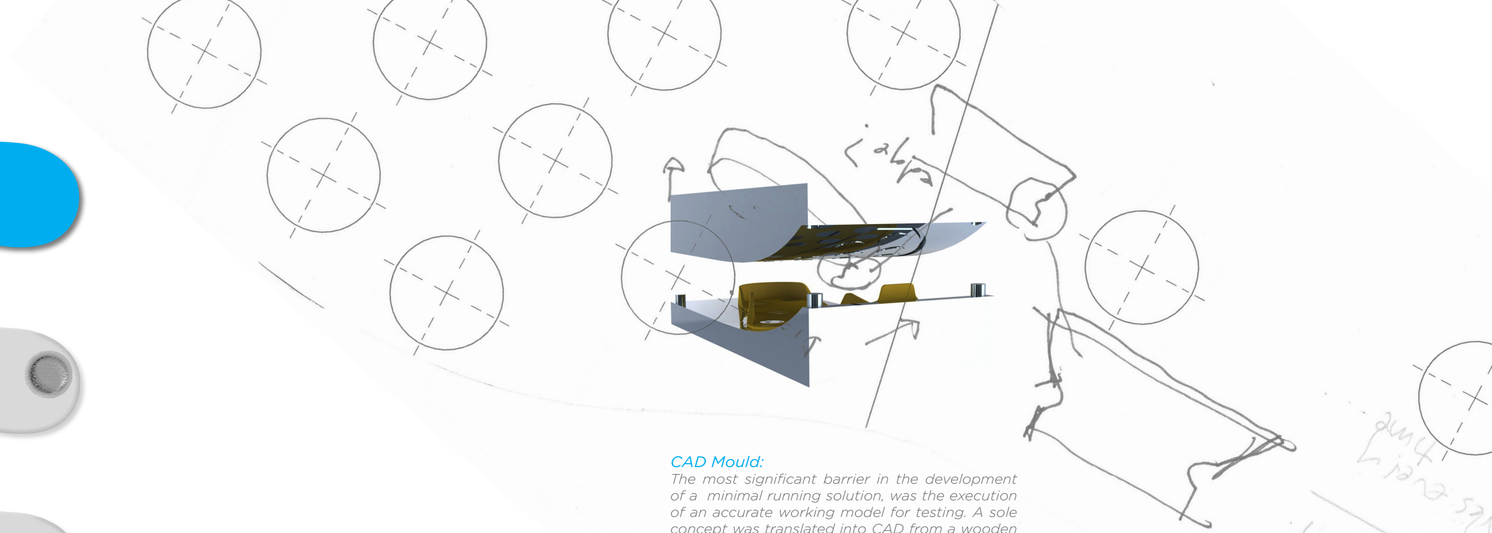
Therefore, those running according to barefoot technique, should wear more significantly across the front of the sole. A replaceable midsole that pressure fits through the outsole, allows the runner to monitor their technique while extending the life of the overall shoe.

midsole

outsole

midsole + outsole





CAD Mould:
The most significant barrier in the development of a minimal running solution, was the execution of an accurate working model for testing. A sole concept was translated into CAD from a wooden workshop prototype. A mould taken of the part in solidworks would be printed in the rapid prototyping machine, ready for casting.

Expert feedback:

Feedback from field experts and business partners was a vital component of this project. A progress summary was presented to the following individuals for review:

Kelly Sheerin: *AUT Running Clinic Manager*
Physiotherapist: *MNZSP BHSC (PHYSIO)*
Tim brown: *'Tobe:'*

The experience and knowledge of field experts helped to support new ideas and provides invaluable rigor to the development process. In addition to presenting 2D conceptual work, there was a need to resolve functioning, well executed models to discuss with experts.

The following response is an example of the feedback received from 'Tobe:'

'I have been thinking a lot on your "process" document and have been really inspired by it. I think it aligns closely with some of my thinking around strapping and how you might replicate the shoe form with strapping. I also very much liked the idea of rubber dots that you could apply to, say, a Fitwool sock upper and provide grip and wear without becoming a full sole. I think a lot of the parameters for that sort of experimentation will come when we see what this fabric can and can't do.

From your document and a lot of my thinking I think there are real opportunities to explore this from the back to front. How can you innovate the making of the shoes? Where do the opportunities lie at the back end of the process?' (T.Brown, personal communication, July 3, 2012)

cycle five

may 7 - may 21

Japanese Bear Fur Shoes

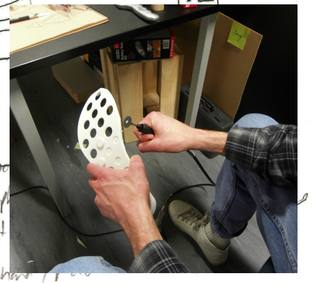
Aleut Grass sock

(The Bata Shoe Museum, 2009)

Inspiration:

This stage of the project has uncovered the value of embracing the more playful nature of the enquiry.

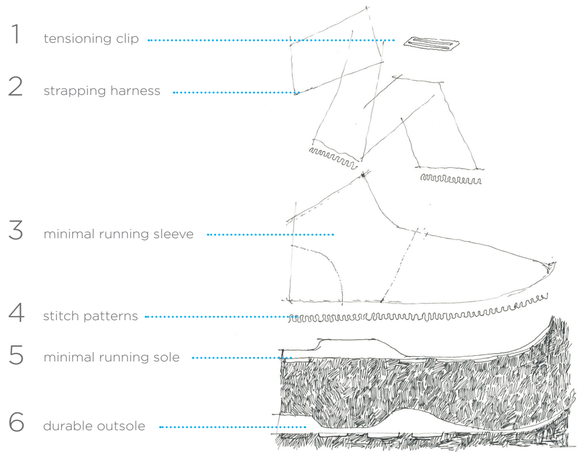
The Japanese Bear shoe has very similar geometric forms to the direction of my design, and also uses a similar fastening and support system around the ankle. The use of bear fur in the upper also has an interesting tie into the wool fibre used in current prototyping. These thoughts inspired me to consider developing the 'world' this product lives in and its underlying story.



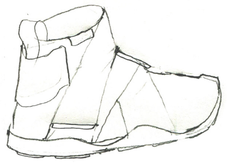
Testing and validation:

One of the most significant Insights to come out of the early research and expert interviews, was the opportunity to playfully explore new footwear solutions.

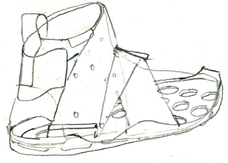
Due to the radical approach of this design brief, It was resolved that user testing would occur through my own running reflection (see video journal). The aim of my design process, was to develop a strong story around a footwear solution, that could be further refined and tested outside the scope of this project. Regular feedback from experts, designers and business partners at 'Tobe:', acted to validate and refine the core ideas of the concept.



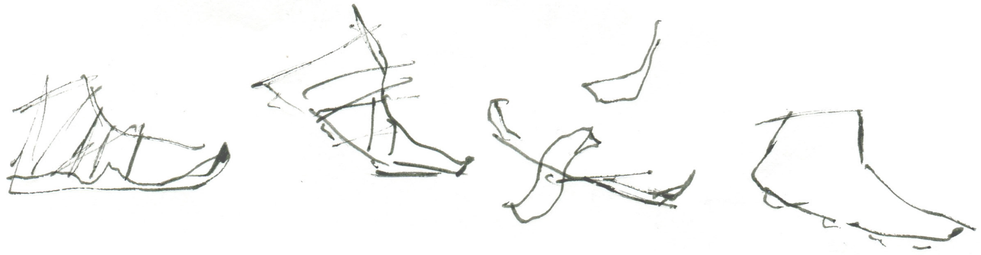
Revised prototyping plan:
As the concept developed, six key areas of the design were identified to focus prototyping efforts.



supportive minimal running design



minimal running sleeve design



Concept Description and Critique:

The benefits of this concept are as follows:

A removable, minimal sleeve allows for easy machine washing.

