SMOOSH

A conceptual approach to adaptable flat-pack shoes for contemporary digital nomads

A dissertation presented in partial fulfilment of the
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To the memory of my beloved Nana

Abstract

Adaptable products often present a range of possibilities for changing contexts and circumstances. Their use can also enable a way of being and operating that engenders nomadism. However, shoe studies in this context have never been systematically studied.

Immense technical changes over the last thirty years have affected communication and reduced travel costs, while globalization has made remote work not only possible but often desirable. This global transformation has produced “digital nomads”, who use telecommunication technologies to earn a living whilst living, travelling and working remotely. The digital nomad has inspired this practice-led research project exploring the conceptual design of a multipurpose, adaptable shoe, which satisfies the requirements of unpredictable travel and a nomadic lifestyle.

This footwear design project is multidisciplinary and situated at the nexus of fashion apparel and product design. Transformable/adaptable fashion and un-build concepts have been utilised as a theoretical framework to explore the shoe’s versatility, critique aesthetic values used on an everyday basis, and locate the shoe in an urban, utilitarian and minimal fashion context. The primary focus is on the versatility and packability of shoes, which are bulky and difficult to transport. Identifying these constraints was a creative catalyst to challenge footwear construction methods and design processes and to explore a collapsible, packable free-upper shoe.

The outcome of this research is a conceptual design for flatpack *Smoosh* shoes, a system that allows for convenient packing. The developed concept is a footwear with a range of sock-like inner components that can be docked into the shell outer-sole, both of which are fully functional pieces that can be used separately to expand versatility and minimize luggage space. They allow hassle-free travel and offer recyclability. *Smoosh* contributes to footwear design knowledge by providing a novel construction system for travel purposes. It establishes that although rolling is the most common collapsible principle in the travel apparel and footwear markets, principles such as *folding*, *hinging* and *creasing* are far more desirable for travel shoes. The conceptual exploration and final footwear design contribute to the field of adaptable footwear by providing information for further research and development.

Creative Work Documentation

This doctoral research is made of two parts: a creative practice component and written exegesis component.

A link to the creative component documentation can be found at

http://www.smooshshoes.com/

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The ethics approvals for this research (4000018292 4000022221—Appendix 4: Human Ethics approvals) to support surveys, interviews, 3D scans, records and pictures of feet, have been obtained from the Massey University Ethics Committee and have been assessed as Low Risk.

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Glossary of Terms

Based on Rossi (2000).

Arch	The area of the sole of the shoe immediately below the longitudinal arch of the foot.
Ball	The part of the foot just behind the large toe, five metatarsal bones and surrounding tissue. Along with the heel, the ball is one of the two primary weight-bearing and tread sections of the foot and shoe.
Bespoke	A custom-made shoe.
CAD	An acronym for Computer-Aided Design.
Counter	An internal reinforcement or stiffener usually placed between the outside and the lining at the back of the shoe. It retains shoe shape and prevents the upper from collapsing around the heel. Can be made of rubber (for vulcanised shoes), thermoplastic (for cold cement shoes), chemi-sheet (for inexpensive shoes) or leather (for dress shoes).
EVA	Ethylene vinyl acetate; polymer. Due to its light weight, EVA is the most common foam used for shoe cushioning within the midsole. Can be hot or cold pressed and is made in a variety of colours and hardness.
Insole	Also known as the footbed, insole, inner sole or sock liner, it is a cushioned liner that occupies the inner surface where the foot rests. It is placed there for comfort and protection. It is usually made of a foam-padded mesh or leather piece. It may be removable or cemented in place.
Midsole	A sole component between the outsole and insole. It is mainly used on outdoor boots and running or athletic shoes to provide a layer of cushioning. Usually made of EVA or PU foam. Not all footwear has a midsole.
Medial side	Toward the middle of the body.
Lateral side	Away from the middle of the body.
Last	Is the foot-shaped form over which the shoe is made to conform to the prescribed shape and size. The term is from the Old English “least”, meaning a footprint. The last can be made of moulded plastic, cast aluminium or carved wood and is an important element in the shoemaking process.

Lasting	The process of shaping the shoe on the last. Almost all shoes are lasted in some way as it helps to bond the outsole when pressed into place. There are several types of lasting operations: slip, board, toe, waist, heel, string, California and hand lasting.
PU	Polyurethane is a synthetic (plastic) material used in both the outsole and midsoles. It is also used as an upper material (with a non-woven or fabric backing for reinforcement).
Outsole	Also known as the outer sole or sole, it is the bottom portion of a shoe, which is the most exposed to abrasion and wear. It provides grip, traction and durability. It is commonly made of rubber, high-density PU or EVA foam or leather (dress shoes).
Shankpiece	The flat, finger-like slab of material inserted between outsole and insole in the centre of the shank (the bridged portion between the heel and ball area). It provides reinforcement against body weight and stress. The shankpiece may be metal, wood, fibreglass, plastic or made of other materials. It is sometimes incorrectly described as an “arch support”.
Toe box	Also known as the toe box or toe cap, it is the reinforced toe area of a shoe. It comes in different sizes and shapes and may have pointed tips (dress shoes) or extra space for steel toe inserts (work boots).
Toe spring	Of a last, shoe, or pattern, this refers to the distance between the front tip and the ground. This distance is needed to help the rolling motion of the foot. The elevation depends on shoe style, heel height and sole thickness. A stiff hiking boot may have a 15 mm toe spring, while that of a slip-on casual shoe may only be 5 mm. The general rule is the stiffer the shoe sole, the greater the toe spring.

PREFACE

I am a multidisciplinary designer who has worked across the creative arts, including industrial design, furniture design, graphic design, interior design and art. I studied at the Academy of Fine Arts in Warsaw, known for its broad interdisciplinary practice which combines elements of both fine arts and design education. Consequently, I tend to utilise a wide range of approaches, methods and creative practices from different design disciplines, thereby blurring the boundaries and selecting the most appropriate approach or method for each project. In this way, I see my work as linked to that element of László Moholy-Nagy's practice that Peter Schjeldahl has described as "relentlessly experimental".[1] My design focus lies in the area of social well-being, understood through a socio-cultural contexts.

This doctoral research was inspired by my personal experience and observational studies throughout my European travels. My design practice was initially spread across European countries (mostly Poland and Italy), which required frequent travel, but eventually it has become remote freelance work from anywhere. For seven years I lived in Europe, and from my main bases in Italy and Poland I travelled to Greece, Spain, Ireland, England, Scotland, Germany, Austria, the Netherlands, Switzerland, France, the Czech Republic, Romania, Hungary, Bulgaria and Portugal). I did so whilst working remotely from a range of environments, including an Italian coffee-shop, the Greek seaside and a hot-desk in a co-working space. I have moved over twenty times[2] in my adult life, finding myself living in rented houses, apartments, dorms, cottages, a van and even a boat that I called a temporary humble abode.[3]

The nomadic concept of fluidity and high adaptability has spread throughout the millennial generation and has nourished this research. I became, unknowingly, a digital nomad (DN). At that time, I did not recognise that the socio-cultural context of my professional practice and lifestyle was nomadic. I was immersed in transformable/adaptable products and nomadic structures that would accommodate this lifestyle, allowing me to avoid buying new items every time I had to move to another place, another city or another country. As a design context this intrigued me; it called for a new approach to understanding consumption, transportability and utility in every item you bought and carried on your travels.

[1] The art critic Peter Schjeldahl has described László Moholy-Nagy in this way due to the fact he worked across disciplines. See https://www.tate.org.uk/art/artists/laszlo-moholy-nagy-1649.
[2] Here, I count the places that I have lived for longer than three months.
[3] Humble abode refers to a home or a liveable structure (for example, a tiny home or capsule) used by vagabonds and travellers, suggesting temporary accommodation. It is often seen on Bed and Breakfast websites, advertised humorously and expressing the peculiar, industrial or unfinished character of a place.

The current digital nomad challenge arose when I decided to move 19,000 km to far-away New Zealand to commence this research. I repacked my 25 kg suitcase several times, thinking how to wisely fit my next four years of life into it. Bursting at the seams, my luggage contained mostly electronics, favourite clothes and far too many shoes, although I have never considered myself as a “shoe person”. Nonetheless, the main goal was to support my lifestyle and the activities I like doing, and so shoes, with their variety of purpose and specialisations, made a significant contribution to my overall luggage.

Why is the study of shoes important now?

This practice-led research intertwines my personal interests and motivations. I identify as a digital nomad. I understand that way of living, the difficulties when trying to travel light, always keeping in mind that I need to pack all the necessities to support not only my travel but also my work. I have a deep insider’s understanding of the DN’s life, and consequently it gives me access and exposure to other DNs. I feel at ease communicating with the DN respondents in my study because of our shared experiences and age. The early pilot study undertaken at the start of my research among location-independent individuals, clearly showed that shoes take up most of their luggage room. Because of the specifics of their travel, which is frequent and variable, it is hard for DNs to choose and pack the right shoes for different activities, occasions and purposes. Initial research proved that there is a huge need for a smart, efficient shoe solution that might be used not only during a city stroll or hike but also during a business meeting, as DNs live at the nexus of work-leisure-travel.

My initial research proposal was about nomadic furniture—not even slightly tilting to the footwear area. However, further literature reviews and surveys directed this study back to where it started: to the journey and packing and my reflections on my lived experience. I struggled to find the ideal shoes to support my nomadic lifestyle, just as much as I struggled to decide on a footwear topic when it became apparent this would be my focus area. As befits a nomad, I was seeking, and I could tolerate a certain discomfort in my environment.

The year 2020 turned out to be undeniably inconvenient for us all. The pandemic has put us in a state of suspension: restrained borders and grounded air travel stranded tourists worldwide, including many DNs. The Coronavirus may have also changed what it means to be a digital nomad. Ironically due to the Covid-19 pandemic many more people find themselves living digital nomadic lives, operating for periods of lock-down at home, in a variety of managed isolation and quarantine facilities, stranded in other countries; operating with minimal belongings, a laptop and an internet connection all whilst trying to maintain employment and a raft of obligations. The global pandemic foreshadows an upcoming change in a post-pandemic world, bringing polarised opinions about our time, future and looming economic crisis. The

design community speculated how designers' roles could evolve and whether design will become a luxury good once again, or how design could imagine a new world. Interest continues to swirl around social-behavioural and emotional conditions, ongoing anti-consumerism mood and economic instability. This has been coupled with criticism raised about the design profession itself, which to paraphrase Victor Papanek's provocative statement, suggests that we (designers) are simply pests (Papanek 1975, 1).

This discussion about the harmful impact of bad and unwise design, alongside the 2020 pandemic, has brought us back to the principles of good and long-lasting design, provoking us to question manufacturing processes as Findeli (2020, 9) reasserts László Moholy-Nagy's statement from 1930 that "man, not the product,… the end in view."

1.0 INTRODUCTION

The last thirty years of digital communications and the Internet have provided many disruptions to how we live and experience life. Consequently, this technological revolution has disrupted many products and services and stimulated all manner of opportunities. After an early period of techno-enthusiasm and its alleged democratisation (Srinivasan 2017, 2), it came time to reflect on the Internet's negative facets; this is often referred to as the *post-digital* paradigm.[4] The Internet has affected most aspects of human life, primarily its social and cultural elements, and has strongly influenced new generations, in particular millennials, who quickly embraced the surfeit of creative possibilities of a novel and freely available World Wide Web. This technological revolution has also enabled remote work to flourish, while galloping globalisation and the housing crisis have encouraged many to set their professional careers online, not constrained by geographic coordinates. This is often referred to as "digital nomadism" (Makimoto, 1997).

However, even though design has often invoked nomadism through a range of adaptable products—such as multifunctional apparel, portable shelters and collapsible furniture—shoe studies have never been systematically investigated or thoroughly explored in this context. It is, then, this context, often intertwined with my lived experience, that inspired my practice-led research of a conceptually designed, multipurpose and adaptable flat-pack shoe. This exegesis therefore examines adaptable footwear, which is essential in satisfying the lifestyle requirements imposed by unpredictable travel and by the dynamic lifestyle of digital nomadism.

Digital nomads (DNs) are mobile professionals who perform their work "freed from constraints of time and location" (Makimoto 2013, 40). DNs work, live and travel "here, there, everywhere" (Makoto Su and Mark, 2008). They absorb the new concept of fluidity and have high adaptability and a broad dependence on technology. They seem to change their destinations "more often than a toothbrush" (Beekmans, 2014), while they carry electronics so that there is little room left for apparel and shoes. The life of uninterrupted travel demands a minimalistic lifestyle, which as Makimoto and Manners have identified, means that "the nomads' prime requirement is clearly portability and that means a tool stripped of all non-essentials" (1997, 119). They live at the nexus of work-leisure-travel and the "urge to travel" is an essential component of digital nomadism (Makimoto and Manners 1997, 17). Consequently,

[4] The term originates from Nicholas Negroponte's (1998) claim that "the digital revolution is over". See also Abblitt (2021).

such a lifestyle means living out of a suitcase, and therefore the core of this study is packability and versatility.

1.1 Objectives

The pilot study that I conducted amongst DNs revealed that footwear takes up most of the room in their luggage after electronic equipment and chargers. An analysis of users' luggage and travellers' behaviours has shown that footwear is difficult to pack and to transport. Shoes are bulky and due to their construction take up a lot of luggage space when transporting.

The objective of this project was to design a shoe that would be easy and convenient to pack and could support a variety of activities that would offer utility along with desirable design benefits to the nomadic lifestyle. As such, this study primarily focuses on footwear versatility and packability. Identifying these design objectives provided a creative catalyst for this project. It called on me to challenge footwear construction methods and design processes in order to explore non-structured, free-upper shoes for convenient packing. However, this project does not seek to compete with what commercial athletic footwear brands have to offer; rather it seeks to represent an alternative urban versatile aesthetic.

Although this research was inspired by DNs' unpredictable travel, it is also based on a far more universal concept. DNs are symbolic of the contemporary "liquid society" (Hermann at et., 2020) where individuals are continuously "on the move" (Bauman, 2006; Urry, 2007; Müller, 2016; Reichenberger, 2018). Accordingly, this project may be relevant to anyone who experiences or seeks high adaptability, fluidity and a fast and ever-changing pace of life, including (against the logic of this research) a commute to work, and ergonomic and diverse footwear that can be worn on several occasions and that can be easily packed.

1.2 Situating the study

This study sits at the nexus of industrial and fashion apparel design. As footwear derives from these two subject specialisations, the study is cross-disciplinary in nature. Following Yuniya Kawamura (2016, 19), we can understand footwear as "a field within fashion and dress studies" and we know that it "has played a peripheral role in fashion and dress studies". Giorgio Riello (2006) argues that for most of the twentieth century, footwear was rarely considered as a part of dress. Consequently, compared to dress, shoes are "repeatedly referred [to] as the 'Cinderella' of fashion theory, frequently overlooked and underestimated" (2006, 387).

Researchers have examined shoes for their **symbolism**, both in terms of *meaning* (Sherlock 2016; Davidson, Riello and McNeil 2006; Sampson 2016) and as *fetish* (Steel and Hill 2012);

for their contribution to a **social way of being**, including in terms of *subcultures* (Kawamura 2016); for their **historical attachment to place** in terms of *cultural heritage* (DeMello 2009); for their **biomechanics**, including *kinematics* and their *kinetic* and *orthotic* functions (Goonetilleke 2013); and for their **manufacturability** and ability to scale to a market (Motawi 2019). However, the context of adaptable shoes in academic research remains a neglected area and has not been thoroughly explored. The scope of this study is represented by the diagram shown below (Fig. 1.1).

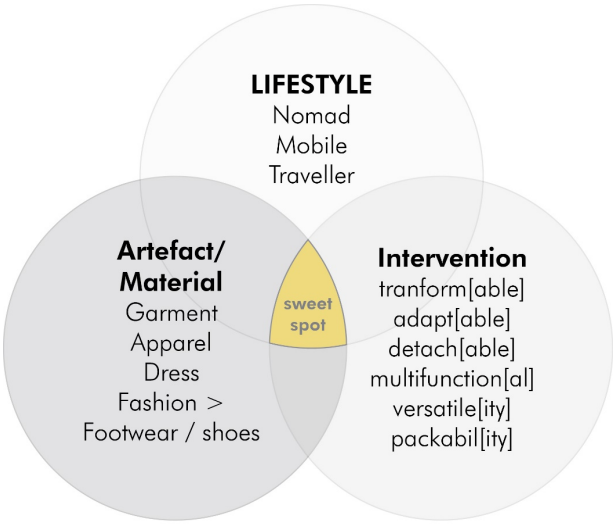


Fig. 1. 1. The creative 'sweet spot' of design focus.

Secondary research informed the understanding of transformable/adaptable fashion strategies and the mechanism, features and approaches in achieving utility. Fashion trends and marketing positioning in relation to DNs informed alignments between product performance, end users and the latent needs of the on-the-move DN target market. The review supports the design brief by critiquing the aesthetics of everyday shoes and then juxtaposing it with an urban, utilitarian and minimal fashion context.

Due to current footwear trends shifting towards ecology and emerging bio-based materials, the initial design brief assumed the use of these materials. Although my study examined their potential, caution is required to avoid greenwashing[5] through a lack of reliable materials research and variable availability. Nonetheless, the design methods used in my research contributes to the discussion about fashion's impact on the environment and

[5] "Greenwashing is a pejorative term used to describe a marketing strategy aimed at giving a business, organisation, or sector, an ethical or environmentally friendly image. It implies that there is little depth to its motivation and is, therefore, disingenuous in its aim. However, it is not only business that could be accused of Greenwashing. The consumer's construction of their ideal social self-image could also be a factor." See also Ross (2007).

contemporary footwear knowledge. The proposed non-bonded footwear construction utilises a modular product architecture in line with environmental considerations; that is, it allows component replacement, which extends the life cycle and makes this project a desirable and eco-friendly product from this traditionally end-of-life disposable product sector.

1.3 Research questions

The broad research question for this study was: How can a shoe accommodate the unpredictable nomadic lifestyle across the nexus of work-leisure-travel? This was supplemented by the following sub-questions:

- Which DN lifestyle activities, occasions and purposes should a multipurpose adaptable shoe aim to satisfy?
- How can shoe utility (versatility and packability) be improved to offer desirable benefits to digital nomadic lifestyles?
- What aesthetic should a multipurpose, adaptable shoe express to appeal to DNs?
- What are the ergonomic requirements of a shoe of this nature?
- What adaptable mechanism, features and attributes should the shoe embody to satisfy DNs' lifestyles?
- What materials and manufacturing processes should a shoe of this nature use?

1.4 PROJECT RATIONALE

1.4.1 The changing nomadic conditions?

The Coronavirus pandemic has pointed out that now more than ever, there is an increased interest in van-based nomadic work as people seek alternative ways of living. That is, according to Google Trends,[6] there has been a spike in the phrase *vanlife*, which is a term popular among contemporary van-dwelling nomads (Fig. 1. 2). Customer demand for prebuilt converted vans, recreational vehicles (RVs) and sailboats has also increased during the pandemic. When accommodation is difficult and isolation is a benefit, these can assist in avoiding crowded urban areas and in adhering to social distancing rules.

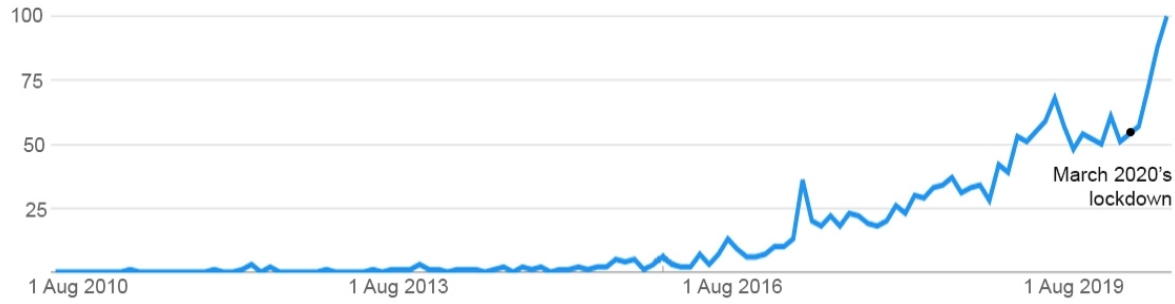


Fig. 1. 2. Worldwide exponential increase of interest over the last decade, based on search engine data referring to the phrase [vanlife].

Framework: 30/07/2010-30/07/2020; phrase [vanlife]; Source Google Trend search; Last revised August 15, 2020.

Furthermore, approximately 74% of companies intend to "permanently shift some employees to remote" (Gartner 2020); (or hybrid) work in the Covid era as a means to reduce overhead costs and (supposedly) support employee wellbeing. The market has opportunistically responded to this rapid business culture and operational change. In order to accommodate remote working-from-home (WFH), manufacturing companies are seeking opportunities in the telecommuting and automotive sector. Nissan's NV350 Office Pod 2021 (Fig. 1. 3) is one example that represents a conceptual, drivable office offering seclusion from household members and the ability to change locations as required by the worker. It can be used as a driverless private office or a mobile meeting room.