The runner is able to able to gauge their wear pattern across the forefoot tread, monitoring strike pattern. The minimal sleeve could easily be replaced once the tread has worn down, without replacing the durable outsole. This aspect of the design uses forefoot wear as a way of teaching the user about correct striking technique.

The strapping harness (connected to the durable outsole) provides the runner with a form of close fit, lightweight support, whilst eliminating the need for lacing. The strapping harness acts to hold the shoe together while running.

This construction technique eliminates the need for harmful glues and adhesives in the manufacturing process.

This interpretation of the design would allow a user to graduate towards minimal running, monitoring the level of support present in their footwear. The goal of this design, would be for runners to become more comfortable with super minimal footwear - bridging the gap from 'running shoes to running socks'. This concept has close parallels to the 4th semester Tri-Cast project, embracing a strong element of story telling in both the products form and function.

The design behaves as a tool to graduate runners towards minimal running footwear.

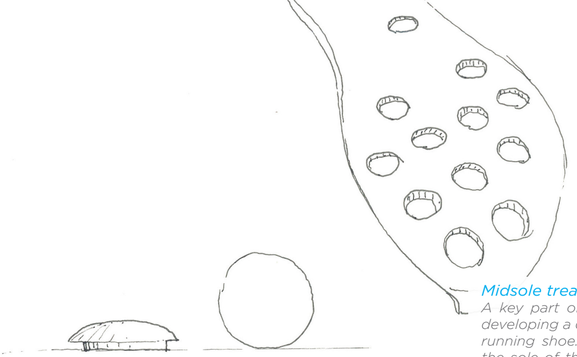
Currently, the potential issues with this concept include:

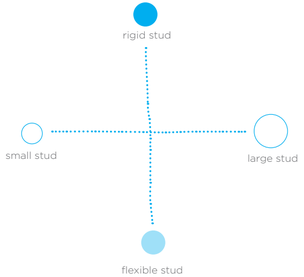
Resolving a tread pattern that punctures through the outsole in a secure fashion.

Weather proofing and the issue of seepage through the holes in the sole.

The tread pattern wearing out and no longer fixing to the durable outsole properly.

Tripping over in running motion, and having the outsole rip away from the rest of the shoe unexpectedly.





Midsole tread pattern:

A key part of this design direction relies on developing a durable, but modular sole for the running shoe. The tread studs placed across the sole of the minimal sleeve, must be both robust and secure when they puncture through the outsole. In addition, they must also have the capacity to disassemble with the use of moderate force.

The following diagram describes the key considerations for prototyping this modular sole, focusing on the size and flexibility of the studs (a). Similar attention must be given to the material properties of the outsole constuction (b).

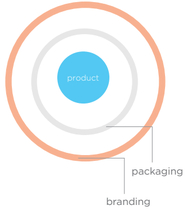
tobe+

Stitching patterns:

In a simple sock-like upper construction, stitch patterns heavily influence both the shape and aesthetic of the design. I had access to a high performance domestic sewing machine, allowing for a creative exploration of complex and professional stitch patterns.

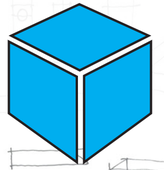
cycle six

may 21 - june 5



Packaging concepts:

The packaging of a concept plays an important role in a products story telling, but may also inspire aspects of the object design development. The following packaging research and sketching, documents my early thinking around potential shoe box forms and its integration of a washing bag.



(fuse project, 2012)

Role playing purchase of nike free.

(Wilson, 2007)

In-Store Research:

-Instead of lengthy information tags, Nike frees utilises the inside surfaces of the shoe box to tell the story of their product.

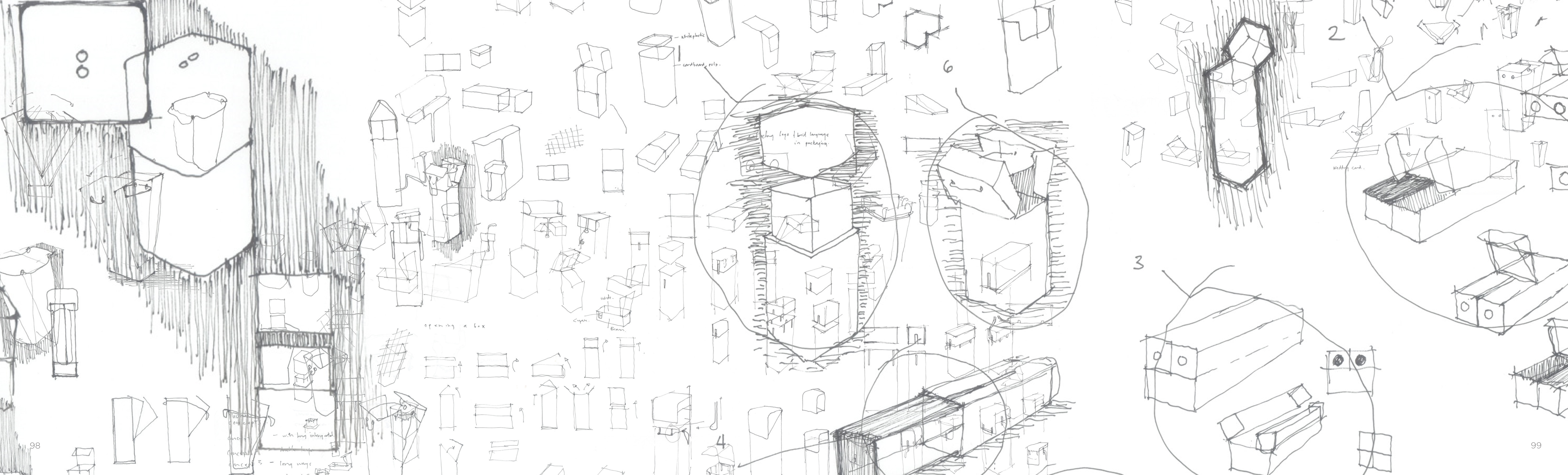
-In discussing the innovative puma packaging with a shop assistant; he found dealing with this system to be annoying. The packaging was untidy from where it had been opened and not reassembled properly.

Simple packaging concepts were developed that would function effectively for customer, retailer and product transport.

(Sung, 2010).

(Pyle, 2009)

testing wool prototypes in washing machine


white plastic
cardboard pulp.
reflecting logo & brand language in packaging.
6
opening a box
2
3
4
wedding card

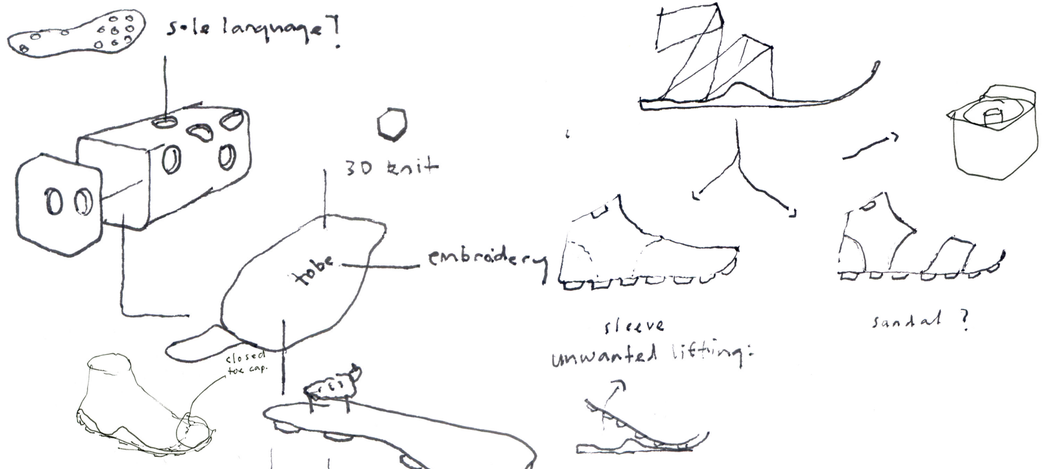
running shoe

casual

tobe:

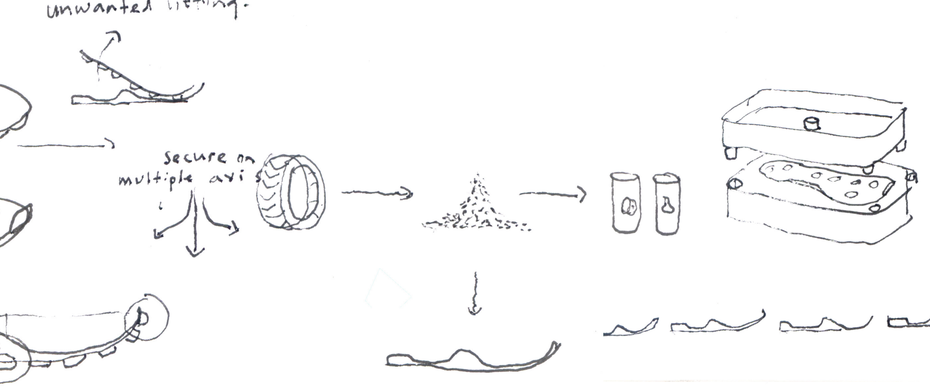
tobe+

Brand
These two logos represent the casual and running labels of the existing brand. Perhaps the '+' and 'O' graphic treatment could speak of the tension between a running shoe and casual footwear.



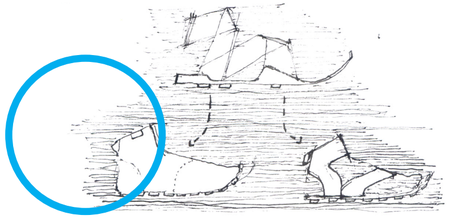
+

Cross imagery reflected in the harness and stitching



O

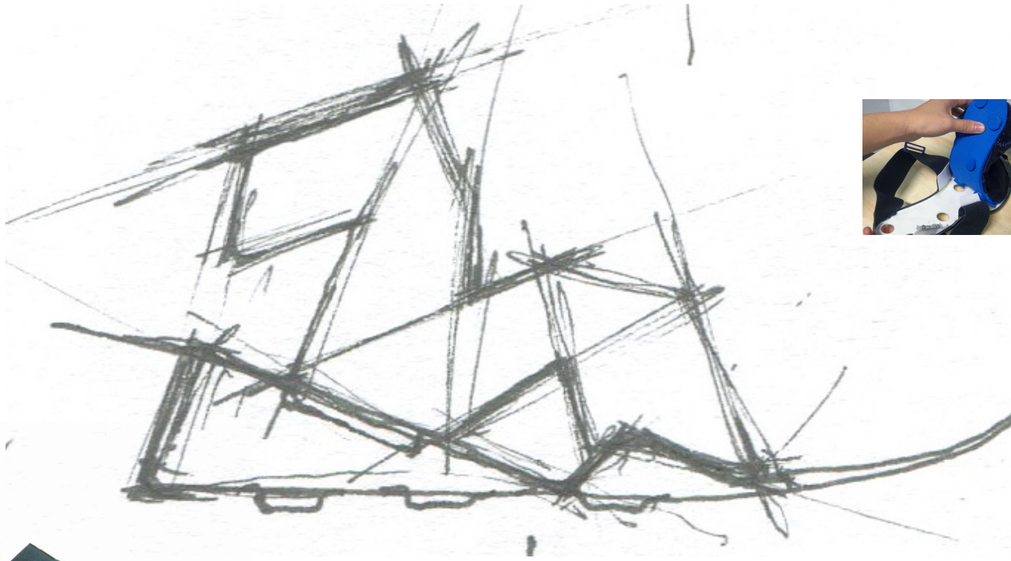
Circle imagery reflected in the sole and neoprene texture.



cycle seven

june 5 - june 30

Modelling and progress:
In an unfamiliar medium such as footwear, much of my time was dedicated to developing clean, functioning prototypes. Although concepts may seem feasible on paper, or even through the lens of CAD software: physical prototypes are the only really method of testing and validating ideas.



Design approach:

Earlier in this thesis, I discussed my aim to explore an area where nobody had specifically articulated a need. How might I develop a meaningful and useful product without a direct problem to solve?

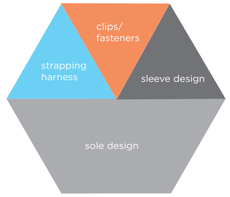
Using the tension between minimalism and support as a driver for innovation, unique product ideas began to develop.

To reflect once more on Apples (2012) design ethos: The success of the latest Macbook was a result of rigorously interogating the market norm. The computer explores the tension between extreme performance and portability (Apple, 2012). In a similar way, I aimed to invesigate a potential contradition in the minimal running market, in order to drive the development of a new performance footwear product.

cycle eight

june 30 - july 30

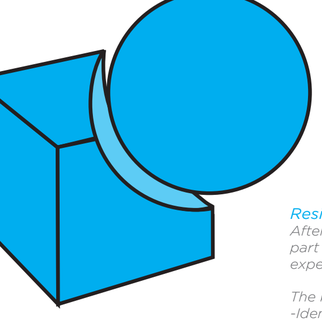
prototyping:



Simple construction:
The following key discussion point arose from a discussion with 'Tobe:'

Wages in China are forecast to rise from $.50 US an hour today to $4.50 an hour in 2015; How can the design of a shoe allow for simple and local manufacture?

Although manufacture is not the goal of this conceptual exploration, my design work utilises simple construction techniques to maximise the potential for local manufacture.



Resin casting experiments:

After Using CAD to produce a feasible, two-part female mould; a number of wet lab experiments took place.

The key areas of testing were as follows:
-Identifying a successful release agent
-Finding a suitable resin and shore hardness rating for a durable shoe sole application.
-Experimenting with the reground tyre granules in the shoe sole. (In keeping with the identified sustainable design framework, recycled materials should be used where possible in manufactured parts).

2

Resin experiments.

Addition cure skin safe clear silicone.

Results:
NO significant success.
change mixture?
part torn.
Part too flexible

+ tyre regrind

Results:
similar results:
part still too flexible.

WC 565

Flexible Water clear Urethane

Results:

Due to previous lack of successful results, this material was skipped.

1

Release agents.

Stoner Rocket Release

notes:
easy application.
leaves no residue.

Results:
Mould very difficult to release - part torn in the process

FW1 cleaning wax

notes:
easy application.
leaves greasy film

Results:
very difficult to release.
Plastic texture finish left in part.

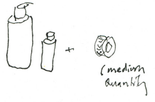
TR Mold Release.

notes:
more time consuming application.
leaves waxy film.