[6] Google trend searches and other Internet-based search engines have been controversial but are increasingly recognised academic research tools and measures. Seth Stephens-Davidowitz, author of the book *Everybody Lies: Big Data, New Data, and What the Internet Can Tell Us About Who We Really Are*, argues that the Internet provides a much more accurate picture of human behaviors and desires than old-fashioned methods such as surveys, in particular on sensitive or personal topics.

Fig. 1. 3. 2021 Nissan NV350 Office Pod concept responds to the emerging work-from-anywhere trend, health crisis and telecommuting by offering a mobile remote office.

Retrieved from: https://www.autoevolution.com/news/2021-nissan-nv350-office-pod-concept-makes-working-from-home-a-dream-154510.html#

Despite travel restrictions during the pandemic, the number "of digital nomads in the US (solely) surged 49% in 2020 to 11 million"[7] (based on an MBO partners survey). A Google.com search supports this data as a "search on ["digital nomads"] in September 2020 generated 5,700,000 generic results (up from 1,300,000 generic results in January 2019)" (Hermann at et., 2020). The pandemic has substantially "accelerated and amplified existing trends towards remote and flexible work"[8] (Fig. 1. 4). The "new remote-working normal" has opened novel opportunities to some full-time workers to achieve a location-independent lifestyle.

[7] The independent MBO 2020 study is based on online panel surveys conducted by Emergent Research and Rockbridge Associates in August of 2020. This survey had responses from 3,457 U.S. citizens or those with U.S. residency status (aged 18 and older). The survey results were weighted to reflect the demographics of the U.S. Since 2018 digital nomads have been included as a separate category in the State of Independence in America annual research report, which is the first and currently only statistical estimation of digital nomadism.

[8] Ibid.

Fig. 1. 4. Worldwide growing prevalence of digital nomad lifestyle over the last fifteen years. The lockdown, in March 2020, is indicated as a reference date triggering unexpected search growth.

Source Google Trend search; Framework: 30/01/2005 -30/11/2020; Term: digital nomad; Scope: worldwide.

What it means to be a digital nomad may have changed with Covid travel restrictions in place and regulations frequently changing (border procedures, quarantining, testing). However, in identifying this trend, several countries have recently introduced a new type of ETIAS[9] visa—digital nomad visas—to welcome foreign remote workers as a remedy for growing economic gaps in the tourism sector. Many countries have designed or have already launched programs targeted at DNs, such as *Remote from Georgia*, the *Nomad Digital Residence (NDR)* of Antigua & Barbuda, the *Barbados Welcome Stamp*, the *Global Citizen Certificate (GCC)* of the Cayman Islands, *Zivno* in the Czech Republic and the *Aufenthaltserlaubnis für selbständige Tätigkeit* in Germany, along with others in Estonia, Norway, Croatia, Portugal, Costa Rica, Dubai and Thailand.[10] These visas allow holders to work or run their business (up to 1 year) regardless of the location or time zone, which is essentially "the digital nomad phenomenon's normalization first predicted by Makimoto and Manners (1997) more than 20 years ago" (Hermann at et., 2020). The continuing rise and interest in digital nomadism since 2014, even though the dramatic changes due to the Coronavirus pandemic, stresses the DN trend's resilience. In the near future, we may expect a range of products targeting DNs and WFH business culture.

1.5 RESEARCH CONTEXT

1.5.1 Socio-cultural context

Nomadism and the nomadic lifestyle has a long history and has come to be associated in many instances with poverty, otherness and social exclusion. The reasons are threefold: first, because of the rebellious air associated with living far from or outside society; second, because of emergence in the late 1960s of the so-called 'Hippie Trail' and experimentation with psychoactive drugs; and lastly, in a quite literal way, as many moved to their vacation trailers to mitigate the financial hardship caused by price rises, failing incomes or hardships due to economic crisis. This last context—poverty—is examined in Chloé Zhao's Oscar-winning

[9] ETIAS stands for European Travel Information and Authorization System. It is a program of visa waiver tourism and business for non-Schengen citizens allowing them to work while visiting for short-term stays of up to 90 days. The program will start by the end of 2022. Retrieved from https://www.etiasvisa.com/etias-news/digital-nomad-visas-eu-countries.
[10] See https://expertvagabond.com/digital-nomad-work-visas/.

movie *Nomadland*[11] (2020, USA), which depicts a community of older Americans who move to “wheel estate” to work on the road due to financial hardship and the exploitational gig economy model, which has led them to become a new type of seasonal worker.

There is no general consensus on the meaning of the term “nomad”, and up until now, an alternative life abroad has been variously defined as *neo/nomadism*, *global nomadism* (D’Andrea 2006, 2007; Bousiou 2008), *flashpacking* (D’Andrea 2016), *lifestyle travel / lifestyle mobility* (Cohen 2010; Duncan et al. 2013; Cohen et al. 2015), *bohemian lifestyle migration* (Benson and O’Reilly 2009; Korpela 2009) and *digital nomadism* (Makimoto 1997; Ĺkerlund 2013; D’Andrea 2016; Hannonen 2018; Korpela 2019; Müller 2016; O’Reilly and Benson 2009; Paris 2012; Reichenberger 2018).

1.5.2 Neo-nomads to digital nomads, the necessary technological conditions

When this research began in 2017, neo-nomadism was not as popular amongst scholars as it is now. The scattered and fragmented academic research, especially on digital nomadism situated the phenomenon as a new form of tourism or as the “search of a countercultural lifestyle” (Korpela 2020, 3360).

Nomadism and neo-nomadism has a broader and more differentiated range of nomadic lifestyles. Within the scope of my research, digital nomads form one of these groups and reveal a different, more luxurious face to the nomadic experience. To grasp the theoretical framework of the group I was researching, I first began to look at different groups related to neo nomadism literature through socio-cultural and tourism journals by authors Anthony D’Andrea (2006) and Jour Legrand (2008). Then, to identify the range of their lifestyles, I systemised them according to the way they travel, where they stay and how often they move from location to location. The three nomadic groups identified through this analysis were backpackers, flashpackers and digital nomads (DNs). Although they all seemed very similar, in the research and comparison of those three groups, it became clear that digital nomadism is an evolution of the previous two. Indeed, some of the DNs were previously backpackers, and, driven by an adventurous way of living, wanted to adjust their adult life away from the cubicle workstation. Olga Hannonen’s recent publication (2020) confirms my research and situates the DN within this related phenomena. Hannonen (2020) conceives of digital nomads as occupying a space that

[11] The movie *Nomadland* is based on Jessica Bruder’s 2017 nonfiction book *Nomadland: Surviving America in the Twenty-First Century*.

traverses both work-related mobility (characterised by telecommuting, freelancers and mobile professionals) and lifestyle mobility (characterised by backpackers, flashpackers and Global/neo-Nomads).

Although studies on digital nomadism are growing, there is still a lack of common understanding and a holistic perspective on the phenomenon, which can be partially explained by its novelty and the limited number of empirical studies. Contemporary studies tend to frame digital nomadism either as a lifestyle—for instance, as a form of creative tourism, as does Gierlang Bhakti Putra and Fauzan Agirachman (2017)—or as a work life perspective—as does Orel (2019). This one-sided approach does not fully explain the theoretical conceptualisation of digital nomadism, where work and leisure coexist. Their lifestyle mingles work and leisure, business and tourism—often caused by their entrepreneurial drive—and this is what makes this group a growing mobile social phenomenon.

In the literature, the new term “digital nomad”, introduced by Makitomo and Manners (1997), is used interchangeably with “working nomad”, “global nomad” (Meyrowitz 2008), “location-independent” (Müller 2016), “techno-Bedouin” and “electronomad” (Mitchell, 2003) and even “urban nomad”, which might be misleading. The term is used in a variety of often contradictory ways. Over the course of the last four years since I started this project, the number of research and study cases on digital nomadism has been steadily growing and is now considered a social-phenomenon (Hannonen 2020; Hermann 2020).

Olga Hannonen has claimed that the “increasing international mobility of individuals [...] has become a worldwide trend since the 1980s” (2020, 335). This was initiated by the inventions of *Transmission Control Protocol/Internet Protocol* (TCP/IP), which was critical for the emergence of the Internet. Daniel Schlagwein (2018) has pinpointed the invention of the first personal computer (PC) in the 1970s as the starting point of the history of digital nomadism. In *The History of Digital Nomadism* (2018) he identified the concurrent events of “interwoven historical trends in technology, business and travel” (Schlagwein 2018, 1) as an explanation why “the 21st century will be the millennium which resurrects for humans a dilemma which has been dormant for 10,000 years—humans will be able to ask themselves: 'Am I a nomad or a settler?'” (Makimoto and Manners 1997, 3). A rapid growth of mobility in recent years is connected to socio-political factors such as globalisation, digitalisation, advancements in transportation and cloud computing enabling new work arrangements such as the virtual global marketplace, the neo-liberal order and entrepreneurial practices, which blur distinctions between work, leisure, office, home and travel.

However, Schlagwein (2018) also pinpointed influential cultural events that have ignited the growth of digital nomadism, such as an influx of *backpackers* in Thailand in 1982, Timothy

Ferris's influential book *The 4-Hour Week: Escape 9–5, Live Anywhere, and Join the New Rich (4HWW)* or the development of Instagram in 2010. Most recently, Instagram's commercialisation in 2018, after it was bought by Facebook (Frier 2020) and YouTube's expansion has contributed to the rise of the new "influencer" profession, which considerably increased the popularity of digital nomadism and ipso facto generated a clichéd portrayal of DNs as "laptop workers on the beach". Also, since 2018, "digital nomads have been included as a separate category in the State of Independence in America annual research report." (Hannonen 2020).

As working remotely has become more accessible than ever, contemporary nomadic practice has grown in popularity and has come to be recognised as a mainstream phenomenon (Richards and Wilson 2004; O'Reily 2006). However, with this shift, the term *nomad* has also become overused in mainstream journalism and thus perceived as just another buzzword. It has caught on fast, replacing the term *traveller*, which has gained a pretentious and pejorative connotation among people travelling off the beaten track, avoiding luxurious and high-consumption ways of travelling or at least perceiving themselves this way.

Although we could equate the terms traveller and nomad for many reasons, at the same time, they contradict each other. We live in an era of big changes and even bigger inconsistency, where on the one hand, we are beholden to the romanticised idea of an old, slow journey from the past, and on the other, we are following a schizophrenic way of travel, jumping from one location to another as though time-zones do not exist.

Such a way of travel, characteristic inter alia of DNs, is abundantly reflected in their social media profiles, which became a self-perpetuating portrayal unjustly earning them the label of "beach-bound laptop workers" (Hermann at et. 2020). No wonder, then, that new generations, shaped by pop-culture and ubiquitous storytelling, have grasped this romanticised notion of adventurous exploration as a lifestyle of choice. Despite the controversy about naming them nomads, for the purpose of this research and following the existing literature, I will refer to them this way.

2.0 LITERATURE REVIEW

Nomadic life has been expressed in a range of products that respond to the particular needs of a lifestyle on the move. In the following chapter I will look at the concept of nomadic design in the 1970s and examine its various manifestations today. I will then consider the fields of fashion apparel and product design, because footwear design sits at their intersection. I will then focus on the concept of adaptable fashion, considering its history, theorisation and key examplars, including a brief commentary on their applicability to shoe design. In the second half of this chapter, I will turn to shoe design more specifically, examining adaptable and transformable methods such as fuse/divide, expose/cover and expand/collapse, which could improve packability and utility for travel in shoe concept projects and today's footwear market. In doing so, I established that although today's footwear market is saturated with a variety of choices across a broad price range, there are only a few shoes that address DNs' needs. I determined, through luggage screening, that rolling is the most common collapsible principle used for travel apparel. However principles such as hinging, folding and stress/compress are far more desirable for adapting shoes.

2.1 Nomadic Design: From Its Origins to Today

The origins of nomadic design can be traced back to the 1970s, specifically, nomadic design started to thrive when James Hennessey and Victor Papanek published their bestselling book *Nomadic Furniture 1.0* (1973). Two years later, Papanek wrote his design manifesto *Design for the Real World* (1975, 69), where he argued against the capitalist face of design, which he characterised as wasteful, destructive and harmful to people and the environment.

Simultaneously, the do-it-yourself (DIY) craze started, which was supposed to "drag out society away from the dead-end we have manoeuvred it into" (Fineder et al. 2017, 6). DIY has subsequently become a mass phenomenon in post-industrial societies, especially in Europe and North America (Fineder et al. 2017,13). The enthusiasm for making something with your own hands has promoted assembly and customisation as the new handcraft, and has shifted interests from *consumer* to *prosumer*[12] in the Post-Industrial Age. These aspects have

[12] Following Toffler (1980), a prosumer is someone who produces some of their goods and services. This is contrary to customers, who only consume. In design, the prosumer culture is seen as a co-creation and co-collaboration not only between professionals but also between companies and individuals. It is often used as a new business model and a tool to screen the market and understand the end user. See also Kotler (1986).

informed nearly all contemporary design, from product and fashion design, to media and architecture.

Through the conjunction of these two key points of origin, the nature of nomadic design became established. As a result, we now say that most nomadic design projects offer inexpensive, recyclable, customisable, disposable or easily portable products. Self-built design products are usually lightweight, foldable, collapsible, stackable, able to be knocked down and or inflatable, and are easy to process and move from place to place. They often have convertible multifunctionality or modularity, which makes them rebuildable or rearrangeable.

Fig. 1. 5. (left) Ken Isaacs, Outdoor Living Structure/ Fun House / Beach Matrix, Installation in Westport, Connecticut, USA, 1969.

Retrieved from: https://walkerart.org/magazine/enter-matrix-interview-ken-isaacs.

Fig. 1. 6. (right) Chmara Rosinke, 25³, Living Cubes, 2013.

Retrieved from: https://chmararosinke.com/2-5-everything-cube.

Papanek's manifesto continues to influence nomadic design, as his concept represents an anti-consumerism utopian stance and undeniably expressed a frugal and minimalistic approach to design. The slogan "having more by owning less"—or, borrowed from the modernists, "less is more"—has represented not only the sparing use of resources but also a minimalistic design aesthetic. Today, the Papanek manifesto's principles of "togetherness" of the crowd, "democratic" product and "participation" come in the form of the contemporary *sharing economy* (Airbnb, Uber, Creative Commons), *open-source software* and *self-fabrication* (Fablab, self-fabrication 3D printing), *mass customisation*, *prosumer culture* (Kickstarter) or *handcraft* (including a widespread interest in forgotten crafts such as leatherwork, shoe making and jewellery making). Accordingly, contemporary design increasingly focuses on societal needs (social design), collaboration (co-design) and sharing (open design). Today's trends of small architecture, tiny houses and liveable structures also borrow from 1970s design. Projects from the past are often re-interpreted, some in literal ways

(Fig. 1. 5 and Fig. 1. 6), or are bridged to a contemporary twenty-first -century design approach by the use of new technologies and manufacturing processes.

Today, there are many examples of products that embody nomadic ideals and philosophy. To take one example, *Chairless* (2010) by Alejandro Aravena for Vitra (Fig. 1. 7) embodies the utility and adaptability for diverse anthropometry, of nothing more than a sturdy striped belt, which is meant to be used in a cross-legged sitting position to support the back and to free our hands for other tasks. Similar strips are used by a nomadic tribe—the Ayoreo Indians—from the Gran Chaco region. This design product directly targets affluent consumers and DN, and their almost fetishised nomadic lifestyle, as well as the beauty of simplicity.

Fig. 1. 7. Alejandro Aravena, Chairless, seating loop / produced by Vitra / Germany, 2010.

Retrieved from: https://www.dezeen.com/2010/04/15/chairless-by-alejandro-aravena-for-vitra/ https://www.designboom.com/design/chairless-by-alejandro-aravena-for-vitra/.

Modern nomadic design also comes in the luxurious form of glamping,[13] which manages the end user's experience, eliminating the tedious tasks of packing and unpacking and focusing on the valued, affective encounter. It is a notion of a "true" experience, delivered in a manner that can deceive and fool the prosumers into thinking they are having a genuine nomadic moment.

This nomadic experience has also been manifested through aesthetics by the use of raw materials, forms and textures, such as linen, jute, wood, sticks and branches. As one example, *Nomadic interiors for the future* (Fig. 1. 8) by Studio Makkink & Bey Envisions, offers a similar approach, albeit in a different context. More specifically, it focused on survival and the condition of homelessness, which has been a common theme of nomadic design.

[13] A new form of luxurious tourism accommodation inspired by temporary structures such as a tent, tipi, yurt, pod, retro caravan or retro trailer.

Fig. 1. 8. Studio Makkink & Bey Envisions, *Nomadic interiors for the future*, 2014.

Retrieved from: https://www.designboom.com/design/studio-makkink-bey-nomadic-interiors-living-spaces-huisraad-03-07-2014/.

Today's nomadic products also usually address the changes of work environment and the "de-territorized" nature of today's neo-liberal (gig) working culture. In recent years, nomadic products have gained a new social relevance, labelled as *emergency design* (Milev 2011). Bude and Willish (2008) have described a group of people they call "superfluous"; that is, a new generation "of victims of globalization consisting of refugees, migrants, labourers, deportees, political and economic refugees, the poor and the homeless, as well as artists, academics and freelancers in general" (Milev 2011, 149). This social polarisation has become a subject eagerly pursued by artists and designers. For example, Winfried Bauman's practice broadly explores this new urban living condition and the needs of an itinerant society. His projects address not only homelessness (*Barrier Bench* 2017; *Instant Housing* 2010) and overpopulation (*Rough Sleepers / Cageman* 2010, Fig. 1. 9), but also the portrayal of a travelling businessman (*Instant Housing Suitcase 2008.* Fig. 1. 10). This representation is framed as temporary sleep-outs, shelters, pods, survival kits and protective wear, thereby questioning how we might live, rest and work in urban space. The designs are utilitarian, raw, clinical and almost hostile in their aesthetic. They are concepts without consideration for practical function and or the end user.

Fig. 1. 9. (left) Winfried Bauman's, *Rough Sleepers/ Cageman* 2010, inspired by cage people of Hong Kong.

Fig. 1. 10. (right) Winfried Bauman's, *Instant Housing Suitcase*, 2008.

Retrieved from: https://winfried-baumann.de/urban-nomads.

In other examples, Lucy Orta's 1993 project *Refuge Wear* (Fig. 1. 11) and Kosuke Tsumara's *Final Home*, from 1994, addressed nomadism in a literal way. By creating a wearable shelter and intimate home for the individual to find refuge from modern life, Orta presented fashion apparel as performance. Even though Tsumara's collection perfectly suits the down-and-out, he was not producing a fashion label geared towards reducing homelessness but creating a shift in the concept of clothing; without implying that life on the streets or a decline into poverty could be solved by fashion alone, it had a broader utility product aspect to it. The projects bring focus on survival and protection but deliver no real benefit to the intended audience. Its dramatic adaptability for diverse use sits on the border between adaptability and transformability.

Fig. 1. 11. Lucy Orta, *Refuge Wear*, 1993.

Retrieved from: https://www.studio-orta.com.

2.2 Product and Fashion Apparel Design

Returning to design more generally, we can say that footwear sits across the fields of fashion apparel and product design, and can fall in a more polarised manner towards each field. For instance, it can lean towards fashion with idealised aesthetic representations for a particular purpose—for example, shoes to be designed for new collections and fashion runway debuts—or it can lean towards product, with functional task performance overriding aesthetic sensibilities—for example, the National Aeronautics and Space Administration requirements for footwear to be used on space missions.

Within these fields, however, terminology is variable and can place different value on different terms. In product design, a term like ‘adaptability’ can often represent positive characteristics contributing to usability, utility, and extending the range of applications a product can perform. In fashion studies, this term is often seen as concessions that compromise high fashion ideals, or, in contrast, they can embrace laudable agendas such as sustainability. As a result, the concept of adaptable fashion is debated with vigour, and so in the following section, I will look at the antecedent fashion that gave rise to the evolution of the digital nomad before and noting some variations in the use of this term. I will then look at what it means when its application shifts from garment to apparel, focusing on the principles of changed functionality, reconstruction, modularity, the role of fastenings, customisability and the nature of deconstructed fashion.

2.2.1 Transformable fashion

To begin with transformable fashion’s origins, according to Bradley Quinn (2002, 117), the concept became visible in the urban landscape in the 1990s because a traditional wardrobe no longer met the shifting social and cultural needs of “fast-paced city-dwellers” (Quinn 2003, 96), who spent more time at work and commuting than they did elsewhere. This new urbanite- and commuter-lifestyle, and its clothing, has become more fluid and practical; office dress codes have become more informal, people started commuting to work in athletic shoes and began replacing briefcases with backpacks. These could be seen as the conditions from which the Digital Nomad emerged. Multi-functionality and mobility became key, whereas the boundaries of what is formal or casual, and what is streetwear or daywear, started to blur.

A pioneering fashion collection foregrounding such multifunctional, comfortable clothing was Yoehlee Teng’s autumn/winter 1997 collection (Fig. 2. 1). She coined the term “urban nomad”, which she equated with “urbanites on the move” (Quinn 2003, 96) and saw as defining a lifestyle accelerated by local and global travel. These urban social changes have inspired

her fashion design process, prompting her to experiment with new forms and constructions. She considers herself a clothing architect and describes her garments as “shelters”, whereby her visionary approach encases the human body as a “superstructure” within a larger system “to traverse the space” (Quinn, 2002, 13). The collection itself drew attention to the construction’s interplay, and to the focus on modularity. Consequently, the garments provide utility, adaptability, and offer variation on a single design, achieving several different fashion looks for particular purposes. As an example, her skirt piece from 1997 has a back panel that can cocoon the wearer’s head as an additional shawl or can sit as a loose cape that can be adjusted like a tailored coat.

Fig. 2. 1. Yoehlee Teng autumn/winter 1997 collection *Urban Nomads* (on the left);

Retrieved from: https://yeohlee.com/.

Fig. 2. 2 Yoehlee Teng autumn/winter 2011–12 and her design practice continue to swirl around multifunction garments for urbanites (on the right);

Retrieved from: https://www.irenebrination.com/irenebrination_notes_on_a/2012/02/yeohlee-teng-aw-11-12.html.

Yeohlee's 1997 collection offered a “year-round wardrobe” (Martin, 1998) that included a fifth season, “climate-controlled interior”, inspired by bioclimatic skyscrapers and adaptable architectural facades. The collection become adaptable and responsive, as it broke out of the fashion convention of one look, designed for seasonal release (Quinn, 114). Yeohlee represents the influential anti-fashion designer, her main methodology is negation and subtraction, resulting in a characteristically utilitarian, modern and streamlined silhouette, with only frugal, functional decoration, echoed in the cut of fabric, volume and resultant pure form (Quinn 2002, 7).

Fashion theorists tend to include the concept of adaptability within transformability. For instance, Quinn claims that “transformable fashion” is “the simplest and most minimal fashion statement of all” (2002, 117), having utility and adaptability for a range of occasions, while Essi Karell (2013) argues that transformable design in fashion refers typically to multi-functional

garments where one thing (for instance, material, function or expression) converts into another, a far more specific use of the term. According to Osmud Rahman and Minjie Gong (2021), the term refers to those garments that offer two or more functional and/or aesthetic alternative styles, while Koo (2012) similarly states that, in most cases, transformable design relates to physical changes in appearance, form, shape and/or structure, without the loss of substance. Moreover, the piece should have the capacity to be reversed back to its original form. While scholars refer to a change or enhancement of the function, there is consequent disagreement on what can be designated transformables and what might be called a single-state multifunction system (Weaver et al 2010) and consequently adaptable. Rahman and Gong (2021), Koo (2012) definition of the term embraces characteristics of adaptability, which provide utility and usability to perform in a range of contexts.

The term “techno fashion” is often used when designs relate or attach themselves to technology, architecture and innovation. Just as often, scholars study fashion that can adapt as sustainable approach strategies to support environmentally conscious behaviour (ECB),[14] because modular, interchangeable, adaptable or detachable components are seen as a way to “maximize the wardrobe beyond its wearable potential” (Quinn 2002, 117). Son and Shu (2014) agreed that such flexible and reconfigurable systems support frequent storage and frequent transportation, characteristics a product designer would generally embrace. Quinn (2002) draws fine distinctions between garments that through their adaptive features transform solely through the rearrangement of surfaces and those with two or more functions. Whereas both are often reinforced by the use of zippers, snaps, buttons, fastening, straps and lining, the adaptive features that effect the transformation differ. For example, a winter and sportswear garment with reversible fabrics and detachable thermal linings (both adaptive features) can be transformed within seconds into a spring jacket by detaching its additional thermal properties.

Different methods have been proposed by fashion scholars to classify the types of fashion adaptability and or transformability. For instance, Quinn (2002) has grouped clothing into three broad types:

1. reorganise,
2. reverse,
3. detach.

In contrast, Marcela Irovan et al. (2004) described nine detailed sub-categories:

[14] According to Stern (2000), ECB defines all significant environmentally conscious behaviours. These are identified as direct impacts, such as low-emission cars, or are indirect when an individual intends to change, such as using a reusable food bag.

1. substitution,
2. detachment–attachment,
3. adjustment–fixation,
4. stretching–compression,
5. wrapping–unwrapping,
6. disappearance–appearance,
7. combination–insertion,
8. orientation
9. recombination.

Finally, Rahman & Gong (2021) distinguished four types of adaptable and transformable garments, which meet the broader criteria:

1. Garments that can be transformed through various manipulative methods, such as: wrapping, binding, rolling, twisting, folding, tying and gathering;
2. Clothing that can be transformed without changing its form or silhouette embellishment; wearable electronic clothing with light-emitting diodes;
3. Transformable features that cannot be observed, such as thermoregulatory clothing;
4. Smart Intelligent textiles, and textiles with thermoelectric cooling mechanisms built in.

These taxonomies provided useful strategies that were employed in various degrees in the design practice investigation that follows.

2.2.2 From Apparel to Product, Modular Architecture and Connective Features

As I've established the history and theory behind adaptable and transformable fashion, looked at its various manifestations. This section considers fashion in terms of the principles of changed functionality, reconstruction, modularity, the role of fastenings, customisability, and the nature of deconstructed fashion. In providing these various examples, I will also briefly consider their applicability to footwear design.

In my first example, the concept of adaptability is manifested as a complete change in function effecting a transformation. Junya Watanabe's *Transforming Bag Jacket* 2004, unzips and unfolds into a jacket (Fig. 2. 3). In doing so, it represents a complete change of assumed functionality, shifting from apparel to fashion and achieving a dramatic shift in perception and usability.

Fig. 2. 3. Junya Watanabe's *Transforming Bag Jacket*, 2004.
Retrieved from: https://www.grailed.com/, Last revised 28 July 2018.

In a second example, Hussein Chalayan's *Coffee table 2000* (Fig. 2. 4) morphs into a skirt by removing a rounded disc from the table's centre and pulling the inside edge up over the hips and attaching to the waist. Reconstruction as a strategy for DNs provides greater potential, with components designed to adapt into completely different and forms that could address footwear practicality on the one hand and packing for travel on the other.

Fig. 2. 4. Hussein Chalayan, *Table dress*, Fall 2000.
Retrieved from: https://www.vogue.com/fashion-shows/fall-2000-ready-to-wear/chalayan.

In yet a third example, Patrick Cox's *Pieces* (Fig. 2. 5) collection introduces a modular system of clothing, shoes and accessories with a utilitarian identity providing versatility. Unlike

typical travel gear, in this example, each garment is cut into slim lines that highlight definite shapes rather than basic forms, which makes this collection modern, unconventional and unexpected. *Pieces* was designed with the millennial generation in mind, and with a focus on the futuristic concept of versatility. This versatility is achieved by the use of innovative fasteners and modular components like removable hoods, collars and sleeves or by dedicated components, which change not only the product's functionality but also adapt its aesthetics, providing multiple looks from a collection of modular pieces.

Fig. 2. 5. Patrick Cox, *Pieces*, 1999.

Retrieved from: https://www-bloomsburyfashioncentral-com.ezproxy.massey.ac.nz/products/berg-fashion-library/book/techno-fashion/transformables; Accessed 20 May 2020.

Different fashion designers have utilised various fastenings within their modular garments. For example, John Ribbe's modular *Mummy Dress* uses velcro as a binder of its interchangeable panels, allowing mass-customisation and an effective response to the user's individual preferences (Rahman & Gong 20121). Damaged or used parts can be replaced without discarding the entire garment. A similar approach (common in product design) would provide the same benefits to footwear: a mix and match of components would allow the end user to express their own particular style.

Fig. 2. 6. John Ribbe, *Mummy Dress,* Year unknown (on the left).
Fig. 2. 7. Galya Rosenfeld, *Object Un Dress,* Year unknown (in the middle).
Fig. 2. 8. Galya Rosenfeld, *G Construction,* Year unknown (on the right).

All Retrieved from: https://www-bloomsburyfashioncentral-com.ezproxy.massey.ac.nz/products/berg-fashion-library/book/techno-fashion/transformables, Accessed 21 May 2020.

In contrast, Galya Rosenfeld used zips in her *Object Un Dress* (Fig. 2. 7) or snap tape to interlock modular components and provide the end user with the ability to customise the garment. Rosenfeld echoed the modernist fascination with showing the technical features of her work, a “technical device and a modular piece” (Quinn 2002, 128). In her couture dress *G Construction* (Fig. 2. 8), tiny interconnecting modular segments can be reconfigured to another dynamic garment. This concept echoes the *Plug-In-City* project by Archigram, translating two-dimensional patterns of abstract shapes into a reconfigurable three-dimensional object.

An elaboration of this strategy is seen in product design, where modular heterogenous components are assembled to achieve particular functions, in a diverse range of aesthetic representations. For example, the Swiss modular watch, Swatch (Ulrich & Eppinger 2016, 191), delivers mass customisation and diverse styles to the consumer. This aspect is already integrated into footwear design, where the components (even when developed as a fused integrated product) present as identifiable elements, such as the sole, toecap, lacing, etc.

Fig. 2. 9. Donna Karan, *Infinity dress*, 2011.

Retrieved from: https://www.nytimes.com/2011/01/20/fashion/20CONVERTIBLES.html?mtrref=www.google.com&gwh=1229C11C8A4F17BB26CDA461BECFB36C&gwt=pay&assetType=REGIWALL.

In achieving diversity of looks fashion items often reconfigure the material content for new aesthetic purposes. Donna Karan's pattern exploration resulted in transformable projects such as the *Infinity dress* (Fig. 2. 9), which brought together seven looks in one dress. The long, convertible halter straps can be twisted, tied and wrapped to produce a low-waisted mini, an obi-sash sheath, an off-the-shoulder shift and more. It can be worn multiple ways, offering a range of flattering, unique silhouettes. The material that makes up the garment stays with it throughout its transformations, which are essentially for aesthetic purposes. The consequent strategy used in footwear design would require a carefully mapped management of aesthetic change to benefit achieved, because it could quickly load volume to a stringent luggage threshold and eliminate its practicality and purpose.

Deconstructed fashion is an aesthetic style that uses recontextualization to achieve a new look or style. The garments look unfinished, misshapen or inside out. Such experimentation "destabilises binaries of inside-outside, body-clothing, old-new, worn and discarded" (Geczy & Karaminas 2020, 65). It embraces the connective tissue between components as an aesthetic feature and often presents individual components of the garment as identifiable heterogenous elements. It combines and collages for affect in a conscious assembled aesthetic. The consequent strategy used in footwear design for the digital nomad would be a real challenge due to the high-performance usability requirements and the need to keep volume down for packing.

To summarise, with the notable exception of Chalayan's *Table Dress*, adaptable fashion seeks utility, functionality, diversity and practicality. Therefore, I would argue that adaptable fashion has some potential to satisfy the requirements imposed by a dynamic lifestyle, determined by rapid changes and an intense rhythm of life. For the digital nomad, who travels light with the consequent pressure on luggage volume, adaptable garments that include additional material to achieve functionality can impact on practicality and necessary utility. Therefore, such adaptable features have to be carefully considered before being included. Nevertheless, the strategies and mechanisms of change have the potential to be applied to experimental design practice interrogating footwear for the DN.

2.3 Adaptable shoes

Having now established the necessary background to nomadic design and having explained the origins of the concept of transformability, along with having offered some key examples and considered their relevance for shoe design, I would now like to examine the shoe as an object: an object of use, of industry and of fashion. In doing so, this section focuses on transformability and utility and identifies characteristics and design strategies that have been employed in fashion and more particularly shoe design to extract elevated levels of performance. This enriches the creative perspective of this study and identifies a gap in the knowledge for this research. I will cover three types of mechanical adaptive features identified by Singh et al. (2007), which are: fuse/divide, expose/cover, and expose/collapse by exemplifying un-build concept project and existing travel footwear.

Contemporary designers, both product and fashion designers, often raise the issue of packability and aesthetics in the context of adaptable design. Whereas fashion designers usually respond to this issue by using lightweight and tech fabrics for their garments, it is more complex for unwieldy industrial objects, including footwear, which sits at the nexus between fashion and industrial design. When we consider products dedicated to a new generation in constant flux, we need to mention volume and packability of such items, which is often the main reason for a physical transformation of the item to take place in the first place. In this respect, the aesthetics of such products are often compromised by the morphed transformation itself. Products that change their function, collapse or morph into something else need to follow mechanical principles and/or contain the devices or mechanism allowing them to do so. Traditional footwear's construction consists of stiffeners, a toe box and shankpiece, which, along with the most common bonding methods, such as cold cement, undermine or preclude transformation. Adaptable footwear adapts function, volume and aesthetic, but it does not need to transform into something else, per se. Adaptable is a wider term than transformable and is contained within it.

While the classification of adaptable/transformable fashion proposed by Quinn and Irovan might be appropriate for soft garments, it has limited utility with respect to footwear due to their sturdier construction. Therefore, I followed the principles identified by Singh et al. (2007), who describe three basic types of adaptable/transformable principles: fuse/divide, expose/cover and expand/collapse. In addition, they provide twenty adaption features—including flip, fold, nest, segment, share core structure, telescope, shell, roll, wrap, inflate, flexible material, among others—which allow these three adaptable/transformable principles to occur. In this respect, the adaptable/transformable aims to alter functionality or size for easy

or frequent storing and frequent transportation. Although their classification aims mainly to support the engineering domain, it is useful to any industrial application, including footwear.

2.3.1 Fuse/divide

According to Jay Jungik Son & L. H. Shu (2014), the fuse/divide principle applied to shoe design separates unwieldy items (the shoe) into smaller components and sub-systems. These components are not useful by themselves but gain their functionality and purpose when combined with other components to build an integrated product concept. The ease of fusing/dividing is consequently vitally important.

Fig. 2. 10. A woman assembling the interchangeable heel, Patent 2795866,1956. An unsuccessful concept as change of high heel compromised balance and comfort.

Photo: Miller Retrieved from: http://www.thehistorialist.com/2011/11/i-miller-is-trend-1956-andre-perugia.html.

There are existing patents and concepts in the fuse/divide principle category; some of which extend back to 1950, while the others are quite new. The invention of novel heel interchangeability (Fig. 2. 10) has been frequently attempted in the past, and resulted in two patented inventions by Andre Perugia in 1957 (2795866[15]) and Merwin Zuckerman (2795867) in the 1960s. Both promised to provide customisation that allowed the user to match the same shoes to different clothes, accessories or walking styles by a change in heel height. In the first case, the heel was locked in the seat by a pin from the side; in the second, a metal tongue fits

[15] See https://patents.google.com/patent/US2795866A/en.

into a slot. Several designers, such as Sorelle Fontana or Pavone with Passion Footwear, tried to revive this concept since the patent first came out in the mid-1950s. In 2010, Tanya Heath Paris seemed to succeed by reaching customers globally with her removable heel version. It is unknown why this multi-height shoe was successful this time, although it may have been due to the timing: its launch aligned with socio-cultural changes of increased mobility and prosumer mass-customisation.

Fig. 2. 11. Tanya Heath, luxury brand transformative shoes, 2010. The brand seems to succeed with this concept by reaching customers globally.

Retrieved from: https://tanyaheathshoes.com/pages/how-it-works.

Placing the mechanism of heel attachment aside, the idea of changing the heel height conflates other issues integral to shoe design. Shoes are made on *lasts*,[16] with a sole to fit specific heights. This means that any change to an adjustable heel's height has a knock-on effect on the whole shoe's usability, affecting balance, comfort and consequently the confidence of the wearer. This specific issue was addressed to some degree in a concept project called *Mime et moi* (Fig. 2. 12), where self-adjusting flex insoles provide the adaptive

[16] A last is an imitation of the human foot, allowing for the manufacture and shaping of the shoe. In the past, lasts were carved from a block of wood but are now mass-produced, mostly out of plastic.

feature to accommodate the differing range of heel heights and types for women's attire. However, high-heel shoes have become less appealing for younger generations of women, making the innovative and adaptive feature of *Mime et moi* less relevant in contemporary everyday use.

Fig. 2. 12. *Mime et moi*,concept project, 2017.

Retrieved from: https://www.kickstarter.com/projects/1183474936/shoes-transform-from-flats-to-high-heels-in-second.

A comprehensive study on high heels was undertaken by fashion historian Elizabeth Semmelhack. In her book *Shoes: The Meaning of Style* (2017), Semmelhack discusses four archetypal types of footwear, including high heels and sneakers. Interestingly, younger generations have readily swapped dress shoes for sneakers (Fuller, 2015). Generation X grew up wearing comfortable shoes because they were comfortable and athletic. They were meant to enhance safety, improve performance and reduce impact on the human body. They were durable, comfortable and appealed to all ages and all cultures. *Transformable Shoe* by Wannida Nivartvong (2005), offers four looks within one shoe by snapping components to the sole, with a low-, mid- or high-cut pump shoe base. However, despite the author's claims, the sandal transformation is less convincing. It offers attachable components that play a solely decorative function: an ankle strap, superfluous tassels and toe box of questionable fixture. As sneakers "have become a fashion item" (Kawamura, 2016, pp.105), they have ushered in a shift in wardrobes, giving them a tool for self-display and adornment. Consequently, *The Rise*

of Sneakers Culture[17] has shifted the meaning behind sneakers from practical to aesthetic in the postmodern age (Kawamura, 2016, p. 105).

Fig. 2. 13. Patent 4745693.
Retrieved from: https://patents.google.com/patent/US4745693A/en.

Fig. 2. 14. *Zipz*, 2017.
Retrieved from: https://zipzshoes.besign-design.com/.

Many adaptable footwear projects borrow ideas from patents and concept projects from the past. The idea of removable soles with zips was used both in a 1988 patent (4745693, - Fig. 2. 13) and more recently in 2017 in the concept shoes *Zipz* (Fig. 2. 14) or *Shooz* (Fig. 2. 15). These projects present changeable upper and sole components, which provide the user

[17] The first exhibition devoted to sneakers, *The Rise of Sneakers Culture*, was shown at the Bata Shoe Museum in Toronto in 2013, then at The Brooklyn Museum in New York in July to October 2015. See also Fuller (2015).

with the ability to mix-and-match styles by combining their selected upper with a selected sole through a functional zip feature, achieving a degree of individual customisation. The connective zip feature is the only common component across the range of component permutations. *Shooz'*s (Fig. 2. 15) design motivation was to incorporate different types of shoes and styles within a compact shoe line; the *Zipz'*s (Fig. 2. 14) design motivation was mass-customization and adornment.

In today's diverse and saturated footwear market, shoppers have an ever-expansive variety of choices across a broad price range. This variety in contemporary shoe design can be traced back to the classic styles (Choklat, 2012). There are six categories of classic shoes (Choklat, 2012): Oxford, Derby, sandal, court shoe, boot, and mule. Moreover, there is an expansive range of specialised shoes like climbing shoes, cross trainers, dance shoes, football boots, golf shoes, hiking shoes, racing flats, skate shoes and track shoes, among others.

Fig. 2. 15. *Shooz*, designed by Edoardo Iannuzz, 2017; from a concept project called Veeshoo; currently the project evolved to *Made2Share*, which was unsuccessful on Kick-starter.

Retrieved from: https://www.kickstarter.com/projects/642936151/shooz-worlds-first-travel-shoe-modular-and-customi.

Project *Shooz* (Fig. 2. 15) tries to equip the user with a shoe-kit of different styles for travel. It provides three types of soles (urban, running, drive) and multiple interchangeable covers called "skins", which can be easily changed for any occasion. However, these modular components with different performance requirements can deliver aesthetically inconsistent results depending on the selected combination of sole and skin. Even though designers intended to incorporate an elegant formal style in the brogue-like skin called "The Wingtips", when matched with a running sole, the look still communicates an athletic aesthetic.

Although the zip feature of *Shooz* seems to be easy in concept, users are less willing to recombine fresh skins with dirty or worn soles. This view is ingrained in the bilateral concept of “polluted outdoor” and “clean indoor” (Kawamura, 2016, p. 27). Although the project is intended for travellers, it has failed to demonstrate a significant advantage of the sole's packability. The “skins”—part of the uppers—can be transported flat, but the soles have high ankle stiffeners, making these components bulky and difficult to pack for transportation. It is worth mentioning that this project evolved to *Made2Share* (Fig. 2. 16), an unsuccessful Kick-starter campaign. *Made2Share* focused on the use of bio-based materials and deprived the previous design iteration of the flat-packed “skins”. Although the designers claim that their footwear still saves space in cabin luggage, the skin is no longer a flat-pack component (Fig. 2. 16). Moreover, even though they claim that it can be transformed into the Joggers, the Sneakers, and the Chukka boots, similarly to the initial iteration, the *Made2Share* represents a solely athletic look, especially as it now offers only a sneaker-type sole in white.

Fig. 2. 16. Made2Share is a Shooz project iteration, 2020.
Retrieved from: https://www.kickstarter.com/projects/made2share/made2share/.

Zipz (Fig. 2. 14) are sneakers with a changeable upper portion. As sneaker culture has subversively shifted accepted dress codes, a singular garment can cover more occasions than before. In the past, people used specific footwear for very specific occasions. They had appropriate shoes for work or to wear casually—all had a specific look. Today such boundaries have become blurred and there is a further erosion of the perception of what is a lower economic status. As sneakers play a major part of even high-fashion brands, interest has shifted from comfort to adornment (Kawamura, 2016, 82–83). Saying that, Kawamura states that an “unwritten dress code” (2016, 117) still exists for many social occasions, drawing further questions of appropriateness, modesty and social status. Consequently, the sneakers *Zipz* is

solely a playful mass-customization concept which would likely target a younger audience than my focus group.