Results:
also unsuccessful.

Flexible Urethane shore 60A. + Tyre regrind

Results:
although part did not release - Mixture successful.

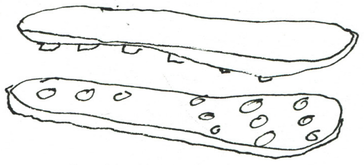


flexible Urethane 60A + Tyre regrind

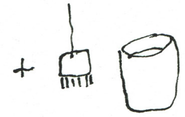
Results:
perfect consistency.
part did not release.

Flexible Urethane 60A + Tyre regrind.

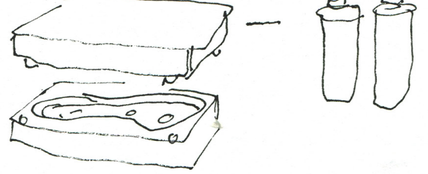
Results:
borderline too much tyre regrind.
part did not release.



plastic mould



paint with latex.



Build silicone mould of part.

1


2


3


4


5


6

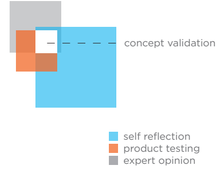

7


8


1 First cast with silicone rubber:
2 Silicone rubber too flexible:
3 Recycled tyre granules:
4 Testing release agents/resins:
5 latex as a release agent:
6 Latex release agent successful:
7 Recycled tyre sole successful:
8 Testing modular concept:

cycle nine

august 14 - august 27



Feedback:

Project feedback can be broken into four areas; field experts, company input, users, and supervisors.

Field Expert:

Kelly Sheerin:
My second visit to Kelly Sheerin, was key to the concept development phase:

-Kelly assured me that the market research I had done was valid and saw a real point of difference in the concept I was proposing. The graduation concept could be expressed in a number of ways through the design.

-It was discussed that a third, more radical stage of graduation might communicate the essence of the barefoot philosophy effectively. A super minimal sleeve might attract a broader range of users.

-With multiple options for usability, users would not be forced to engage with aspects of the design. They would be free to interpret the product in their own way. One might only disengage the removable sleeve for the purpose of washing, while another might use the different sleeves to gradually progress towards the more extreme minimal footwear.

-Kelly was positive about the harness system at the centre of the concept, and in his experience, hadn't seen anything like this in the market.

-With regard to forefoot stability: an independent strap that visually ties into the style of the harness might be effective. People have different forefoot, rear foot needs in terms of fit.

-With the mid-cut style of the design, Its important not to take the heel counter two high up the Achilles heel. This is a problem area for most people.

-We agreed that the modular midsole concept was worth pursuing; but it was recognised that there was a danger of spending to much time resolving the mechanics of this feature.

-The patterned sole has parallels to a popular new balance minimal shoe. From his experience with this shoe, the placement of the circular studs should be carefully considered. 'Dead spots' in the tread pattern are very uncomfortable when encountering uneven surfaces.

-The washability of the inner sleeve, as well as a knitted washing bag was well received.

-Aesthetically, Kelly appreciated the concept and saw it as a unique approach to a saturated area of design.

-He advised that I focus on resolving the complete design to the best of my ability, and accept that there may be a few unresolved components to the subsequent stages of the concept.

-The concept was viewed as 70% of the way developed, with the next stage very much about designing out complexity and simplifying the design from a more pragmatic perspective, i.e. aesthetic, comfort, fit, weather proofing, usability.

Secondary Experts:

Dialogue with a physiotherapist and a sports science researcher in the field of anti-ergonomic design has also been helpful for concept validation.

Company Input:

Feedback from 'Tobe:' has been invaluable. Similar to the conclusions of my meeting with Kelly, I was encouraged to keep pushing the current direction, anchoring the concept in usability. I was reminded that the key consideration with footwear is that it is simple and easy to use. We instinctively know and understand footwear and this should be recognised and honoured as I look to reinvent aspects of the user experience.

The visual cues of the products sporting application are also really important to consider; The shape of the shoe should suggest it's end use. Overall, it was stated that the project is heading in a really interesting direction.

Users

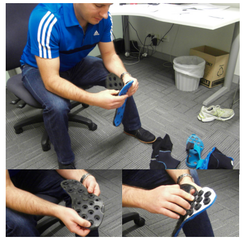
Using concept artwork as a method of discussing the projects core ideas has allowed me to receive valuable feedback. The fictional personas halped me to identify potential users. I have been able to listen to the opinions and suggestions of others while i resolve the design.

Designers

Positive feedback from the senior footwear designer at 'Tobe:', has been useful for gauging the success of my design direction.

Often over-looked, my studio colleagues have had a significant impact on the direction of this project. Collaborative prototyping sessions have been the instigator for many design breakthroughs through out the year.


(Cooper, n.d.)



Concept refinement:

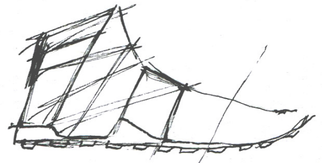
Clarifying the core concept of the design allowed for a deeper level of resolution at the back end of the project. There were two potential options for structuring the design:

All-in-one:
This direction was modelled after the 'graduation' moonboot design of 2009. A user would begin running in the complete shoe (sleeve and Harness), before graduating to a less supportive running sock. The final stage would allow the user to run in a sandal form with a minimal level of support.

week 1-4

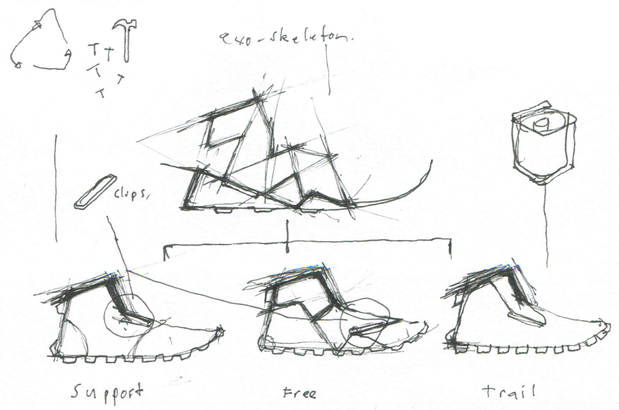
week 4-7

week 7-10



All-in-one

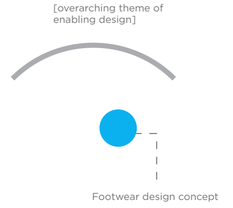
Eco-system



Eco system:
This response was inspired by the cartridge system in the domestic first aid design of 2010. Replaceable cartridges with different supplies catered to the varying first aid needs in New Zealand homes. In a similar way, Minimal sleeves that offered varying levels of support and weather proofing would install into the exo skeleton design.

cycle ten

august 27 - september 5



Selected Direction:

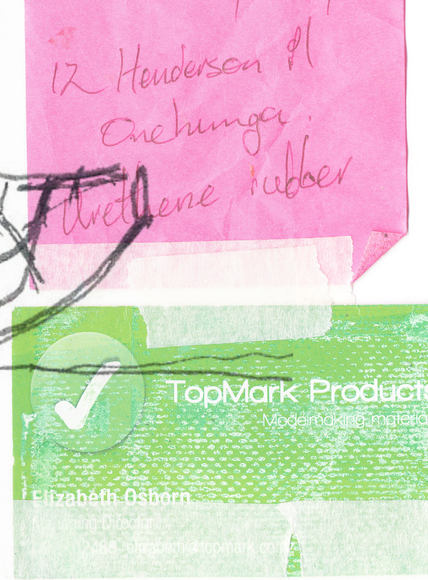
Reflecting on feedback from both expert and business contacts, the notion of usability was constant. Previous design projects in my degree have often struggled to resolve concepts through the pragmatic lens of usability. This was a key criticism from my honours year examiner when reviewing my hybrid emergency device.