Made2Share and *Zipz* use zippers as the way to connect the sole with the upper shoe. In traditional footwear, zips are hidden due to their questionable aesthetics and foot ergonomics. Like stitches, zips or shoe piping cannot disturb foot movement. As such, it is customary to place such components on the medial side of the upper or hide it at the back stitch of the shoe upper. In contrast, placing them along the sole not only challenges aesthetic sensibilities but also raises doubts as to the durability of the product, as this is the place where there is the most concentration of stresses.

Fig. 2. 17. *Nat-2 2-In-1 Stack Shoe*, designer Stephen Yeung, Matthias and Sebastian Thies, 2003. (on the left)

Retrieved from: https://nat-2.eu/press/special-editions-2/stack-4-in-1/.

Fig. 2. 18. *Nat-2 4-In-1* Stack Shoe, designer Sebastian Thies, 2008. (on the right)

Retrieved from: https://virtualshoemuseum.com/sebastian-thies/stack-4-1-eco/.

Snaps have also been utilized to alter footwear versatility within a pair of shoes. While *Nat-2: 2-In-1* (Fig. 2. 17) is a sneaker style shoe that unzips to reveal a hidden strappy sandal, *Nat-2: 4-In-1* (Fig. 2. 18) provides four looks in one pair of shoes, similar to Nivartvong (2005), by adding a low-cut and mid-cut style, or boot to a slip-on component. Both projects represent a degree of playfulness and novelty through adaptability, customizing its presentation. Similarly to *Shooz*, *Made2Share* and *Zipz* sneakers, the zip's placement favours collecting dirt, making the adaption process an unpleasant customer experience.

Fig. 2. 19. *Mahabis*. Indoor-outdoor slippers, Joe Cooke, founder Ankur Shah.
Retrieved from: https://uncrate.com/mahabis-slipper/.

Fig. 2. 20. Patent 6345454.
Retrieved from: https://patents.google.com/patent/US6345454B1/en?oq=6345454.

Similarly to *Nat-2: 4-In-1*, the project *Mahabis* (Fig. 2. 19) targets adaptability with the use of snaps. These minimal wool indoor-outdoor slippers with collapsible neoprene heels can be easily slid into the detachable sole to be used outside. The mechanism allowing this connection is a simple snap at the back of the slipper, matching the mounting hole at the sole. Although this basic idea is similar to the patent 6345454 (Fig. 2. 20), the toe portion is wrapped by the shaped sole. The design team claims that their slippers are convenient for air travel as

they can be easily attached and detached for security checks or using the toilet. Similarly to the detachable crampons, and unlike typical slippers, *Mahabis* provide traction and a degree of water and dirt protection. However, *Mahabis*'s detachable sole feature is now discontinued and it is sold with a fixed rubber sole slipper. The reason for this is unknown but it might be deduced it is due to the tearing of the silicon sole or getting debris and dirt between the components. The original concept proved unfeasible.

Fig. 2. 21. *KI ecobe* is a self-assembled modular shoe; designed by Lee Hyunho, Park Sungeun, Lee Sangwoo and Lee Junghi, 2016.

Retrieved from: https://www.kickstarter.com/projects/1121278858/ki-ecobe-customizable-self-assembled-footwear?ref=video; https://www.red-dot.org/project/ki-ecobe-26159.

KI ecobe (Fig. 2. 21), a self-assembled modular shoe, is an eco-friendly project that attempts to respond to one of today's biggest issues of footwear manufacturing: “300 million pairs of shoes are thrown away each year” (Lickteig, 2021) in America solely, and most of these are not made of recycled materials. They are mostly made of leather, resin, vulcanized or microcellular rubber, PVC, Polyurethane, Thermo-plastic rubber, EVA, neoprene or vinyl, among other options. However, not only carbon emission[18] through the used materials but also traditional shoe construction contributes to the prodigious waste. In particular, one shoe can be made from 26 different materials and require 360 different steps to manufacture and assemble, which also creates a downstream recycling problem. In contrast, *KI ecobe* is made of merely five components—upper pattern, sole shoe lace, in-boot and in-sole—which can be

[18] In 2013, researchers at MIT reported that the lifecycle of one shoe in their study generated 13.5 kg of carbon emissions (Semmelhack, 2017, p. 290). Globally, the footwear industry emits 700 million tonnes of carbon dioxide each year. Retrieved from https://quantis-intl.com › wp-content › uploads › 2018/03.

easily self-assembled at home. Unlike existing shoes manufactured with toxic adhesives, *Kl ecobe*'s modular design does not require glue, making the manufacturing process healthier and less labour intensive. Needless to say, the assembling process can be easily reversed for convenient recycling or replacement of worn-out parts. *Kl ecobe* promises three in one: a pair of washable slippers of 'in-boot' portion used alone; a pair of summer sandals created by attaching the upper to the sole; and an outdoor shoe, when these parts are merged. Such a layering construction might compromise the fit and comfort of an individual pair of shoes. Consequently, whereas the sandals used alone might not fit tight to the feet, the slippers might slide inside the outdoor shell. Many self-assembled and modular footwear concepts involving manipulation with the sole have been criticised for being challenging when the shoe components get dirty, wet or worn, resulting in users who are reluctant and discouraged to adapt the shoes for an extended new life.

The literature indicates the fuse/divide principle for facilitating the transportation of bulky and unwieldy objects and demonstrates the potential for a conceptual design that would take less space than traditional footwear. The examples provide converging evidence for weaknesses in the interchangeable sole and upper components. One of which is that the components often cannot exist alone as they gain functional features only when assembled. Moreover, the assembly process might be difficult and unpleasant for user if the shoe is dirty, wet or used.

2.3.2 Expose/cover

The strategy of expose/cover relates to hiding unused features of adaptation (Son & Shu, 2014). In the footwear context the expose/cover strategy applies to hidden mechanisms, electronics or features which may not be required or may be redundant until adapted for a particular purpose. This strategy provides control of the aesthetic presentation of the footwear in its various guises. For example *Nat-2: 2-In-1* (Fig. 2. 17), which dresses and undresses unwanted functionalities—sandals or sneakers respectively—where the functional features are physically carried within the product concept ready for selection and use.

Generally speaking, the expose/cover principle might improve footwear functionality by adding thermal layers, and most importantly improves appearance and aesthetics. Therefore it is a notable area of exploration for adaptable footwear.

2.3.2.1 Accessorise

An alternative to the expose/cover strategy is to extend functionality with accessory components that are carried separately. This strategy is seen in climbing boots designed with

accessory crampons, waterproof covers, galoshes or overshoes designed for use in wet conditions with everyday shoes. *Mahabis* (Fig. 2. 19) utilises this strategy.

2.3.2.2 Minimalist solutions

Although *01M One Moment* (Fig. 2. 22) is meant to be used alone, it can be rolled and hidden when not needed. This 1 mm thick injection-moulded one-piece gives the user an elastic and tight-fitting shoe. Even though the designers claim its versatility, it is hard to imagine using such barefoot skin-like covers in the urban space. Shoes are ubiquitous and being barefoot is often considered eccentric, vulgar or unhygienic,[19] In Western society, wearing shoes is considered more appropriate than being barefoot.

Fig. 2. 22. 01M One Moment, Figtree Factory S.L., based in Valencia, 2011.

Retrieved from: https://www.dezeen.com/2011/11/01/competition-five-pairs-of-01m-onemoment-shoes-to-be-won/.

Similarly, *Skinners* offer a non-constructed shoe solution. These provide a sock with a polymer sole which is lightweight, waterproof and durable. The creators claim it as a 4-in-1 ultra-versatile shoe which is compact yet protective. As with many similar barefoot solutions, it promises to adapt to the human body better than traditional footwear. However, its thin sole and sock visuals will not resonate with modesty and the aesthetics of an appealing shoe. Although they claim that *Skinners* are suitable for sport and travel, for many they will not provide the comfort needed for these activities.

[19] Contrary to public opinion in New Zealand and Australia, where barefoot walking is on the agenda and does not raise controversy.

Fig. 2. 23. *Skinners* Ultraportable Footwear, Minimal Barefoot Socks Shoes, 2016.

Retrieved from: https://www.kickstarter.com/projects/skinners/skinners-20-ultraportable-footwear-for-sports-and-travels-0.

2.3.3 Expand/collapse

The expand/collapse strategy has a distinctive potential for travel footwear. Products that collapse require less storage space and are therefore more likely to be carried and used when luggage limits impact travel (Son & Shu 2014, 198). The concept of flat-packed products is rarely attempted in the footwear field due to their traditional construction involving stiffeners, toe box and shank. *Wrap Shoe* (Fig. 2. 24) by Christian Ferrara (2018) utilises this strategy to enhance its sustainability. The *Wrap Shoe* can be sent in a flat-packed envelope, reducing shipping costs, improving recyclability transport costs, and making resale easy and affordable. Adaptability is at the base of a more ecological approach to design manufacture. Adaptable apparel is expected to increase the wear rate, postpone disposal and ultimately expand the apparel life cycle (Koo, 2012). For DNs, the thin sole and minimal upper present as a slipper and fail to deliver the versatility and protection needed for a travel footwear.

Fig. 2. 24. Christian Ferrara, 2018.

Retrieved from: https://cargocollective.com/ChristianFerrara/Wrap-shoe. Accessed 03 Mar 2021.

Footwear can be interpreted within specific cultural contexts (Kawamura 2016, 25). Often, western and non-western cultures grasp the concepts of modesty and aesthetics in different ways. Such cultural disparities can be seen in a *Furoshiki* by Vibram (2017). The first prototype of this wrapping sole was designed by Masaya Hashimoto in 2011. His Japanese background inspired him to mimic the traditional Japanese techniques of transporting goods in this wrapping style. This minimal project is simplified to a piece of fabric and attached sole, which can be easily transported flat-packed. Masaya explains that his main design motivation was to improve fitting, as western-manufactured footwear did not fit the wider eastern foot.[20] His project presents a non-constrained upper that wraps individual feet, adapting to different foot types. It freely wraps around the ankle, almost mummifying them. *Furoshiki* was designed for Italian-based company Vibram. The archetypal footwear semiotic left this project undermined in western countries, where consumers found the wrapping feature confusing. Similarly to Hashimoto's previous footwear project for Vibram, called *Five Finger*, it raises controversy as it evokes a barefoot shoe context. A subversive and innovative concept, the sole's thickness and distinctive functional features and consequent aesthetic, limited the potential for developing versatility of style.

Fig. 2. 25. Vibram *Furoshiki* The Wrapping Sole, 2017, designed by Masaya Hashimoto, launched in 2015. Retrieved from: https://sportbusinessmag.sport-press.it/2017/10/27/vibram-furoshiki-premio-innovazione-adi-design-index/.

In contrast, Lem's *Boulder Boot* (Fig. 2. 26) represents a versatile general aesthetic that is appropriate for a range of occasions, from travel to hiking or meetings. It is minimal footwear with a zero toe-to-heel drop sole, a wide toe box and 9 mm outsole. In this regard the sole thickness might compromise the comfort. Designers claim that it can be rolled into a ball for a

[20] See https://www.domusweb.it/en/design/2020/12/04/the-history-of-the-shoes-that-wrap-around-your-feet-like-bandages.html.

convenient packing experience due to the use of the air-injected rubber and thin sole. Whereas rolling garments in the luggage space is the most efficient way of packing, the use of such methods for structured footwear is not the best approach and is not the most efficient way of storing shoes. This is because storing them in this manner compromises shoes' durability and integrity as fabric, leather and adhesives become brittle during such extensive and unnecessary stresses.

Fig. 2. 26. Lems's *Boulder Boots*, 2019.
Retrieved from: https://www.lemsshoes.com/products/mens-boulder-boot-leather.

In summary, although today's footwear market is saturated with a variety of choices across a broad price range, there are only a few addressing DNs' needs. Research on adaptable footwear is scarce and very little work has been published. Literature (Son et al., 2014) identifies that among possible mechanical adaptations, expand/collapse improves not only the portability of the product but also enables spontaneous use, which addresses the latent needs of DNs' dynamic lifestyles. Although the collapsible principle has been explored in the adaptable footwear context, such attempts seem to compromise the functionality, utility or aesthetic desired by DNs. Therefore, footwear for DNs has not been successfully addressed either through design practice or through the literature. Consequently, the footwear design methods are non-existent, or protected by companies' IP (Intellectual Property) policies where one can only evaluate the final product. To address this deficiency I have utilised a variety of design methods, which are presented in the following chapter.

3.0 METHODOLOGY

The research methodology employed in this study is characterised by an interdisciplinary model using a *multi-method technique* (Gray 2004, 72). It draws on traditional qualitative methods, including surveys, interviews and observational studies, and is augmented by quantitative research developed from secondary survey records. This approach provided the research data that was used to build design research insights and stimulate the development of design collateral.

In this chapter I will briefly explain the selection and methods used for this conceptual, user-led study. I will elaborate on the three key modes of design research: *into (and about)* design, *through* design and *for (or as)* design[21] (Laurel 2003, 11) that were utilised across this investigation, in a conceptual enquiry into the footwear requirements of DNs. I will then focus on the individual methods, including considering the specific aims and questions in play, and will offer a brief commentary on the findings. In doing so, I will establish the background that underpins the exploratory investigation and the subsequent concept elaboration and consequences of this speculative footwear design research.

According to Gray (2004, 21), most creative qualitative[22] research is "responsive", "naturalistic" and interdisciplinary. As such, following Frayling's (1993) classification, three key modes of design research,

- into (and about) design
- through design
- and for (or as) design

were utilised for this multi-facet footwear conceptual study. These approaches were variously undertaken to elucidate specific research questions and the design practice methods used to build product knowledge. The chosen methods are presented in the diagram in Fig. 3. 1, where the methods are colour-coded as follows: green for research into (and about) design, red for research through design and yellow for research for (or as) design. I will now explain each of these design modes.

[21] These three key modes of art and design were identified by Sir Christopher Frayling in 1993.

[22] Qualitative research was invented by Bronislaw Malinowski in 1922. See also Curedale (2012, 25).

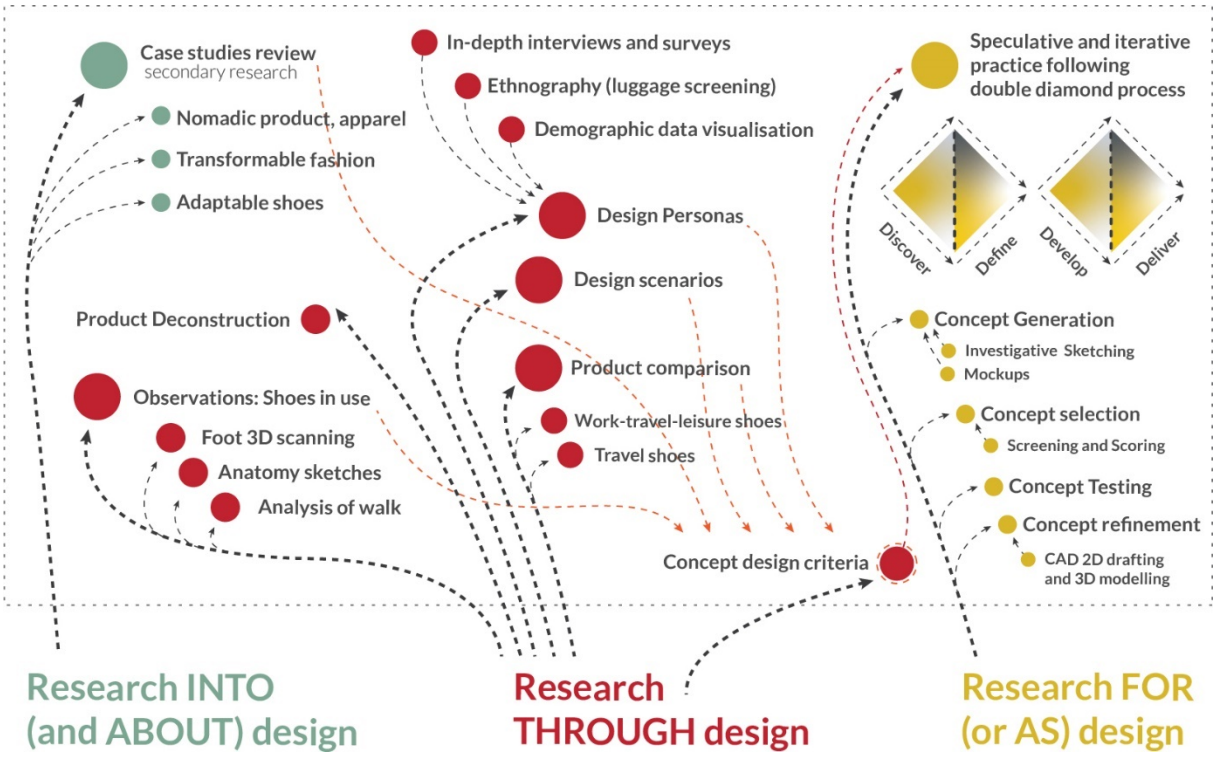


Fig. 3. 1. Methodology diagram showing the three design modes used.

First, the *research into (and about) design* was undertaken through the critical review of selected case studies of products, apparel and fashion artefacts. Secondary research provided a reflective and objective understanding (Milton and Rogers 2013, 12) of the emerging historical context shaping DN culture. This research content provided the background and context review of Chapter One and Two and the Research Context and Literature Review. It also established in what ways previous research has fallen short, thereby providing the reason for my focus on collapsible design principles, such as nesting, hinging and creasing,[23] in this practice-based footwear study.

The focus on *research through design*, translates and develops survey data and observational studies into personas that were used as sounding boards and as anonymised respondents to provide a focus for creative inquiry. I combined both quantitative (secondary research) and qualitative (primary research) data to create these design personas. This two-fold approach (see Fig. 3. 2) provided a degree of validation and direction for further in-depth

[23] Creasing is the collapsible principle identified by Mollerup (2001, 52), who notes that "creases may facilitate the act of folding and unfolding". It relates to other collapsible principles identified by Mollerup, such as folding and stress, all of which provide the benefit of reducing an object's size. See also Mollerup (2001, 32, 34).

interviews. This has allowed me to gain a comprehensive understanding of the end-user group, which informed the user requirements for the concept design criteria.

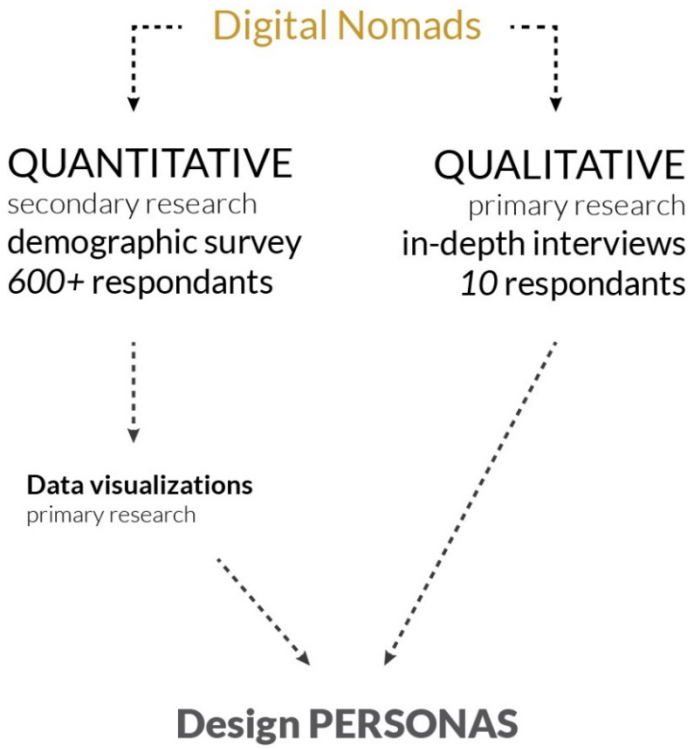


Fig. 3. 2. Methods used for design personas.

The focus on *research for (or as) design* has provided me with a speculative practice, whereby I have proposed and tested ideas and concepts in response to the context and conditions presented in the study. The designs generated were then critiqued and screened against criteria to develop the level of resolution in a contemporary, double diamond design process involving the key phases of discover, define, develop and deliver (Kochanowska et al. 2021, 22). This mode also involved iterative exploratory measures, such as investigative sketching, 2D drafting and 3D modelling, which resulted in the conceptual footwear project *Smoosh shoes*.

Having explained the general purpose of the three design research modes and methods utilised in this research, I will now dive deeper into each of these techniques. In doing so I will identify their objectives, document the exploration and review the findings.

3.1 Research Into (and About) Design

The *research into (and about) design* was undertaken through the critical review of selected case studies of products, apparel and fashion artefacts. The main objective of this research mode was to establish how previous research has fallen short and to understand the research audience of the product. This critical review of case studies has been explained in Chapter Two: Literature Review, therefore I will only recollect the findings here.

The research established that folding, hinging and creasing are desirable and promising collapsible principles for DNs' footwear, among the studied mechanical transformations/adaptations. The use of such principles in the footwear context might improve not only portability but also address the agile DN lifestyle at the nexus of work-life-leisure.

3.2 Research Through Design

The *research through design* mode covers all methods that brought insights to the issues that surrounded my design and informed the iteration of concept design criteria. The objective of this mode was to establish latent DN needs (Ulrich and Eppinger 2016, 75) and gain a background knowledge about footwear functionality and utility. It has been achieved by demographic data visualisation, in-depth interviews and surveys, ethnography (luggage screening), design personas and design scenarios and various observational studies such as shoes in use, 3d foot scanning and analysis of walk (see Fig. 3. 2).

I will now cover each of these methods individually, then move to the overall findings of the *research through design* mode which established the 3.2.4.3 Second concept design criteria development before moving to the *research for design* mode and concept generation in the next chapter.

3.2.1 DN as lead-user

The objective of the DN case study was to gain a broader understanding of DNs' lifestyles and needs, as well as demographic information on end users. To do so, I augmented the qualitative (primary) research with quantitative (secondary) research in order to create enriched design personas and design scenarios (see Fig. 3. 2).

3.2.1.1 Demographic data visualisation

The visualisation Demographic (Fig. 3. 3) below was designed to show existing data (secondary research) on DN demographics, including the breakdown of the surveyed group by gender, age and country of origin. This visualisation is based on publicly accessed data collected by Enrico Icardi in 2016 from 606 respondents among users of DN services like Share Desk, Copass and Teleport.[24] It was the biggest public survey undertaken amongst DNs and therefore it was chosen as a representative source of demographic data. The figure shows the top 10 countries of origin among the surveyed group. The number of surveyed people is visualised along the horizontal axis by age, and along the vertical axis by country of origin. More data ranges depicting DNs' lifestyles and demographics are presented in Appendix 1: Case Study: Footwear Deconstruction.

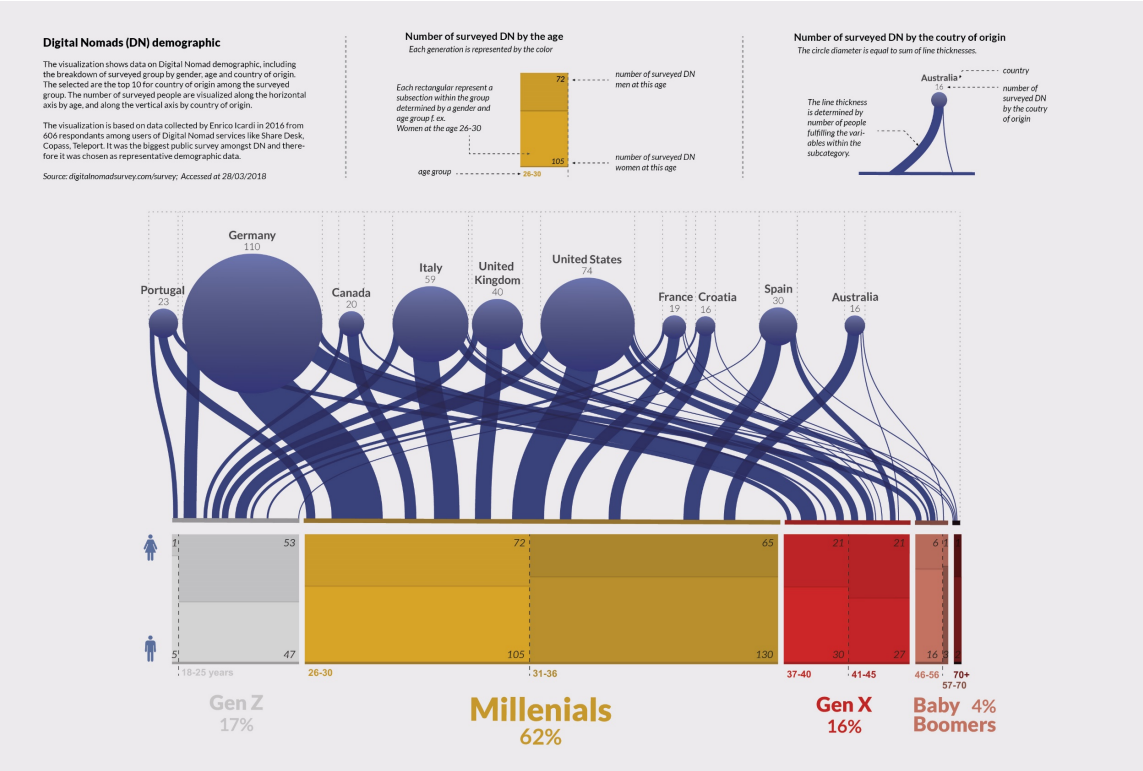


Fig. 3. 3. The visualisation Demographic based on the Icardi (2016) data. [Own work]

The survey's findings indicate that most respondents were male Caucasian millennials aged thirty-one to thirty-six. They also came from wealthy, highly developed countries. Although they seem to belong to the most stereotypical targeted design group—for which 90%

[24] Icardi, "Digital Nomads survey". Last revised March 28, 2018. http://digitalnomadsurvey.com/survey

(Criado-Perez, 2019) of industrial design products are designed—the responses presented a diverse range of opinions and positions.

This survey's data was further analysed by occupation, current location and lifestyle, including travel, work and leisure patterns. This provided the basis for profiling participants for selection in a qualitative study. As a result, ten participants, selected by occupation, were invited for an in-depth interview.

3.2.1.2 In-depth interviews and surveys

Ten participants were involved in this DN study: eight were invited for in-depth online interviews and two were interviewed in-person. Eight participants were approached online: three via email, which were known from a co-working space; two via NomadList website access; and via the Digital Nomads Community and Digital Nomads Around the World private Facebook groups. The two remaining participants were interviewed on-site. Each interview lasted between thirty and forty-five minutes, and was scheduled according to the participants' time zones. Participants were selected based on data from the demographic analysis mentioned above (see Fig. 3.2), and were intended to offer a representative segment of DNs. Seven participants were male and three female, and all were Generation Y. The ethics approval (4000018292) for such interviews and surveys has been obtained from the Massey University Ethics Committee (see Appendix 4: Human Ethics approvals) and has been assessed as Low Risk. In response to the ethical principle of "do not harm", the participants could refuse to answer questions or refuse to be recorded, and could withdraw their participation at any time without giving a reason. The interviews were confidential and informed consent was given.

Recruited participants received the list of questions beforehand via email to inform them about the meeting's agenda and to increase their comfort and wellbeing. All participants were asked qualitative questions about their lifestyle, travel and packing choices. As a semi-structured interview, additional questions arose during the interviews, but participants were welcome to skip any question at any time. The participants showed a high level of commitment to these studies by answering all questions asked. Collected data were securely stored on researcher hard disk and can be presented as a summary of findings.

Responses presented a diverse range of positions and opinions. As respondents were reflecting on their own lived experience, each interview provided an intimate insight into the remarkably diversified DN group.

3.2.1.3 Ethnography (luggage screening)

The participants of the in-depth interviews were also asked to take a picture of their current luggage before or after their travel. This picture was to include all their personal belongings. They were informed that they could remove any belongings due to ethical, emotional or religious reasons. Visual analysis (see Fig. 3. 4) of these images provided valuable insights into the impact footwear had on packing volumes. Specifically, it identified that the volume of shoes when unpacked was difficult to judge in relation to the amount of space occupied within the luggage when packed. When looked at more closely, footwear accounted for only 20–25% of items, but took up 40–45% of the actual volume of packed luggage. Footwear is bulky and difficult to pack, and can generally not be rolled nor folded. If not transported on our feet, it is also prone to creasing and deformation, damaging the aesthetic appeal and desirability.

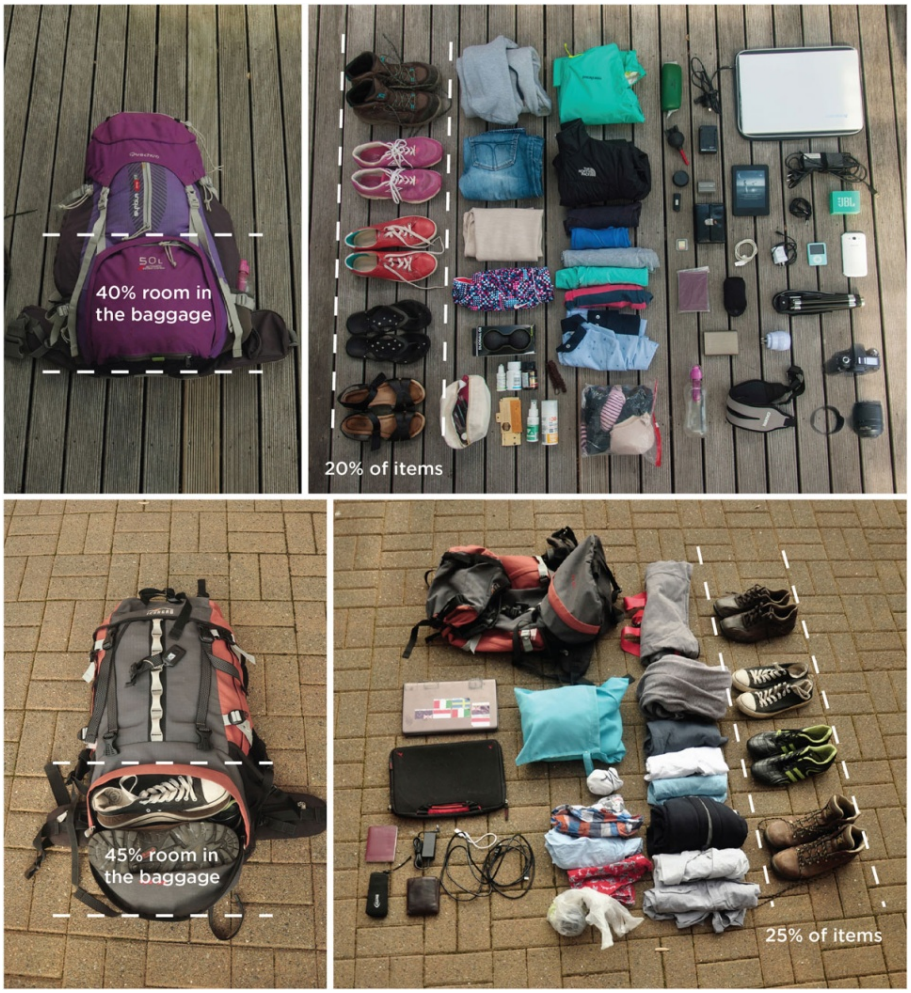


Fig. 3. 4. Pictures showing difficulties around shoe packing. The comparison pictures show the volume of packed (on the left) and unpacked (on the right) footwear amongst all items, 2018.

Findings:

- Because footwear is bulky, DNs tend to wear their heaviest or bulkiest shoes on their feet when travelling, even though that compromises travel comfort.
- When asked about their travel experience, they often mentioned the impracticality of shoes when changing zones and climates and during long hours at the airport or on the plane.
- 80% of respondents acknowledged difficulty storing or accessing their footwear within their luggage, especially when shoes are wet or dirty.
- Most respondents, when asked about their footwear usage during travel, indicated that they have started to travel with one or two pairs of shoes on average. They admitted that the most important criteria for travel shoes was utility and a light weight. Their footwear choice was highly conditioned by the upcoming trip destination and was rarely considered in a long-range perspective.
- Although I had assumed that DNs wardrobes were defined by minimalistic characteristics with generic, one colour, no-pattern garments allowing for the mixing and matching of small quantities of clothing, I could not see evidence for such a tendency among the respondents.
- Respondents admitted that having to choose limited pairs limits their on-the-go lifestyle.
- 50% of respondents would like to have at least one additional pair of shoes with them.
- 30% of those interviewed have purchased another pair (or more) of shoes when travelling. The reasons were varied: for an unplanned multi-day hike, a business meeting and for a sports activity. However, the respondents were concerned by the addition of this luggage item due to baggage limitations. They considered getting rid of overweight items by sending them unaccompanied to the traveller's country of origin.

3.2.1.4 Design Personas and Design Scenarios

Having collected such insights, I created a series of design personas and design scenarios with visual and textural DN descriptions. In doing so, I followed Allan Cooper's (1999) method. The objective was to create archetypal or representative users, which would allow me to gain a better understanding of individuals' motivations, frustrations, wants and needs based on the synthetised data. Uncovering their lifestyle and favourite brands also helped to expose the desired aesthetic that this adaptable footwear should represent.

Although respondents provided a diverse range of answers based on their living experiences, and bearing in mind that the design personas method is the most effective for a homogeneous audience (Laurel 2003, 28), the group falls into an extreme group where the common quality of all respondents is their “urge for travel”. Therefore, the chosen method was effective in exploring this quality and resulted in four design personas, which are presented in Fig. 3. 5.

The design personas’ case study utilised generic but representative profile images, rather than the participants’ own profile pictures. Personal data, such as names, were also changed to ensure participants’ anonymity. Design personas were built to maintain confidentiality and to represent the overall attributes of the representative segment that was revealed by the interviews.

Fig. 3. 5. Four segments Design Personas.

Fig. 3. 6. Three main scenarios depicting DN lifestyle: travel-work-leisure. Explanatory images showing a variety of activities and occasions pursued with relevant shoe examples for each.

To depict the DN lifestyle, I created design scenarios with explanatory images showcasing the activities and occasions pursued, with each matched to relevant shoe examples (see Fig. 3. 6). As the DN group is oriented around a plug-and-play workers' lifestyle, with people who want to escape, explore and experience, the "urge to travel" is an essential design criteria consideration for this footwear design project (Fig. 3. 7). Therefore, the main question of this research remained how can I accommodate these needs?

Fig. 3. 7. DNs live at the nexus of work-leisure-travel. Picture taken at Wellington International Airport in 2018, questioning: How can we accommodate the three scenarios of business, travel/sport and leisure? Where does it intersect or overlap?

3.2.2 Observational studies

Another implemented research method was observational studies, which are a traditional behavioural method that was initiated by Alex Bavelas in 1944 (Curedale 2012). In design, these methods are often referred to as shadowing (Vernile and Monteiro 1991), which entails the reflective observation of people, either in context or with a product. Such observational techniques have been, for example, in New Product Development (NPD) to obtain market research of consumers' needs.

The observational studies employed in my research included observations of shoes in use, 3D foot scanning, anatomical sketches and gait analysis. The aim here was to gain a contextual understanding of shoes and their diversity of styles and everyday transitions; in particular, upon activities, from work to leisure. A basic understanding of foot behaviour, gait, ergonomics and the process of wearing out were gained through this method, allowing me to better understand functionality, utility and aesthetics as design criteria.

3.2.2.1 Observations: Shoes in use

The observation took place in two Wellington locations. The first was introduced on Thursday 5 April 2018 on Lambton Quay, known as a business area within the capital city. The second was at the Waterfront on Friday 6 April 2018, where Wellingtonians tend to come on a sunny day during their midday break. Each forty-five-minute observation was undertaken during the common lunch break period—from 12:15pm to 1pm midday. They were recorded and presented as shown in the video screenshot displayed in Fig. 3. 8.

Fig. 3. 8. Video screenshots of a variety of shoe choices in a “business” (left) and “leisure” (right) context. Recorded during a busy lunch break in the city centre: on Lambton Quay and on the waterfront, Wellington, 2018.

People were not aware of being observed but the camera was directed on the footwear only. Although this observation was taken on a generalised audience, not DNs, the two scenarios of business and leisure context were examined. The observed shoes represented a diverse range of types, styles and colours. Observations in both locations seem to indicate a leaning towards overall comfort and casual styles in everyday circumstances. This does not mean that athletic-type footwear might fully meet the requirements and needs of daily activities.

The study could not assess whether it is generality, a limitation of the result or is location or weather dependent.

Additional observations indicated the common practice of commuting to work wearing athletic shoes but changing them for formal shoes at the workplace. My own additional observations suggests that many office workers do indeed keep a pair of dress shoes in a desk cabinet or in their car, which is often used as a form of handy “briefcase”. This scenario certainly does not apply to DNs, who often work at a shared hot-desk within a co-working space, do not own a car in a foreign country and hold most of their belongings in their suitcase.

3.2.2.1.1 Comfort and street wear

Office dress culture has certainly changed worldwide. Although it still heavily relies on professional requirements, now even white-collar office workers wear casual clothing on so-called “casual Fridays”. Clothing in general has also increasingly moved away from restrictive formal business-style dressing towards leisure dressing. Such a shift to more relaxed everyday wardrobe can be also observed in a more extreme phenomenon called “athleisure”, which represents the use of athletics or gym clothing and footwear on a daily basis. Described as a progressive statement and as a response to the rigidness of fashion canons, the phenomenon is characterised by a vivid craving for comfort in casual living, and as a trend, it grew at an increasing rate when people started to have more leisure time.

Over the decades this trend has returned and reappeared under different names, including “sportwear”, “activewear”, “streetwear” and now “athleisure”. For years, clothing has shifted from formal to casual to athletic. As a recent Netflix documentary identified, “clothing that allows people to move freely and comfortably, almost all began as sports apparel. Sneakers come from croquet, Henley shirts from rowing and turtlenecks come from polo” (Vox Media 2019).

The trend has also been influenced by marketing and the media. For instance, it boomed when the media began to turn athletes into celebrities, as seeing them wearing spandex and sneakers encouraged new trends to go viral, with people always wanting cool items. Similarly, many footwear and clothing companies base their marking strategies on brand ambassadors, such as Michael Jordan for Nike, Run-DMC’s *My Adidas* song and Kanye West’s *Yeezy* for Adidas, Rihanna for Puma and Aaliyah for Tommy Hilfiger.

The role of comfort is also important, although as footwear designer Jamie McLellan has identified, “comfort is a multi-dimensional experience” that can be represented by “softness, breathability, insulation, waterproofing, rebound and springiness”, protection, the initial

sensation or how an item feels through hours of wear, and or any combination of these characteristics (see Appendix 3: Transcript of interview with footwear designer Jamie McLellan.

In this regard, a new generation has grown up in soft-sole shoes. It seems that people being gripped by the idea of comfort and “athleisure” has allowed us to value personal comfort above everything else. On the other hand, orthopaedic shoes, which are comfortable, have never entered the canon of loved, desirable items. Their appearance was never perceived as ground breaking or rebellious, and they have connotations of something proudly worn by your grandma, rather than an idol, rock star or an aspirational celebrity.

3.2.2.2 3D foot scanning and anatomy sketches

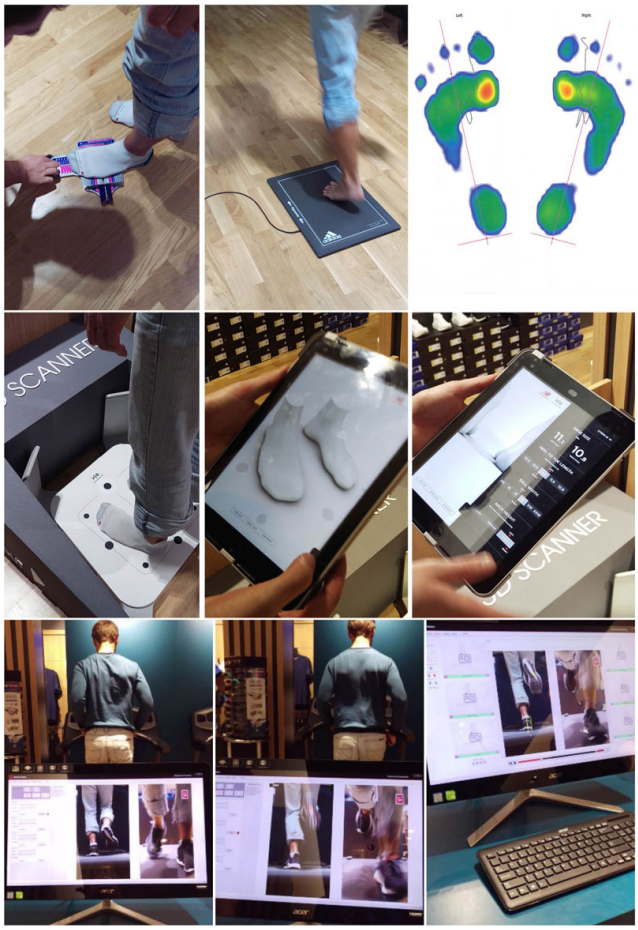


Fig. 3. 9. The process of fitting experience in order to find the shoe fit. The process was supervised by advisor Jem Halpine and a podiatrist at Shoe Clinic, Wellington, 25 July 2019.

Despite the multi-dimensionality of comfort, the most comfort can be provided by the right fit and sizing. Since many have difficulty finding the right size and the right shoe, companies like Shoe Clinic offer a fitting service to help them in this regard, with technology such as 3D scanners and a pressure pad employed alongside the expertise of an advisor and podiatrist. The images in Fig. 3. 9 illustrate an expanded process undertaken on 4 March 2020, which consisted of: 3D scans; width and length measurements; an impact check, measuring the pressure of the foot on the ground while running and walking; and video records of a treadmill run. This measuring process helped me to grasp an understanding of foot biomechanics, such as a foot's range of motions (see Fig. 3. 10). This was supplemented by insights gained from the relevant literature, such as Luximon (2013) and Fishcher et al. (2017).