Based on these reflections, an 'eco system' interpretation of the current concept was selected. It was concluded that this decision would provide the best opportunity to resolve a pragmatic, usable design solution.

Systems thinking:

'A system is more than the sum of its parts. It may exhibit adaptive, dynamic, goal seeking, self preserving, and sometimes evolutionary behavior' (Meadows, 2008).

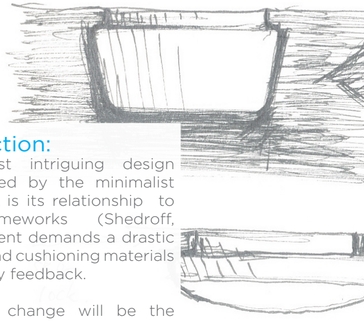
The possibilities of how this product could be re-interpreted stretch further than the simplicity of the two parts in the design. The concept could be customised on style or performance, and parts could be replaced and repaired across the life of the shoe. A systemic approach also draws into question how the packaging of the product might support an ongoing customer business relationship.



Material reduction:

One of the most intriguing design implications afforded by the minimalist running movement, is its relationship to sustainability frameworks (Shedroff, 2009). The movement demands a drastic reduction in foam and cushioning materials to maximise sensory feedback.

Human behavioral change will be the catalyst for a move toward sustainable living (Manzini, 2003). Minimalist running, acts as a suitable metaphor in human behavioral change and its affects on material consumption.



cycle eleven

september 5 - september 20

[project]

- design brief
- enabling design research
- barefoot running research
- industry learning

five point plan.

i sleeve designs

ii sole profile

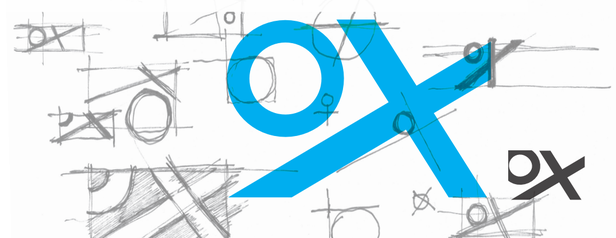
iii tread mechanism

iv toe cap

v seatbelt clip

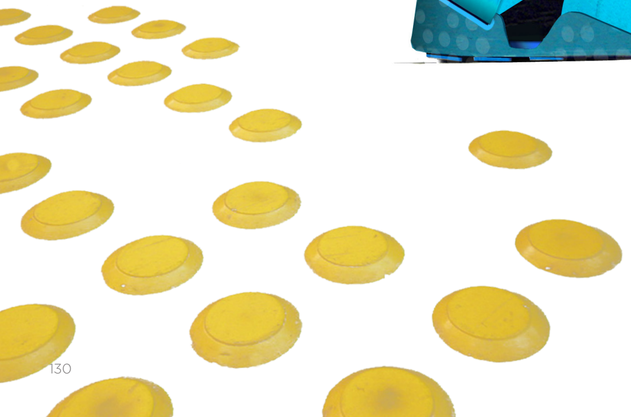
logo

This simple logo was based on the 'X' and 'O ' design language of the concept. These symbols represent the strapping configuration of the harness, along side the patterned dots across the sole. More subtly, these symbols can be seen in the stitch patterns and embossed textiles on the ankle sleeves. Two variations of the design could be used for the shoe; a 'cropped' version might be suitable for small rectangular tags.



street ox

trail ox



street

trail

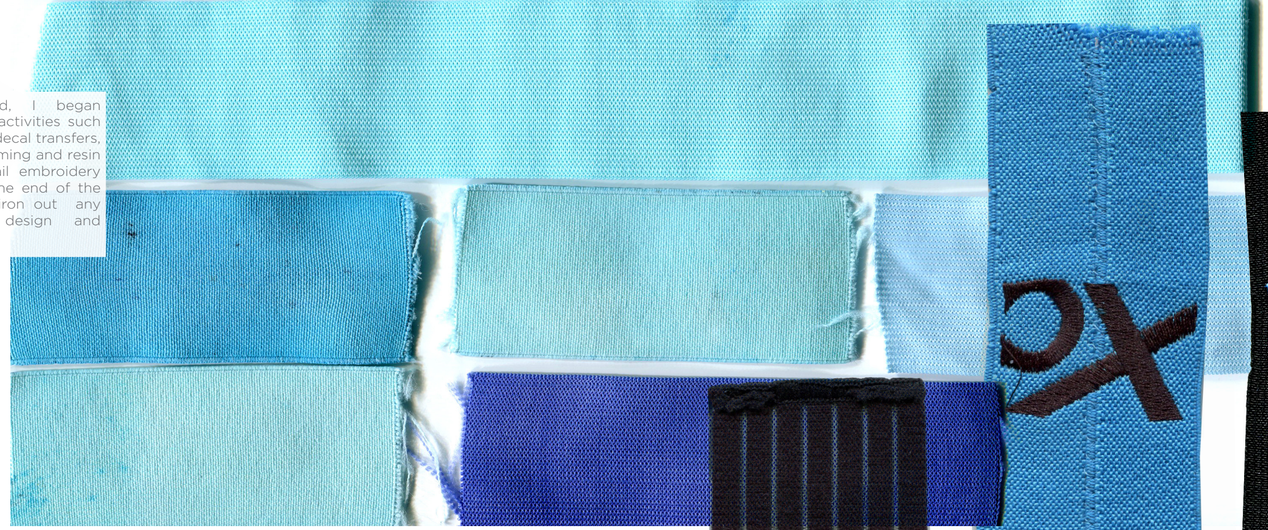
light

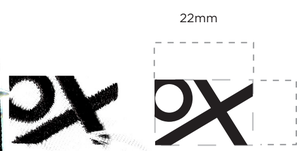
Concept mapping:
As pictured on the ***previous page,*** *the design could be worn in two strapping configurations: either a low top or an ankle high version. The more supportive high top configuration would thread through a buckle on the inner sleeve* ***(left).***

Below: *Mapping out a potential system between product, user and company. This concept explores how packaging might facilitate washing, while also transporting parts for replacement or repair.*

Refinement

As the design evolved, I began incorporating prototyping activities such as: seaming, textile dying, decal transfers, clay modelling, vacuum forming and resin casting. Knitting and detail embroidery was outsourced towards the end of the project, allowing time to iron out any discrepancies between design and manufacture.



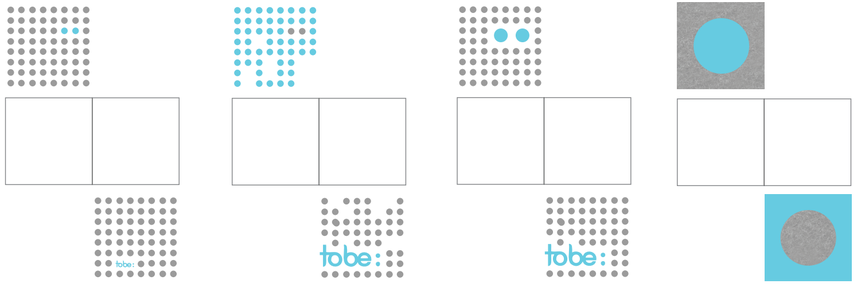


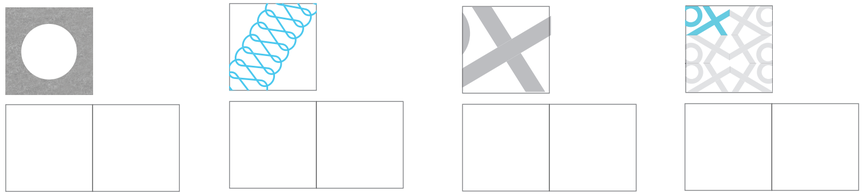
Above: Dye samples on polyester straps: Polyester dyes turned textile a navy blue. Cotton dyes left the textile too pale.
Left: Clay modelling to resolve side profile of the sole.
Far left: Vacuum formed insert for modular sole concept.

Above: Successful Interpretation of cropped logo design for small tags.
Left: Same file upscaled by manufacturer. Begins to read 'c x' instead of 'o x.'
Below: Future strap samples used the uncropped version of the logo design.

Wool fibre:
These creme coloured textiles are factory samples of the 'Tobe: fitwool'. While still in development, the material is very breathable, strong, comfortable and combats odor issues. I have been using a substitute wool textile throughout this brief, developing a concept around simple sock-like running sleeves. The close fit, washable sleeves could be worn without socks.

Below: Weather proofing TPU for the side walls of the running sleeves: Heat transfered onto substitute wool texile and availble in multiple colours.





Sample text:
NewBalance Minimus shoe tag:
'This product increases the strain on the foot, calf and Achilles tendon. Over use of this product or the use of activities outside of running and walking may increase the risk of sustaining injury. This product should be introduced slowly into a running exercise routine. New balance recommends limiting initial use to 10% of overall running workouts and very gradually increasing time and distance.' (Hampton, 2012)

Left: Concepts for simple tags; Informing users of minimal running footwear precautions and key product features.
Below: The harness system has been designed to reflect historic footwear references such as the iconic Mexican running huarache. Such footwear has a strong tie into the barefoot running movement and has been celebrated through this concept.

(Barefoot Ted, March, 2006)

cycle twelve

september 20 - october 5

Sole design feedback:

The following feedback was received with regard to design of the sole:

"You should have a strong sense by looking at a product what it should do. In this case I sort of want the sole to be slightly more moulded to form of the foot. A bit more suggestive of a running/performance 'shoe' than a sandal. It is minor and more a feeling. I could almost see that strapping system on one of the 'Tobe:' soles working really well." (T.Brown, personal communication, September 14, 2012)

To explore the possibilities for the sole aesthetic, an existing Vibram (Hitchens, 2011) design was mapped onto the upper. The contours of this minimal sole follow the shaping of the human foot, reflecting the application of barefoot running and defining the concept as a running 'shoe' (left).

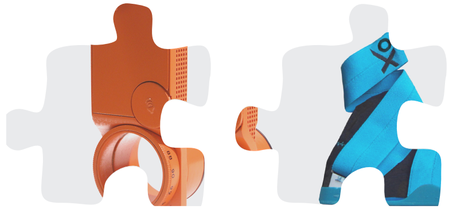
I have learnt that the usability a design is directly related to the 'visual cues' that indicate how a product should be used. How might a sole design remain true to the angular visual language of the upper, while embracing contours of a minimal running sole?

In response to the feedback from 'Tobe:', the company's running sole was combined with the upper developed through my research (above). Their was a surprising synergy between the strapping harness and the existing sole, asking questions of how 'Tobe:' might further develop upper designs for minimal running footwear.

Lateral studs:

Earlier process work explored the possibility of stretching a rubber out-sole over more rigid studs; The difficulty in using this function lead me to explore a much simpler and more secure system.

A very basic modular prototype held together in testing. Moving forward, spreading the studs across the side walls of shoe would allow for a more secure interface between sole and sleeve. This intervention, combined with a semi enclosed toe cap would allow the inner sleeve to install into the harness in a straight forward, usable fashion.

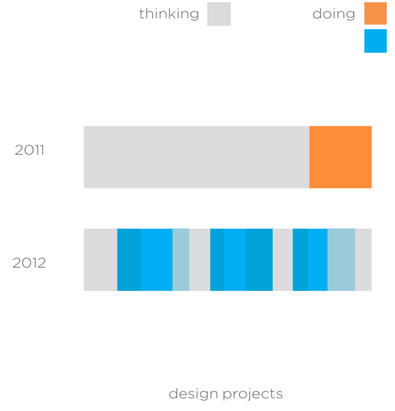


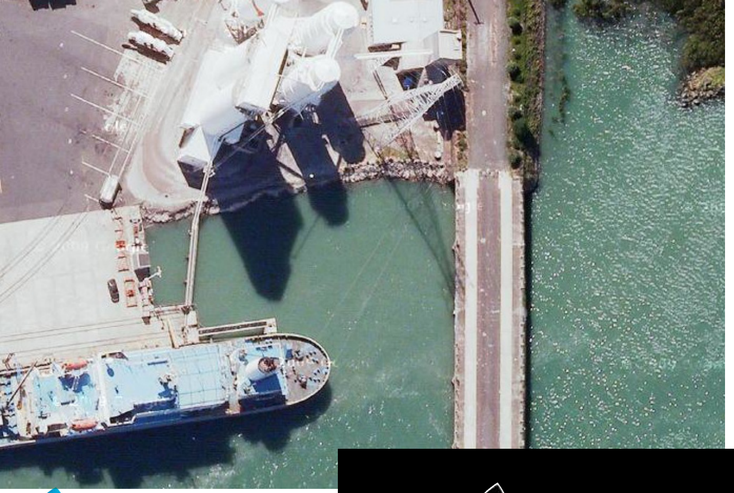
Process reflection:

Thinking and doing

The 2011 investigation into urban self-reliance was immersed in deep thinking around the role of design in fulfilling basic human need. Much of the project operated in a idealistic paradigm and translating deep insights into a pragmatic design solution proved difficult.

The master enquiry has moved back and forth between deep thinking and design practise. This constant transition between 'thinking' and 'doing' has been key to establishing project momentum. More pragmatic design solutions underpinned by deep thinking have arisen from this approach to theory and practise.





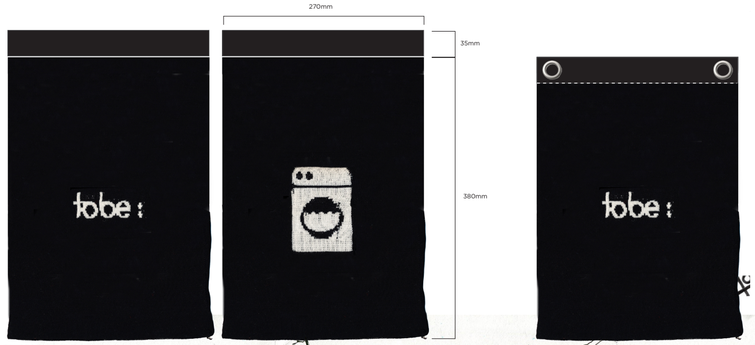
Running Route:

Earlier, I described how my regular running route allowed me to reflect on the project and consider new ideas.
Lawson (2005) criticises the notion that design process can be mapped out in a series of planned activities; designers should allow for an explorative dimension to their process, which might include intuitive or non-goal-oriented activities.

My running route through industrial Onehunga was an example of a non-goal oriented activity. The familiar scenery developed as the context of my research and helped me to imagine the scenarios this product might used in. Towards the end of this project phase, I began to photograph the most iconic scenes from my running route.