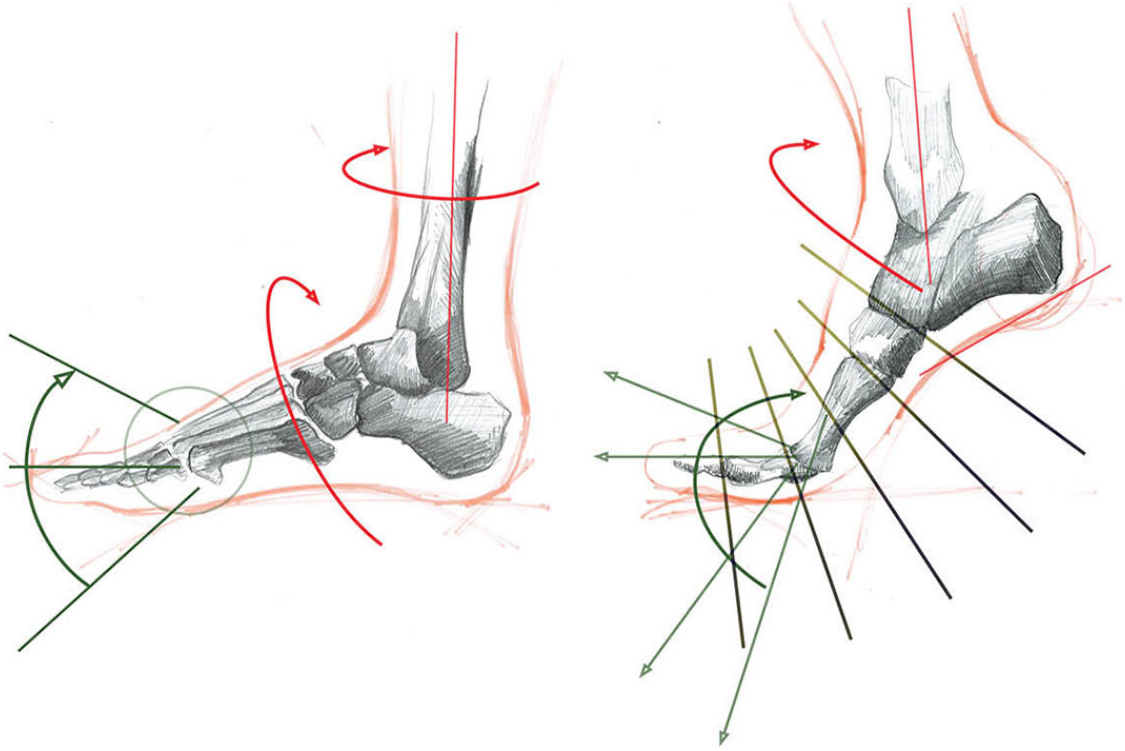


Fig. 3. 10. Sketches showing the range of movement and rotation axis. Own sketches based on anatomy books.

These 3D scans and individual measurements indicated that shoppers have difficulties matching their foot to the right footwear and there is a need for individualised or adjustable components with massed-produced footwear. This could be solved by either a material or a structural design strategy; for instance, with 3D-printed components made to measure or 4D-printed parts, which would adapt to an individual foot shape, weather conditions, temperature or desired activity. The shoe-shell could remain mass-produced, but additional components, such as supportive insoles or a supportive sock, would be customised to individual needs to increase the user's comfort.

3.2.2.3 Analysis of walk

Comfort can be understood as an initial or prolonged sensation; for instance, that which is felt during long hours on one's feet. This sensation disappears when the shoe starts to degrade, split and wear-out. However, footwear is not made to last. An average item of footwear lasts, depending on type, as follows: 500 miles for a trail runners last, 750 miles for hiking shoes and 1000 miles for hiking boots.[25] Runners usually use one pair every four months. Moreover, because the sole usually wears out much faster than the upper, modular shoes would be one way to address this.

Fig. 3. 11. Analysis of walk (left) and run (right) phases based on videos taken on the Wellington waterfront, 2018.

Material is one way to improve footwear durability. However, footwear often wears out unevenly, with commonly worn areas in the toe and heel parts and in the metatarsal area. This wear may be caused by a person's physiology, shoe construction or higher stress in the sole and fabric. Several observations and analyses were undertaken to gain an understanding of these footwear characteristics. These included observations of figures at a walk and run (see Fig. 3. 11) and of used shoes at second-hand shops, which were checked to assess wear.

[25] https://www.cleverhiker.com/blog/hiking-boots-vs-hiking-shoes-vs-trail-runners.

The investigation of gait and run was undertaken on people wearing athletic shoes. The reason for using this type of footwear was that they are characterised by less rigidness, promising less restriction on a foot's motion range. The walk and run phases were analysed based on the videos and observation sketches. The analysis of the walk (see Fig. 3. 11) represented several stages: the initial swing, mid-swing, terminal swing, initial contact, loading response, midstance, terminal swing, pre-swing and its repetition. During the contact phase and pre-swing (or propulsion), both the shoe and the foot are experiencing the highest stresses (see Fig. 3. 12). These contact points with the ground reflect areas of fast material decrease. This is showcased in Fig. 3. 13. This visual analysis shows the commonly identified material splitting and wearing-out. These commonly worn areas are the back of the sole and toe area, which is additionally exaggerated by stresses between upper and sole, and the metatarsal portion of the sole, which is directly associated with material thickness and its durability.

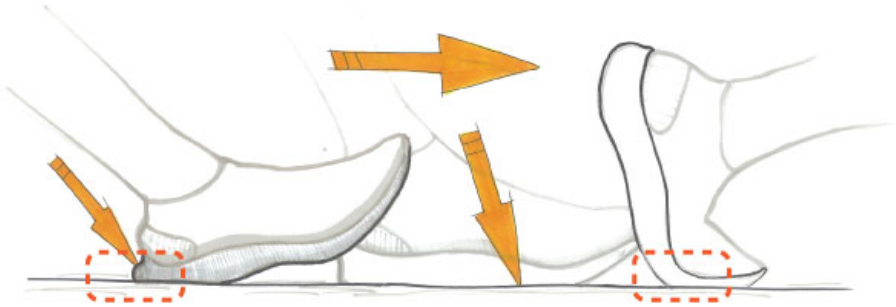


Fig. 3. 12. Diagram showing a foot's pressure in a relevant walk phase, where both the shoe and the foot are experiencing the highest stresses. Analysis undertaken upon the captured videos, 2018.

Fig. 3. 13. An analysis of common deformations, creases and wearing out of used shoes. It is caused by an individual's anatomy and pronation, but also by the material and construction method used, Wellington, 2017–20.

3.2.3 Product comparison

The aim of product deconstruction was to understand build approaches, component parts and their features. Having studied the product architecture, which comprises the “functional elements” and “physical elements” of the product (Ulrich and Eppinger 2016, 186), I established which components could be isolated to allow for mechanical adaptation. This research was undertaken with manufacture and disposal processes in mind, but these were not primary criteria.

One shoe can be made of twenty-six parts. This creates difficulties in assembly and in recycling. To understand the construction and product architecture, two athletic shoes were de-constructed (see Fig. 3. 14). The objectives of this deconstruction case study were to gain an understanding of the components' importance, to isolate them and eventually to remove them from the shoe construction. The case study analysis can be found in Appendix 1: Case Study: Footwear Deconstruction

Fig. 3. 14. Images showing the components and reverse assembling steps.

Findings:

- Surprisingly, Allbirds shoes consist of many more parts than I expected. Although they have been designed in a meaningful way with respect to natural materials and a carbon footprint of only +7.1 kg CO_2 for their Wool Runners,[26] the sole wears out quickly and the upper deteriorates with use.

[26] This information is on the official Allbirds website, in the “Sustainability” section, https://www.allbirds.co.nz/pages/sustainability?utm_source=Shopify%20NZ&utm_medium=email&utm_campaign=%5BBC%5D_Carbon-Number_NZ-AU_041420&Iterable_campaign=1143095&Iterable_template=1599673).

- Athletic shoe construction does not allow re-soling.
- A modular product architecture could achieve a functional change by component replacement for variant combination and recycling.
- The toe and heel portions provide utility but interfere with collapsibility.

3.2.3.1 First concept design criteria

Footwear is a complex industrial product with multi-facetted variables. These early design analyses helped to delineate the design criteria. The collected data was organised into four categories: packing, comfort, aesthetic and hygiene (see Fig. 3. 15).

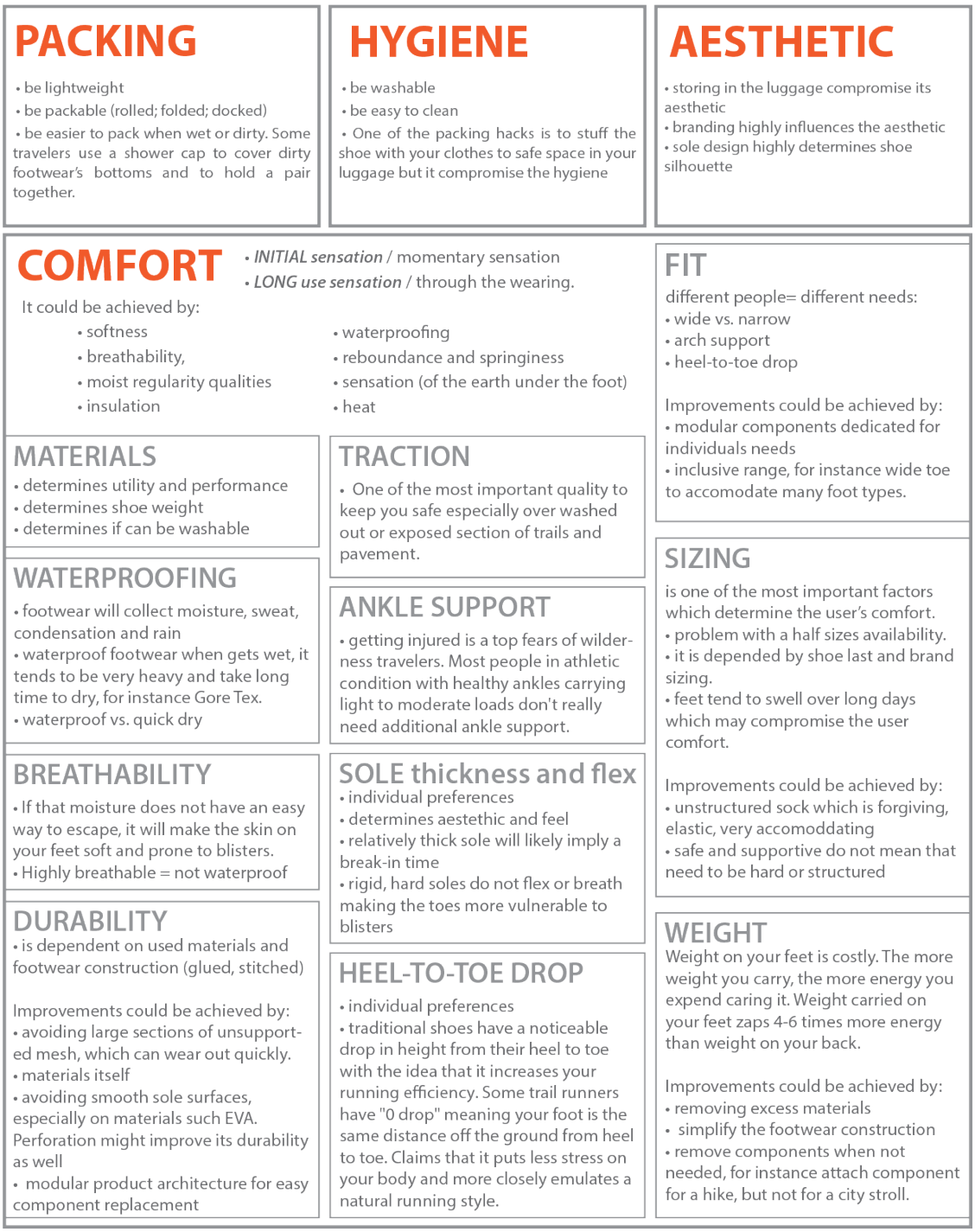


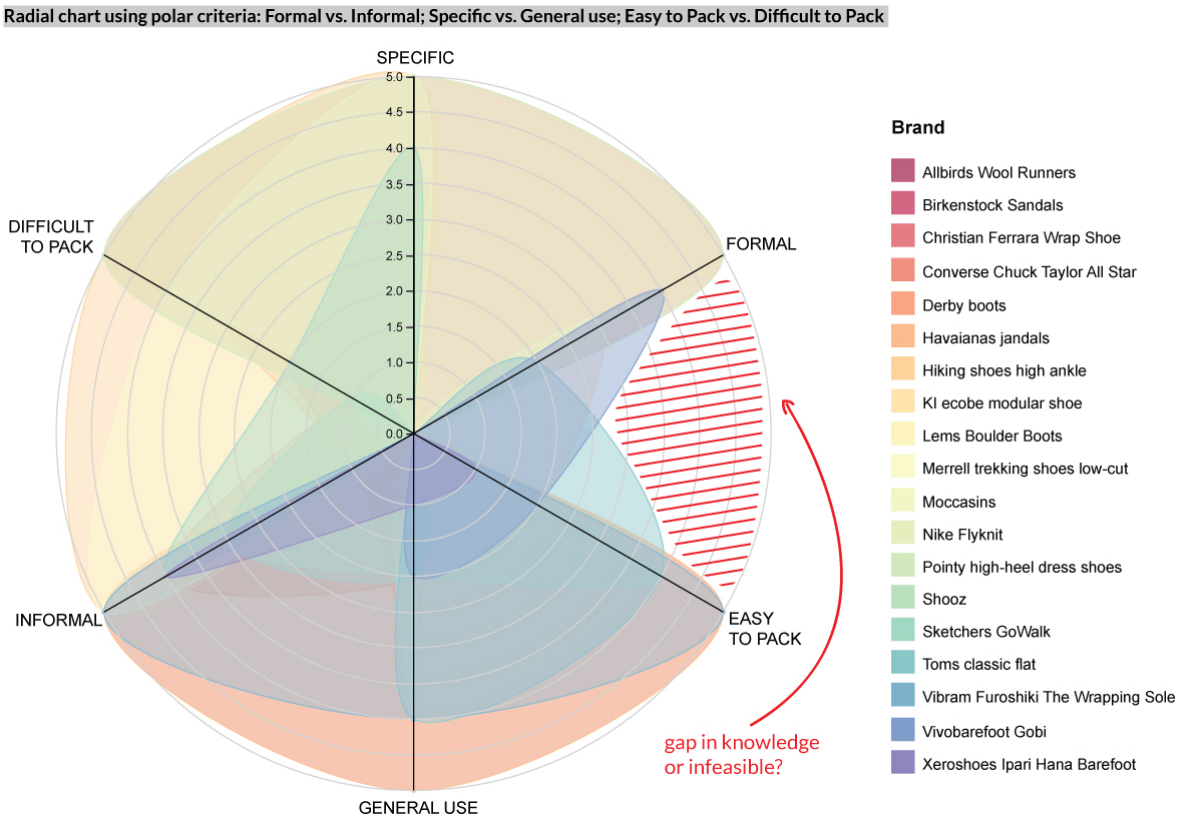
Fig. 3. 15. Multi-facetted footwear variables categorised into four main categories.

3.2.4 Product comparison

3.2.4.1 Work–travel–leisure

Footwear types identified in the DN case study, which covers work–travel–leisure occasions, were compared using a radial chart, alluvian diagram and matrix plot. Several types of charts were developed to contrast the criteria:

1) A series of individual radial charts (Fig. 3. 16) compared criteria such as whether they were formal or informal, for general or specific use or were easy or difficult to pack. The overlayed radial chart showed the gap in knowledge
    - Objectives: to classify and compare products; to indicate the zone of interests
    - Results:
        - each of the examined footwear examples covers different criteria but none is situated in both the Formal and Easy to Pack categories simultaneously.
        - there is a gap between Formal and Easy to Pack.



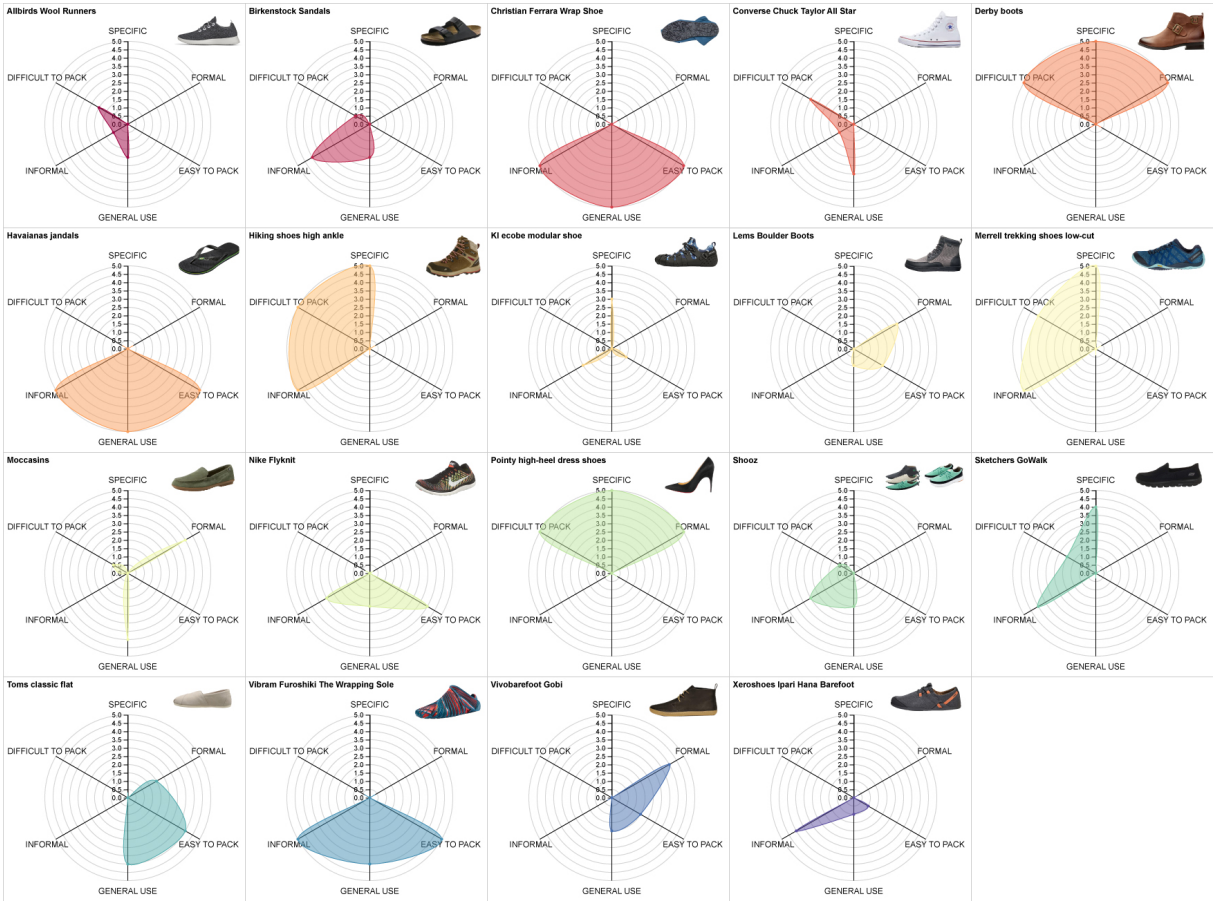


Fig. 3. 16. Radial charts

2) A matrix plot (Fig. 3. 17) screened the chosen footwear against the Easy to Pack criteria as the primary and required design criteria for travel shoes.
    - Objectives: to indicate the footwear by Easy to Pack criteria (the primary one for DNs)
    - Results: indicated nine footwear items, five of which are Easier to Pack. None of these five are Formal.

Fig. 3. 17. Matrix plot

3) Alluvian diagrams (Fig. 3. 18) indicated the most promising footwear in terms of the given criteria.
    - Objectives: to indicate existing and the most promising travel shoes on the market (either often used by DNs, or Easy to Pack).
    - Results:
        - Existing shoes are either General Use and Easy to Pack or Specific and Difficult to Pack
        - Zone of interests is on the cross of a) General Use and Easy to Pack and b) Specific and Difficult to Pack
        - The most promising travel footwear options are: Lems Boulder Boots, Vivobarefoot Gobi and Toms.