New Balance. (2012).

Bag:
A knit wash bag is a core element of the product eco-system. The bag is part of retail story, but would also be used for washing the removable sleeves. Researching online blogs, it was found that a person would use a pillowcase to protect shoes from scuffing and prevent damage to the washing machine drum. The goal of the sleeve design, was to reduce, if not eliminate the need for any adhesives that might be affected by machine washing.



project state october 5th

Design evaluation 3.5

This evaluation consists of two sections: a personal reflection on the initial design brief (page 44) and a review of feedback from 'Tobe:'

Personal reflection:

Working steadily in an unfamiliar field of design, has resulted in a unique product response. The design consists of radical, conceptual elements such as the modular mid-sole solution, along side more pragmatic interventions, such as the strapping harness.

Successes:

-Multiple strapping configurations and sleeve styles, allow a runner to monitor their transition to minimally supportive, footwear. This concept grew from the tension between minimalism and support and has facilitated a unique enquiry into this subject.

-To teach the runner about correct strike pattern,the sole has been designed with a target forefoot wear area. The replaceable midsole tread studs are worn down independently to the durable outsole, studs would vary in density and size depending on their application.

-The concept has begun to develop a modular footwear eco-system, based on only two manageable parts.

-Historic footwear inspiration has been interpreted in a contemporary fashion. The sock like structure of the inner sleeve and harness system, reference iconic minimal footwear solutions of the past.

-The minimal design aesthetic lends itself to be used for either running footwear, or casual attire.

Critique:

-The mechanism for the modular sleeve system is a core element of the concept. Specialist expertise and manufacture would be required to achieve a secure, yet removal midsole that was easy to use.

-Modest project funding has had a direct impact on the design process, requiring strategic, cost-effective prototyping decisions. This has been a limiting factor in the concept's development.

-This project revolved around personal testing and reflection. In developing the project further, extensive user testing would allow for a more rigorous interrogation of design decisions.

-The reusable packaging would facilitate maintenance by machine washing, also functioning as a means of transporting parts between company and customer. This system needs to be refined and tested in order to be proved viable. For example, how would the packaging remain durable travelling back and forth from company to customer?

Review of Feedback from 'Tobe:'

Design work to date has been well received by 'Tobe:' The work I presented told a clear and compelling story. I was encouraged, to look into the sculpting of the sole in order to differentiate the shoe from sandal-like geometry. 'Tobe:' described the value of this research:

'You have tested the overall 'Tobe:' visual language or kit of parts. What is interesting to me how well that has stood up. Our aesthetic prescription is very strongly utilised in your work and I see that as a compliment to the process as a whole. Secondly, it provides you to take on that aesthetic language and the 'Tobe:' story as you understand it and be uninhibited by some of the constraints we have dealt with through the project proper. Certainly you have considered them but manufacturing, budgets, team building and relationships within the process, amongst other things can be removed from your process to streamline a creative output and I think that leads to freer generation of concepts and truer innovation. In summary, your direction is fresh and very interesting while retaining a strong linkage to the 'Tobe:' ethos... You bring a fresh voice to the conversation around our development of a running shoe. It has been inspiring for all of us – Jamie, Mike and myself – who have worked with you around this project both as an intern and in the context of your independent work. Hopefully it is the start of a longer association.'

(T.Brown, personal communication, September 14, 2012)

This industry feedback helped me to gauge the success of this conceptual footwear exploration. It was valuable to hear what the company has received from the relationship thus far.

4.0

4.1 Enabling design: a journey

Enabling design: a journey 4.1

Section 1: Understanding sustainability:

This masters project has sought to develop a tangible design outcome that responds to the need for pragmatic sustainable solutions in the chosen field of minimal running footwear.

A shift toward sustainability in product design is a complex issue and 'urgently needed because of global environmental threats' (Safarzynska, 2010, p.1176). Over the last 30 years the relationship between designers, unbridled mass production, and environmental degradation has become an uncomfortable, but pressing reality (Papanek, 1984). In a 'global monoculture' (Norberg, 2011) of over-consumption and disposability, design has found itself integral to the problem.

The design profession has been confronted with the charge of responding to these massive global issues (Morelli, 2007, p.19). Through complicated frameworks such as 'Eco-design' or 'Design for the Environment' the industry seeks to lessen the impact of manufactured products (Spangenberg, 2010, p.1485). The problem of design (Shedroff, 2009) is a systemic one, dealing with a combination social constraints, economic viability and environmental considerations (Ciegis, 2009).

Meaningful change seems increasingly inaccessible to young designers; There is both a danger in being paralysed by heavy, sustainable design theory and frameworks, or selling out to marketing 'greenwash' (Green, 2009). How can a young designer make informed, responsible decisions with regard to the mandate for sustainable design? This project has helped me formulate a personal philosophy and strategies for meaningful sustainable design.

Section 2: Enabling and Disabling design:

Morelli (2007, p.5) confronts the idea that western society is 'passivised' to the point of disabling the user it aims to serve. People lose the knowledge and skills to solve everyday problems when comfort and convenience is the main driver for product development. This approach to design is based on the misguided attempt to 'reliev[e] people of the many tasks of everyday life' (Morelli, 2007, p.5). 'Our dependence on convenience is at an all time high' and is having a direct impact of the wellbeing of the planet (Dioffa, 2012). Manzini (2008, p.4) speaks in a similar vein, arguing that in the past, 'widespread knowledge, skills and know-how' enabled people to deal with the diverse aspects of daily living.'

Both Manzini and Morelli centre their arguments around the notion of behavioral change in order to achieve empowered, sustainable living. This is the central theme that has evolved through my design education. I have sought to investigate how a product might foster skills, knowledge and resourceful behavior, instead of simply working for convenience and comfort.
My understanding of this subject has developed through a range of product design fields, namely: medical equipment, home living, furniture, simple devices and footwear.

1. Moonboot 2009:
A modular cast represents the healing process in three stages. As time passes, parts of the casts are removed to promote mobility. Sustainable, design for disassembly frameworks were integral to the products development. The design empowers the patient to graduate toward full recovery.

2. Herb can 2010:
This design was inspired by the beautiful manufactured qualities of an ordinary tin can. I sought to use minimal product intervention to challenge the status of the can in the home environment; lifting it above the mundane. This project fostered the up keep of seasonal herbs, centering the ritual around a drip fed, elevated tin can.

3. Domestic first aid 2010:
A simple stool anchors first aid knowledge and supplies in the home. The design would 'come to life' in an emergency, with an internal draw revealing key first aid supplies. Clear, instructional diagrams are found on the reversible plastic top. The concept was centered around the goal of empowering families to look after themselves; discouraging an over dependence on medical services.

Figure 1
Further details of these projects can be found in Appendix(2)

4. Kinetic connections 2011:
This emergency device incorporates an analogue landline and a dynamo charger to power a cellphone, led torch and radio.

An over dependence on modern communication products was encountered through first hand Christchurch field research. The design uses reliable analogue functions, enabling residents to remain connected in the broken city.

5. Minimal running footwear:
This project has used the application of minimal running footwear to clarify and refine my investigation into enabling design. The concept focusses on how a user might find minimal running accessible through a design intervention. An adaptable strapping harness and modular sleeve system seeks to empower an enjoyable minimal running experience, while establishing a lasting customer - business relationship.

Section 3: Minimal Running as a Case Study in Enabling Design.

Much higher degrees of pragmatism must be applied in product design to bring about sustainable change (Shedroff, 2009). In this project, strategies such as design for disassembly and stewardship schemes have grown from the notion of behavioral change, to achieve a more sustainable product response. This thesis does not claim that other sustainable frameworks (such as a material life cycle analysis) are ineffective; Simply, that the notion of behavioral change has been invaluable in directing the sustainable design decisions of this project.

According to barefoot running fundamentalists, conventional footwear products have acted to foster a dependency on highly protective and cushioning shoes (Lieberman, 2010; Saxby, 2011; McDougall, 2009). Runners are not exposed to the real forces present in running locomotion - most significantly in the practise of heel striking. Advocates believe that by weakening muscle and fostering poor technique, conventional footwear increases typical running related injuries (Lieberman, 2010). From the outset of this project, I began exploring this subject as an example of the degeneration in skills, suggested by both Manzini (2008) and Morelli (2007); where product or services might disable a user through overly comfort focussed design (Lieberman, 2010). Through personal testing and reflection of the barefoot running technique I have investigated the these claims for myself. A minimal footwear concept has been developed from my own testing, that allows for maximum ground feel and encourages forefoot strike technique, while providing adaptable lightweight support through a strapping harness. Advocates believe that through the practise of minimal running technique and footwear, muscles become strong, reducing injuries and fostering a more natural running experience (Mcdougall, 2009).

Spangenberg (2010, p.1491) places strong emphasis on social innovation in business

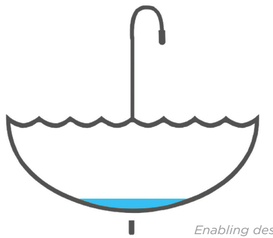
for the cause of sustainability. 'Products are to be 'fertile', having development and adaptation potentials, involv[ing] consumers in designing the final shape and function.' A product should possess 'buy in' qualities, empowering the user to define a product according to their specific needs. I believe that meaningful personal identity found in a product, works against impersonal, blind consumption. The ecosystem of products proposed in the concept aims to establish a lasting businness-customer relationship. The replaceable repairable parts encourage user to 'maintain' this product.

In Design for the Real World, Papanek (1984) proposes that the ultimate job of design is to change human environments and tools and thereby change humans themselves. Papanek (1984) believes that behavioral change is the core issue when confronting sustainability. Through this project, I have asked how a product might facilitate behavioral change amongst runners.

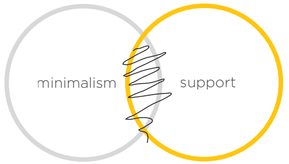
To make a speculative comparison based on my learning of the barefoot running movement; conventional footwear can be likened to a 'crutch,' keeping runners dependent on specialised equipment in order to engage with the practise of running. The graduated moonboot designed in 2009 (figure 1) Initiated my journey into enabling design. In a similar way to the moonboot, this concept functions as a 'tool;' empowering runners by fostering the forefoot technique proposed by experts (Saxby, 2011). The ability to customise the design encourages a user to 'buy in' to a system of responsibly manufactured footwear components. (Sapngenberg, 2010, p.1491). 'Involving consumers in designing the final shape and function' of this concept, enables a user to control their journey towards minimal running.

Building on my learning from previous design projects, this master project has practically explored the area of minimal running with regard to 'enabling design' (figure 1). This project has been part of a continual journey into discovering myself as a designer and has demonstrated how tangible, product responses can develop from a more pragmatic attitude to sustainability and design.

Design project



Enabling design



"A product that ... encompasses the scientific approach to injury prevention (a graduated introduction to minimalist running), with the cultural dynamics of the Mexican huaraches and the durability of modern materials that are practical and eco-friendly. Great to share the journey with you."

- Kelly Sheerin (*AUT Millennium Institute Running and Cycling Mechanics Clinic Manager.)*

Proposed Stewardship model

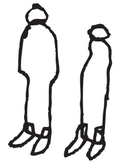
This diagram maps out a potential model for establishing a more lasting, customer-business relationship.

to be :

[The shoes are sold in a durable, knitted bag.]

[Parts are sent back to the company for recycling or repairs.]

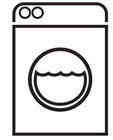
[The user may remove the sleeves from the harness.]



[The shoes can be configured in two ways, for varying degrees of support.]

[When the sleeves wear out, they may be re-soled or recycled.]

[The sleeves can be machined washed in the knit bag.]

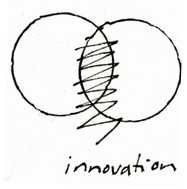


Reflections

design process

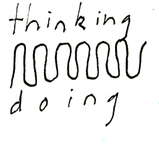
Innovation can be found through exploring 'contradictions' and tensions in a field of design.

Through investigating the tension between minimalism and support, a unique product system has been developed.



design research

This project has developed a rhythm of 'thinking' and 'doing.' More pragmatic design solutions underpinned by deep thinking arise from this approach to theory and practise.



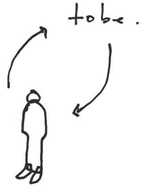
enabling design

Masters study has developed my personal framework for responding to sustainability. A product and its story can be used to foster behavioral change for the cause of sustainability through practical design methodologies (such as design for disassembly or stewardship schemes).

industry learning

Conceptual projects with existing companies:
1 Allow the student to exhibit their process in front of potential employers.
2 Allow the company to explore the flexibility of their brand.

Through this project I have demonstrated my approach to the field of minimal footwear. For 'Tobe:', this relationship has enabled a conceptual level of design that they would not otherwise have the resources for.



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Appendices

Appendix 1

Concept a:

This model was built to prove the over arching design concept of minimalism and support. A fit wool substitute was used for a simple toe box. A Nike ankle sleeve provides structure to the prototype. A nylon woven strap provides a low level of support.

Reflections:
This model was successful in validating the core concept of minimalist running footwear and ankle support. The running experience proved to be very unique, taking on the feel of a 'structured sock.' The ankle sleeve and strap acted to encase the foot whilst the material elasticity provided a subtle bounce to each step.

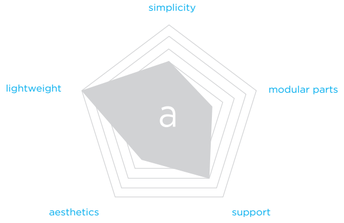
Concept b:

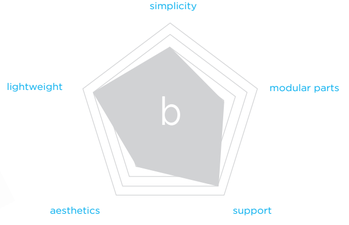
This model explores how a strapping component may integrate with the upper form to provide both midfoot and ankle support. An asymmetrical woven design provides a interesting contrast to the simplicity of the wool fibre textile. The length of the straps has been exaggerated in this model to illustrate its connections to historic, ankle lacing footwear such as the Greek or Mexican running sandals.

Reflections:
This image helps to frame the design intent of this project to investigate new directions in the field of performance footwear. A 'woven' design language could be expressed throughout the whole object, ultimately taking root in the nature of the woven, 'Tobe:' fitwool. Working with these materials has illuminated the need to execute clean ,slick material finishings against the authentic, woven strapping aesthetic and the 'Tobe:' wool textile.

This prototype has also drawn attention to: A) the opportunity for a modular strapping system, B) The line between casual and running footwear and the reflection of this trade off in the design, C) The impracticalities and potential hazards of lengthy straps in running foot wear.

polygon diagrams





Appendix 2

2009

2010

2010

2011