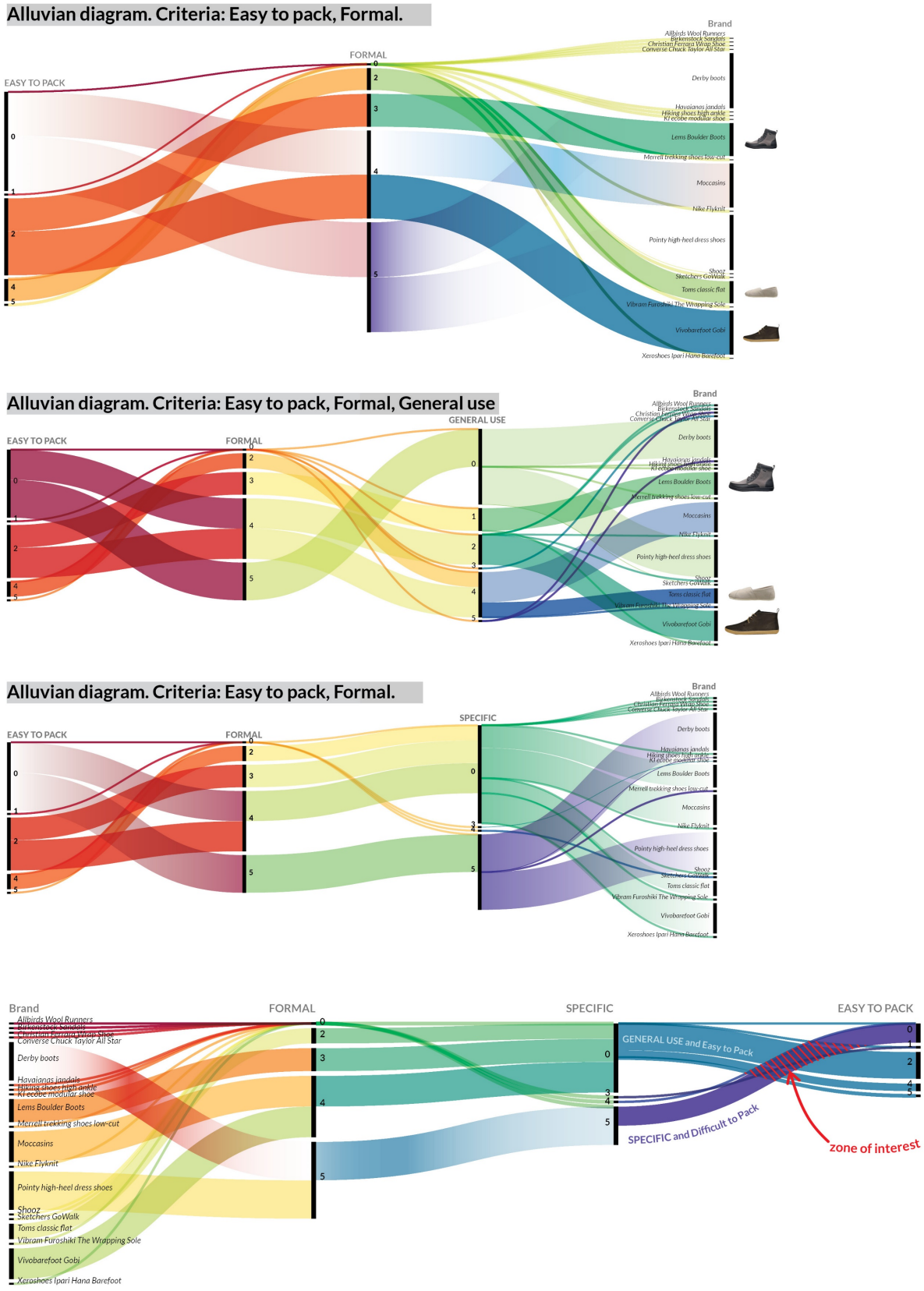


Fig. 3. 18. Alluvian diagrams.

3.2.4.2 Travel shoes

Three products, including Lems Boulder Boots, Vivobarefoot Gobi and Toms, emerged as promising footwear for DNs in search of latent and explicit needs.

Radial charts (see Fig. 3. 19) were developed to screen against the First Design Criteria including utility, aesthetic and comfort. Additional footwear aspects, such as shipment, packing and wearing-out, were examined for these three pairs of shoes. It was important to acknowledge these aspects as they affect footwear utility and aesthetic. The evaluation of these shoes was made based upon images and users' online reviews as a part of the travel footwear market screening study. This visual comparison is showcased in Fig. 3. 19.

Objectives: to examine Lems Boulder Boots, Vivobarefoot Gobi and Toms against the First Design Criteria, as these are the most promising existing travel footwear options on the market.

Results:

- Each of the footwear types covers slightly different criteria. For instance, Toms footwear is classified low in terms of durability, ankle support and traction.
- Lems Boulder Boots and Vivobarefoot Gobi can be rolled, while Toms are meant to be stored flat in the luggage. Toms provided a dedicated bag for this purpose.

Conclusion: Rolling, widely used in fashion, is not the most efficient way of storing shoes. Moreover, storing them in this manner compromises durability and the integrity of the fabric and leather, with adhesives also becoming brittle during such extensive and unnecessary stressing.

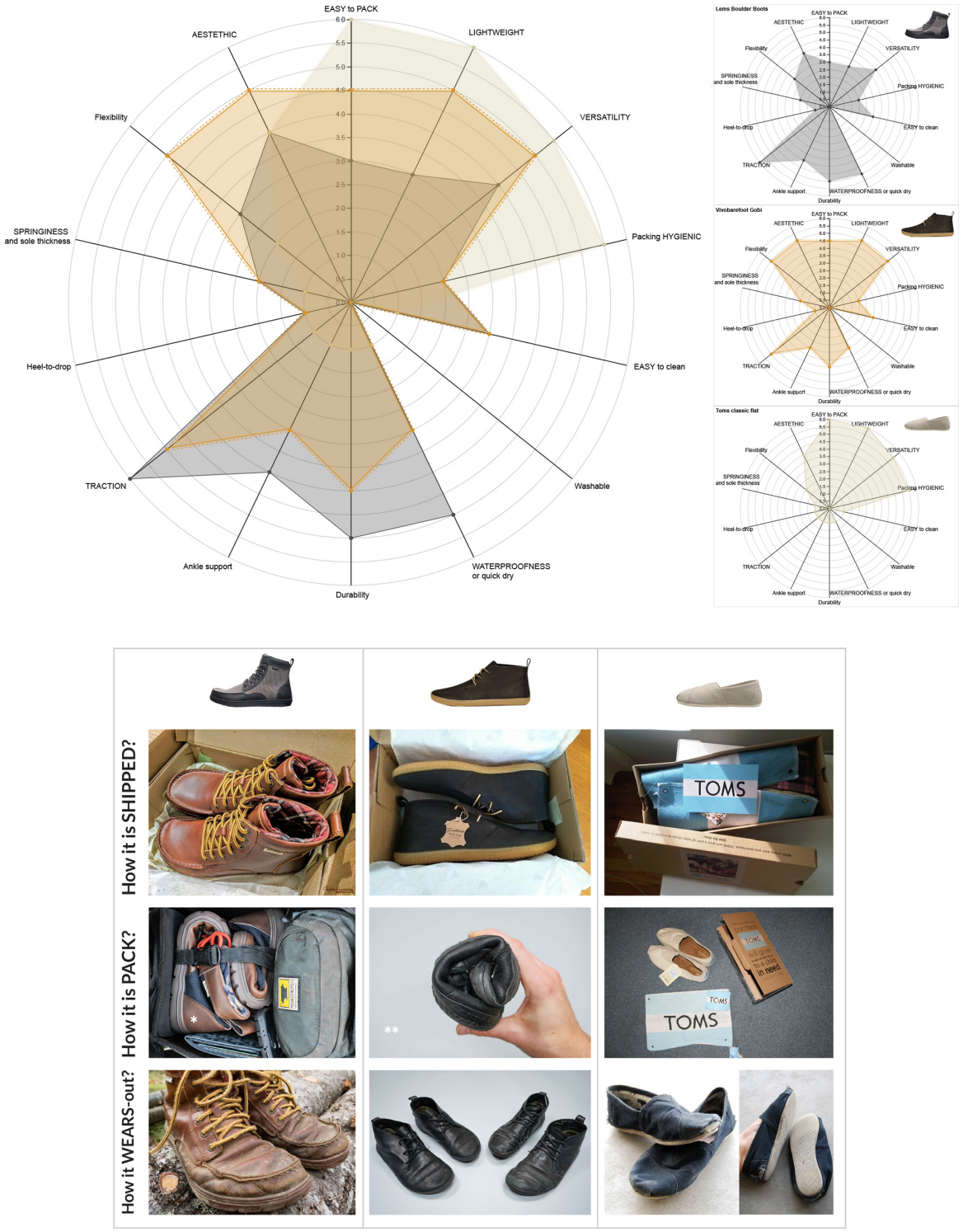


Fig. 3. 19. A radial chart is used here as a visual comparison of three footwear types (Lems Boulder Boots, Vivobarefoot Gobi, Toms) screened against the First Design Criteria (on the left). Comparison of footwear aspects, such as shipment, packing and wearing-out, are presented on the right.

3.2.4.3 Second concept design criteria development

The qualitative research investigation informed the iteration of design criteria.

Primary footwear needs (required):

- Easy and convenient to pack. Ideally should be as flat as possible to be stored next to the laptop.
- Utilise a modular product architecture to achieve a functional change by components replacement for variant combination and recycling.
- Easy to take off or partially remove; for instance, to remove for security check or flight mode.
- Resists being rolled but should use alternative collapsible techniques for efficient and convenient packing.
- Should be lightweight.
- Should provide arch and heel support, or at least allow for a reversable module/component to offer such support.
- Should be made of flexible but durable materials that do not degrade through undue packing.
- Washable.

Secondary footwear needs (desired):

- Would support a variety of activities that would offer utility along with desirable design benefits to the DN lifestyle, such as the “urge to travel”.
- Should not use glue as adhesives and fabric become brittle through extensive stresses. Instead, should use stitching or injection into fabric.
- Would adapt to the weather to alleviate travel discomfort.
- Should have an additional component, such as a bag or cover, for storing wet or dirty shoes.
- Would enable a wide variety manufacturing by assembling heterogenous components to deliver individual customisation and to pass style control back to the user.

3.3 Research For (or As) Design

The *research for design* follows the British Council “double diamond” design process involving the key phases of discover, define, develop and deliver (Kochanowska et al. 2021, 22). This is an iterative, speculative process that includes a sequential mode of identifying needs, concept generation, concept selection, concept testing and refinement. Similar to Ulrich and Eppinger’s (2016) Product Development process, it is structured around *diverging* and *converging* techniques to establish a reflective and meaningful design. On that note, the first part of diamond responds to diverging processes, discover or develop, while the second part to converging processes define and deliver. Darrel Rhea (Laurel 2003, 148) describes it as narrowing down to yet another phase that he refers to as an “advanced development funnel”, which can be broadly understood as a concept development approach or DFM (Design for Manufacturing).

The scope of this *research for (or as) design*, is presented in the diagram in Fig. 3. 1. According to James C. Kaufman and Robert J. Sternberg (2019), having various approaches engenders diverse solutions, which is recognised as a key component of the creative process. It helps to look at multi-faceted problems from many different perspectives, a process that is often referred to as analogous inspiration, leading to an original, unconventional design solution. Extending this aspect of the research gave room for speculative and experimental activities, such as structural 3D printing onto fabric. The diverging mode also resulted in an extensive investigative sketching and prototyping as a search for an appropriate mechanical adaptation followed by simplification, selection and refinements approach.

Although there is an interesting critique of the Double Diamond model, which sees it as too linear (Kochanowska et al. 2021, 24), it is easily tailored to many interdisciplinary studies. The main objective of this model is to find latent user needs through a series of steps and iterations in order to find the best solution to a given problem. This can be achieved by these diverging and converging processes. This kind of design exploration is presented in the next chapter, which includes the following methods: concept generation, concept selection, concept development and refinement and concept testing. Used methods, such as investigative sketching, CAD (Computer-Aided Design) 2D and 3D modelling, and testing established the final concept design criteria. This will then allow me to move to the Smoosh final conceptual design presented in Chapter 5.

4.0 RESEARCH FOR DESIGN EXPLORATION

This project has been especially challenging, because it requires me to design for a dynamic, complex human foot structure, manifested across a range of performance contexts and applications, with a product that needs to flex, fold, provide comfort and aesthetic satisfaction.

In this chapter I will briefly explain the design exploration by offering a selection of design concepts and explaining the key features and aspects that were established during the process. This includes product architecture for isolated components to improve adaptability and functional details such as connectors and undercut to allow collapsibility. I will also discuss the insights from testing and CAD modelling. In doing so, I established the final design criteria which informed the development of Smoosh footwear for the Digital Nomad.

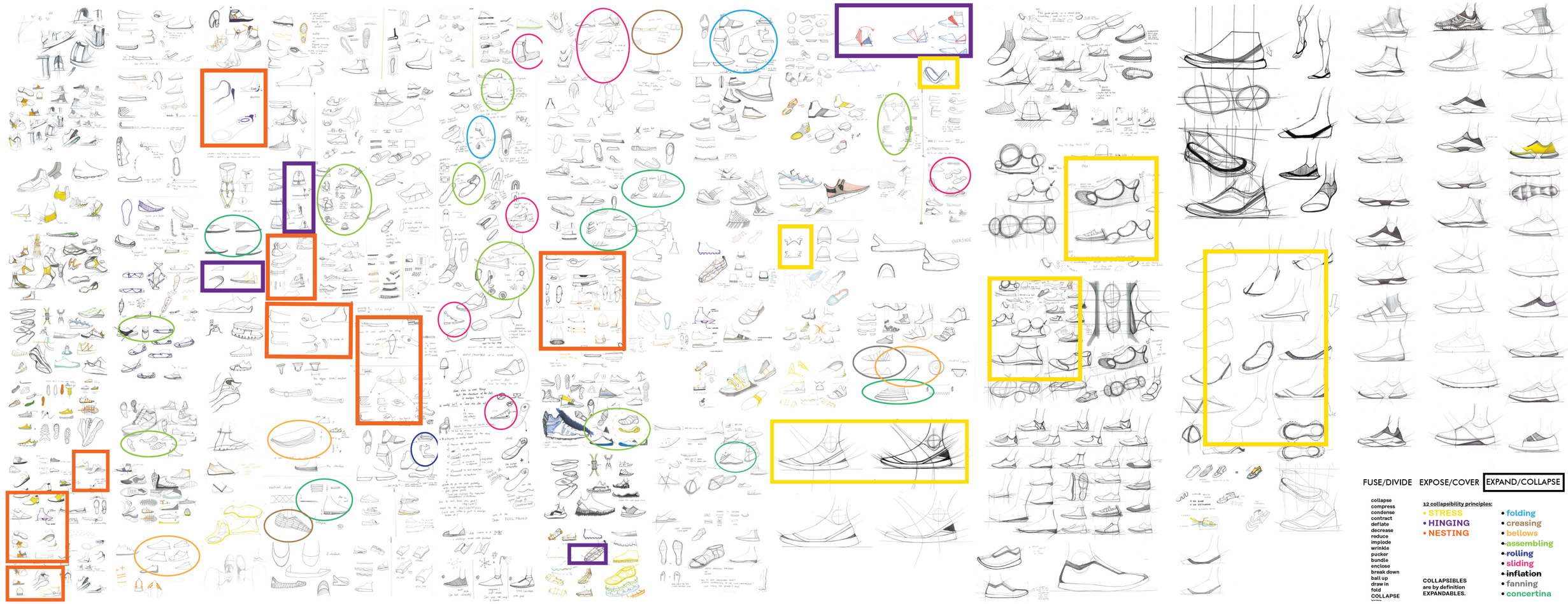
4.1 Concept Generation

Expansive ideas generation was established, mainly through sketching, mock-ups and modelling, in search of conceptual adaptable shoes for DNs. The selection of concepts covers the previously explained adaptation principles offered by Singh et al. (2007). Collapsible principles supporting adaptability, per Mollerup (2001) were highlighted and color-coded (see Fig. 4. 3). The main focus of this concept selection was on collapsible principles such as *stress/compression*,[27] color-coded as yellow, *hinging*, color-coded as purple, and *nesting*, color-coded as orange colour. The remaining collapsible principles encountered during this vast concept screening but discarded at the early stage were: *folding* as light blue, *creasing* as brown, *bellows* as light orange, *assembling* as light green, *rolling* as blue, *sliding* as pink, *inflation* as black, *fanning* as grey and *concertina* as green.

The screening established that the most appropriate concepts utilise modular architecture, either slot or bus-modularity[28] (Ulrich and Eppinger 2016, 188). For instance, removable stiffeners provided utility for walking but could be remove or partially un-clipped to loosen the shoe's rigidity for storing.

[27] Stress here was used as a wider and basic collapsible principle concept (Mollerup 2001, 32), where "stress-pressure" and "stress-tension" imply that the "stressed (compressed) state is for storage and its relaxed stage is for action". Folding and creasing are further tools to achieve the stress/compression principle.

[28] Ulrich and Eppinger define 'slot-modularity' as a connection mechanism that is specific between components and does not support interchangeability as opposed to 'bus-modularity' that allows different components to be attached through a common connector.


FUSE/DIVIDE
EXPOSE/COVER
EXPAND/COLLAPSE
collapse
compress
condense
contract
deflate
decrease
reduce
implode
wrinkle
pucker
bundle
enclose
break down
ball up
draw in
fold
COLLAPSE
12 collapsibility principles:
• STRESS
• HINGING
• NESTING
• folding
• creasing
• bellows
• assembling
• rolling
• sliding
• inflation
• fanning
• concertina
COLLAPSIBLES are by definition EXPANDABLES.


assembling
WRAP
COLLAPS
REVERSE
SUPPORT
COMPRESS (SQUEEZE / ROLL / FLEX)
ILLUSION
PUSH PULL / ADDING
OVERSHOE
TIDE / BIND
SANDAL not JANDAL
SANDAL not JANDAL cd

Fig. 4. 1. Selection of conceptual sketches categorised by adaptation principles colour-mapped. (next pages)

4.2 Selection of the concepts

4.2.1 Concept scoring

The concepts within these three groups were further scored against the project criteria based on the “Pugh concept selection” method from 1990 (outlined in Ulrich and Eppinger 2016, 152). Toms and Lems footwear were taken as references for the most promising existing travel footwear on the market (see Fig. 3. 19). Selected scored projects are presented in Fig. 4. 2, which contains: back hinge sole, squeeze pouch, overshoe sole, insole stiffener and back entrance. The concept-scoring matrix is presented in Fig. 4. 3 and Fig. 4. 4.

Fig. 4. 2. The selection of concepts chosen during the screening process for further concept-scoring.

		Concept											
		A [Rerefence] Toms		B Back Hinge Sole		C Squeeze Pouch		D Overshoe Sole		E Insole Stiffener		F Back Entrance	
Selection Criteria	**Weight**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**
Easy and convenient to pack-as flat as possible	25%	**3**	0.75	2	0.5	2	0.5	4	1	3	0.75	2	0.5
Utilize a modular product architecture	20%	2	0.4	4	0.8	2	0.4	5	1	3	0.6	3	0.6
Easy to take off or partial remove	15%	**3**	0.45	4	0.6	2	0.3	4	0.6	2	0.3	4	0.6
Resists being rolled	5%	**3**	0.15	4	0.2	1	0.05	3	0.15	2	0.1	2	0.1
Should be lightweight	10%	**3**	0.3	3	0.3	4	0.4	3	0.3	3	0.3	3	0.3
Should provide arch and heel support	10%	2	0.2	4	0.4	2	0.2	4	0.4	4	0.4	2	0.2
Durability	5%	2	0.1	3	0.15	2	0.1	4	0.2	3	0.15	2	0.1
Washable	10%	2	0.2	4	0.4	4	0.4	5	0.5	3	0.3	4	0.4
	Total	2.55		3.35		2.35		4.15		2.9		2.8	
	Rank	5		2		6		1		3		4	
	Proceed	NO		NO		NO		PROCEED		NO		NO	

	Rating
Much worse than reference	1
Worse that reference	2
Same as reference	3
Better than reference	4
Much better than reference	5

Fig. 4. 3. The concept-scoring matrix to Toms footwear as a reference.

		Concept											
		A [Rerefence] Lems Boulders Boots		B Back Hinge Sole		C Squeeze Pouch		D Overshoe Sole		E Insole Stiffener		F Back Entrance	
Selection Criteria	**Weight**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**	**Rating**	**Weight Score**
Easy and convenient to pack-as flat as possible	25%	2	0.5	4	1	4	1	4	1	4	1	2	0.5
Utilize a modular product architecture	20%	2	0.4	4	0.8	2	0.4	5	1	3	0.6	2	0.4
Easy to take off or partial remove	15%	**3**	0.45	4	0.6	2	0.3	4	0.6	2	0.3	4	0.6
Resists being rolled	5%	2	0.1	4	0.2	1	0.05	3	0.15	2	0.1	3	0.15
Should be lightweight	10%	**3**	0.3	3	0.3	4	0.4	3	0.3	3	0.3	3	0.3
Should provide arch and heel support	10%	**3**	0.3	3	0.3	2	0.2	4	0.4	4	0.4	2	0.2
Durability	5%	**3**	0.15	2	0.1	2	0.1	3	0.15	2	0.1	2	0.1
Washable	10%	2	0.2	4	0.4	4	0.4	5	0.5	4	0.4	4	0.4
	Total	2.4		3.7		2.85		4.1		3.2		2.65	
	Rank	6		2		4		1		3		5	
	Proceed	NO		NO		NO		PROCEED		NO		NO	

	Rating
Much worse than reference	1
Worse that reference	2
Same as reference	3
Better than reference	4
Much better than reference	5

Fig. 4. 4. The concept-scoring matrix to Lems Boulder Boots footwear as a reference.

4.2.2 Exploration of the selected collapsible principles

I will now briefly explain the chosen design concepts within their categories and give the findings. Because the heaviest weight of the concept-scoring criteria was footwear packability and versatility, the main design challenge was to enable toe and heel stiffeners to collapse without compromising their functionality. These components should support the foot when needed and collapse for transit. Several sketches and testing were undertaken to explore this.

4.2.2.1 Folding

First, the concept assumed that the heavy-lifting would be done by one component; for instance, removable insoles. By shifting this characteristic (versatility and packability) to one component only, it would enable a variety of manufacturing options and allow for easy component replacement. Such insoles could be customised to individual health needs (pronation, overpronation) or sport needs (adjusted by density). Such an approach would greatly flatten the shoe for travel and enable recycling.

This was supported by the *folding* collapsibility principle. This means that one object is nested within the other's cavity and as a result, together they occupy less space than they would do individually.

Fig. 4. 5. *Folding* exploration as one promising collapsibility principle.

Findings:

- There are usability issues; for instance, users might not be keen to remove the insole on an everyday basis, as when switching from street to sport mode. However, they will do it occasionally; for instance, for washing.
- Removable insoles favour the collection of dirt, making the adaptation process an unpleasant customer experience.
- An unresolved question is how can the insole be kept in place effectively?

4.2.2.2 Stress/compress

The objective here was to explore compression and expansion to achieve adaptability by the use of 3D-printed geometry on a stretched fabric. These experiments assumed integration of such a structure into the upper, or the use of such a structure alone as a structured outsole. Multiple samples of 3D prints were undertaken.

Fig. 4. 6. Stress exploration as one of promising collapsibility principles. 3D prints with TPU on stretched fabric.

Findings:

- Compression is factored by shape, print wall thickness and the stretchiness fabric factor (see samples' annotations Fig. 4. 6).
- It might require an additional elastic or Velcro strap to prevent unexpected release and compression when walking or an additional blockage to prevent unexpected compression on used shoes.

4.2.2.3 Hinging

Hinging refers to the mechanics of joints. It can be a flexible single piece injected in plastic or a traditional rod between moving metal parts. Similar hinging results (see Fig. 4. 7) can be achieved by material undercuts, which allow material to bend.

Fig. 4. 7. Hinging exploration as one of the promising collapsibility principles.

Conclusions: The overshoe sole concept and back hinge sole were rated highly in the concept scoring assessment.

Stress/compress, hinging and folding are the most prominent and not previously explored collapsibility principles for footwear design. The combination of these approaches might be beneficial for concept development and refinement, as folding would keep the sock in place, the stress principle would allow to bend and bounce back and hinging would provide heel support. Even though the collapse principle greatly improves packability and product versatility, it often compromises the functionality, usage and aesthetic, which needs to be tested. Having explored these early concepts, I will now move to the concept development, refinement and testing in the next section.

4.2.3 Third concept design criteria

Research through design, concept screening and scoring, informed the iteration of the design criteria.

Primary SMOOSH needs:

- Easy and convenient to pack. Ideally should be as flat as possible to be stored next to the laptop.
- Resists being rolled but should use collapsible principles such as *folding*, *hinging* or *stress/compress*.
- Utilise a modular product architecture to achieve a functional change by component replacement for variant combination and recycling.
- Would support a variety of activities that would offer utility along with desirable design benefits to the DN lifestyle, such as the “urge to travel”.
- Should not use glue as adhesives and fabric become brittle through extensive stresses. Instead should use stitching or injection into the fabric.
- Should be easy to clean or wash.

Secondary SMOOSH needs:

- Should cover DN scenarios, such as flight mode, airport mode, pack mode, hike, shower, business and nightlife, street/ urban and swim/reef.
- Would adapt to the weather to alleviate travel discomfort.
- Should provide arch and heel support, or at least allow for a reversable module/component to offer such support.
- Should be lightweight.

Tertiary SMOOSH needs:

- Should be made of durable and breathable materials.
- Should be quick dry or waterproof / water-resistant.

MAIN questions that needed to be further explored and tested:

- How can heel and toe stiffeners collapse?
- How can shoes be packed efficiently?

4.3 Concept Development and Refinement

The Smoosh shoes concept consist of three primary components:

1. A Smoosh Shell
2. A Smoosh Sock
3. A OO Connector, a fastener integrated within the Smoosh Sock allowing it to dock into the Smoosh Shell.

All parts have been developed simultaneously to achieve design cohesion.

4.3.1 Investigative sketching

A significant amount of investigative sketching, which is my preferred design method, was undertaken to establish a shell and a sock connection, points to snap, functional details or material breaks.

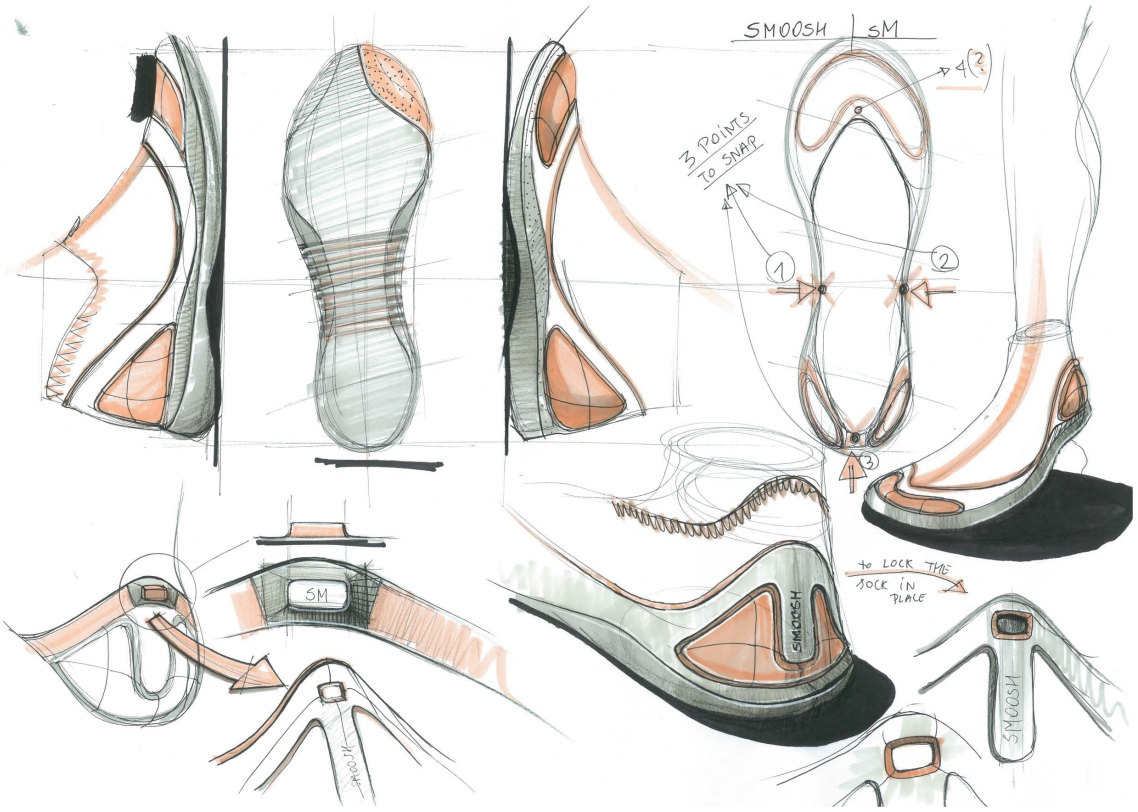


Fig. 4. 8. Concept development sketches.

These sketches provide valuable insights into the development of the Shell and Sock connection. One point of exploration allowed me to achieve the design of a connector, later

called the OO Connector, as an integral part of the SmOOsh branding. By utilising the double ‘O’ shape both on the Smoosh Sock and the Smoosh Shell, helps the user to locate the snaps (see Fig. 4. 8). The O-shape or capsule-like shape is considered a detail feature, as in the rigid edge inserts (see Fig. 4. 9), which prevent tearing of the material and give an attractive design detail supporting high-variety manufacturing and component standardisation.

The overall approach during the conceptualisation and development process was to incorporate the OO Connector, which snaps the Smoosh Sock and Smoosh Shell together. As seen in Fig. 4. 8, four snap points were marked: one on the lateral and one on the medial side, another on the heel and the last on the metatarsal portion. These are significant areas where the Smoosh Sock could be nested into the Smoosh shell. The location of the OO connector—that is, the snap points—was strategically checked on the human foot by low-fidelity mock-ups.

In order to enhance collapsibility, the concept introduced various footwear innovations and new functions, such as a hinge at the heel portion and undercuts (see Fig. 4. 9). One of the most distinguishing features of both the Smoosh Sock and Smoosh Shell is the OO connector which influenced the shoes’ aesthetic. Sketches (see Fig. 4. 10) show my investigation of the OO connector, including material parting and rigidness of the added components.

Fig. 4. 9 shows a sketch of the Smoosh Shells oriented face-to-face, presenting the consideration of storage methods, where one shoe-shell can be tied into the other to keep them together in the luggage.

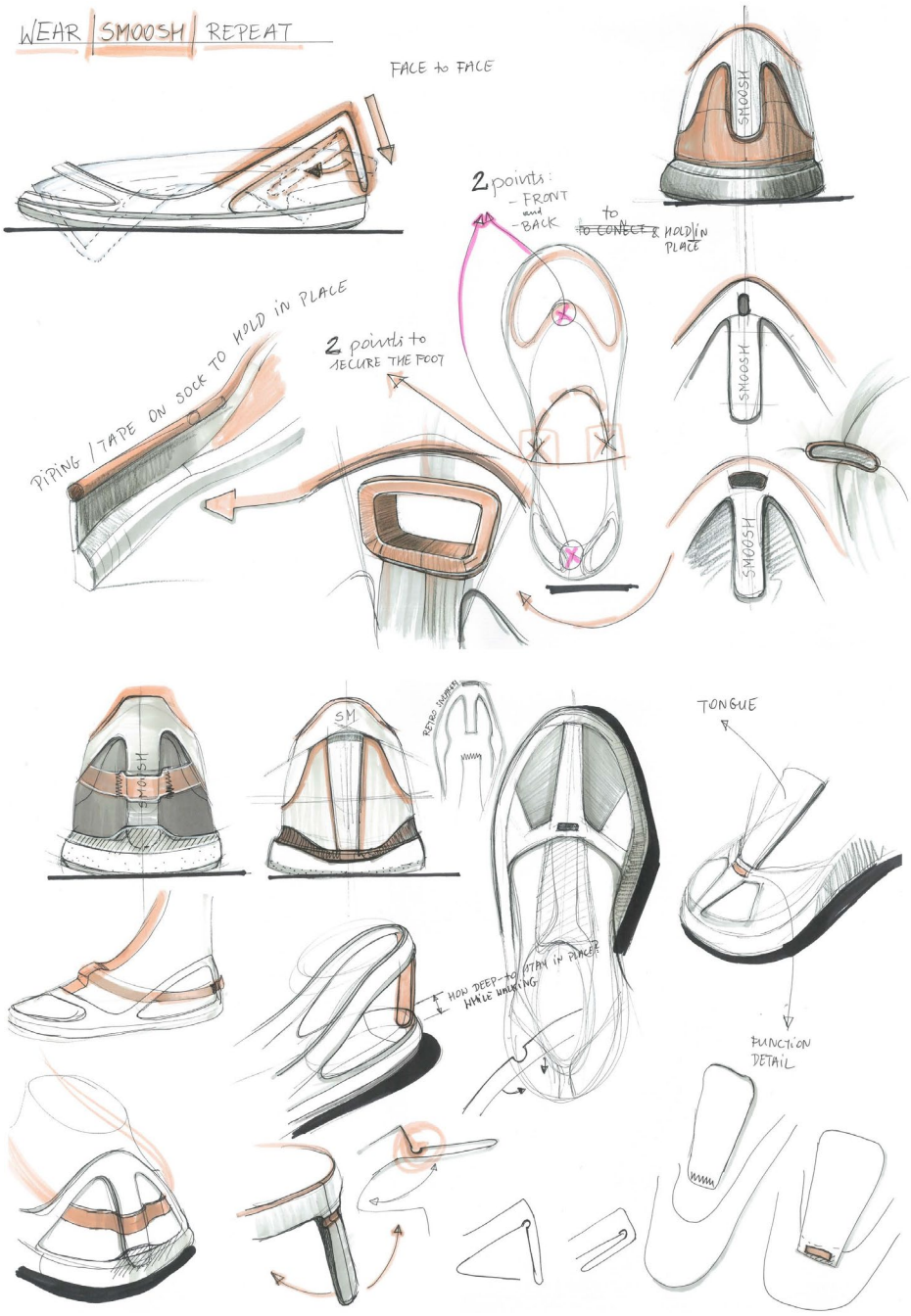


Fig. 4. 9. Development sketches exploring hinging as a desired collapsible principle.

The development sketches in Fig. 4. 9 explore hinging as a desired collapsible principle, allowing the heel stiffener to remain in place to provide the needed support. The latch was placed and locked either inside (see Fig. 4. 9) or outside (see Fig. 4. 10) of the Smoosh Shell. These sketches gave me an insight into the sole material parting as well as procedures such as undercuts of the material to encourage it to bend in the desired places. The placement of the latch was also considered so as not to compromise comfort or to chafe on the heel.

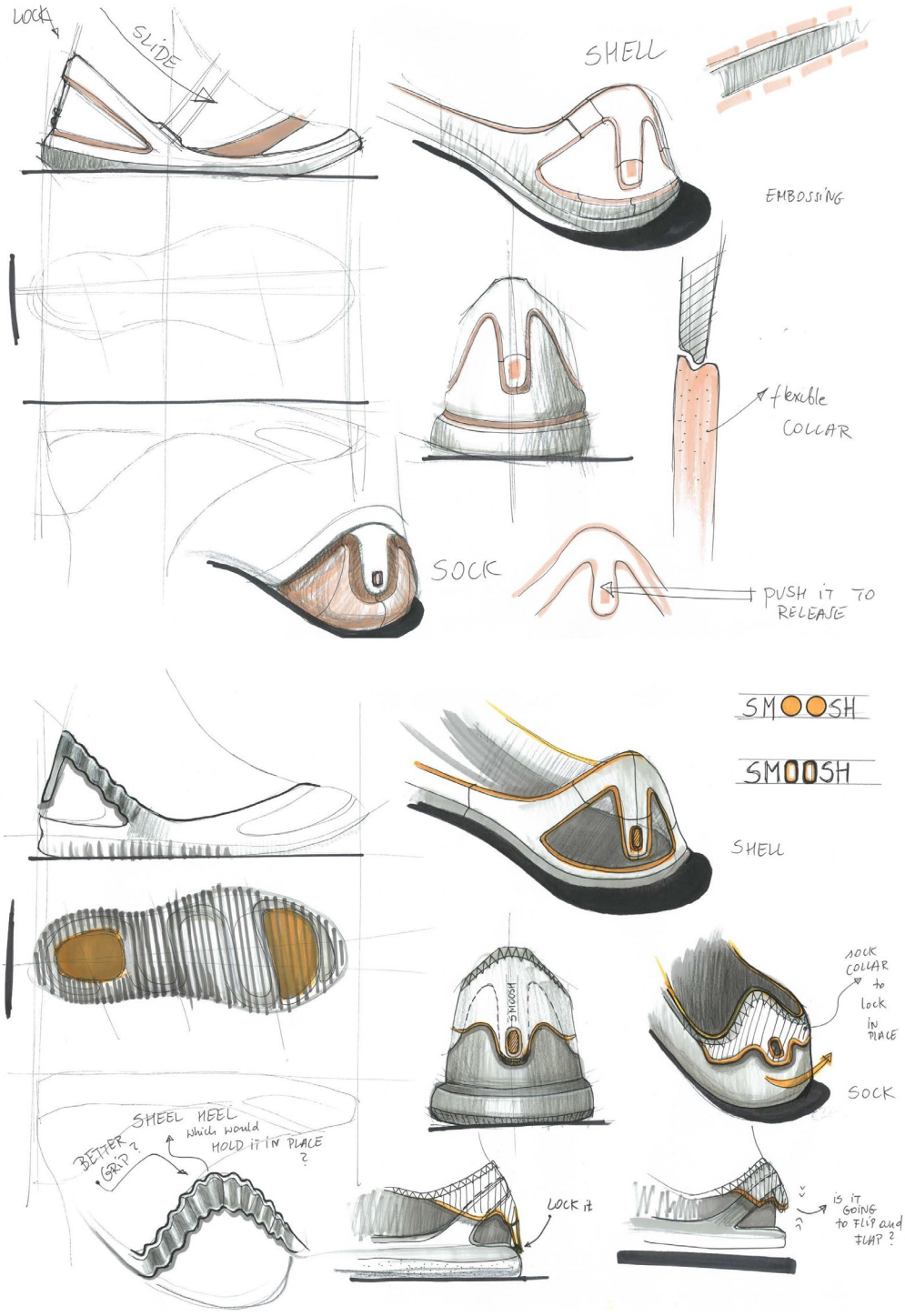


Fig. 4. 10. Development sketches, including locking in a sock collar.

A push to release the ankle collar (see Fig. 4. 10) was considered and was stretched on top of the heel stiffener. This was in addition to a grip that would hold better on the foot heel.

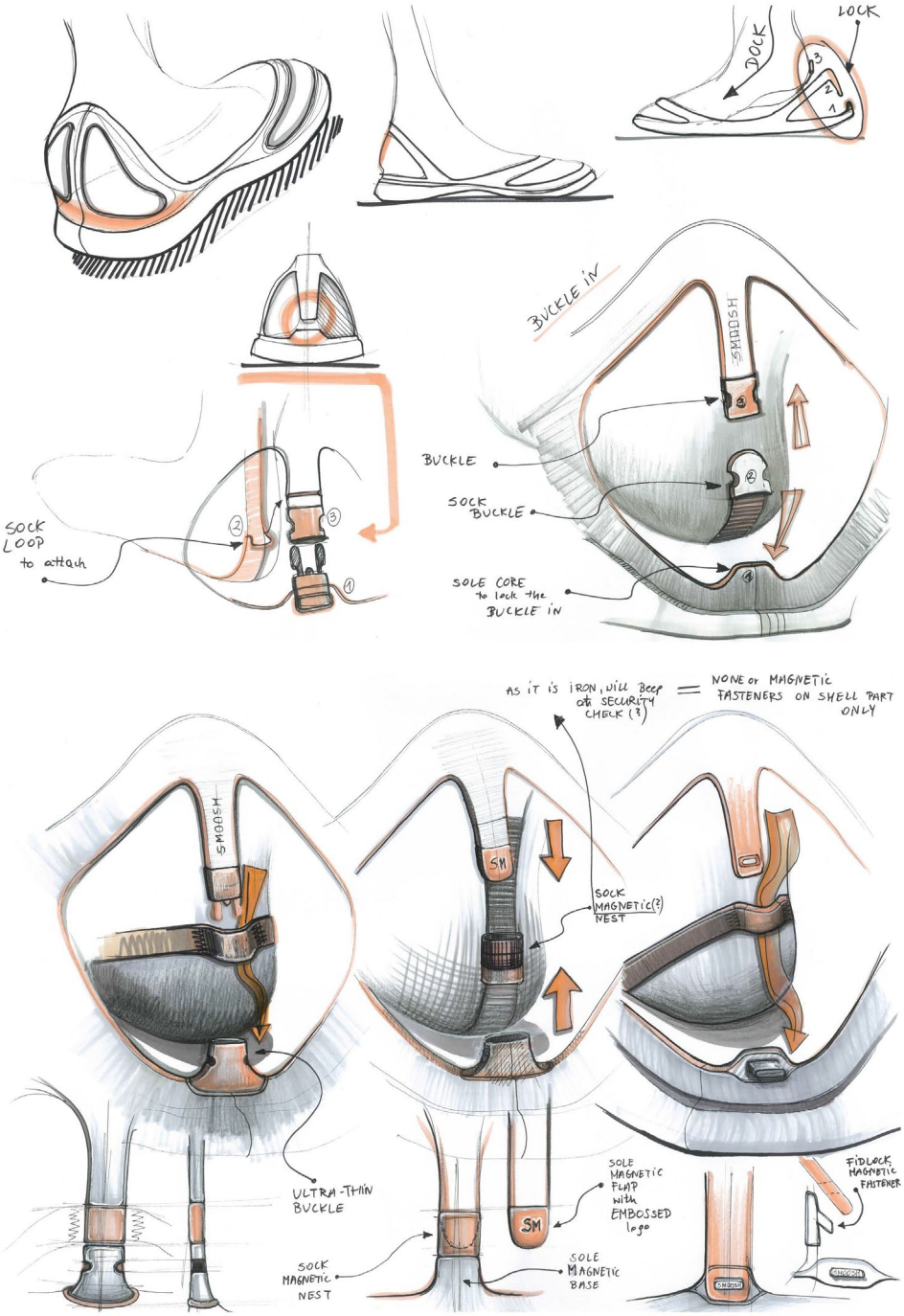


Fig. 4. 11. Exploration of functional details, such as a buckle, magnetic flap and magnetic fastener, allowing the heel stiffener to collapse.

Fig. 4. 11 explores the three heel latches: an ultra-thin buckle (on the left), a magnetic flap (in the middle) and a Fidlock magnetic fastener (on the right). Each of the sketches provide information about engaging the Smoosh Sock component to lock it in place by additional components such as tape or a magnetic nest, which would dock and lock through. However, the challenge was to make this component as small as possible, which would allow the

Smoosh Shell to collapse, while keeping the ergonomics, as it needed to be comfortably unclipped with one hand.

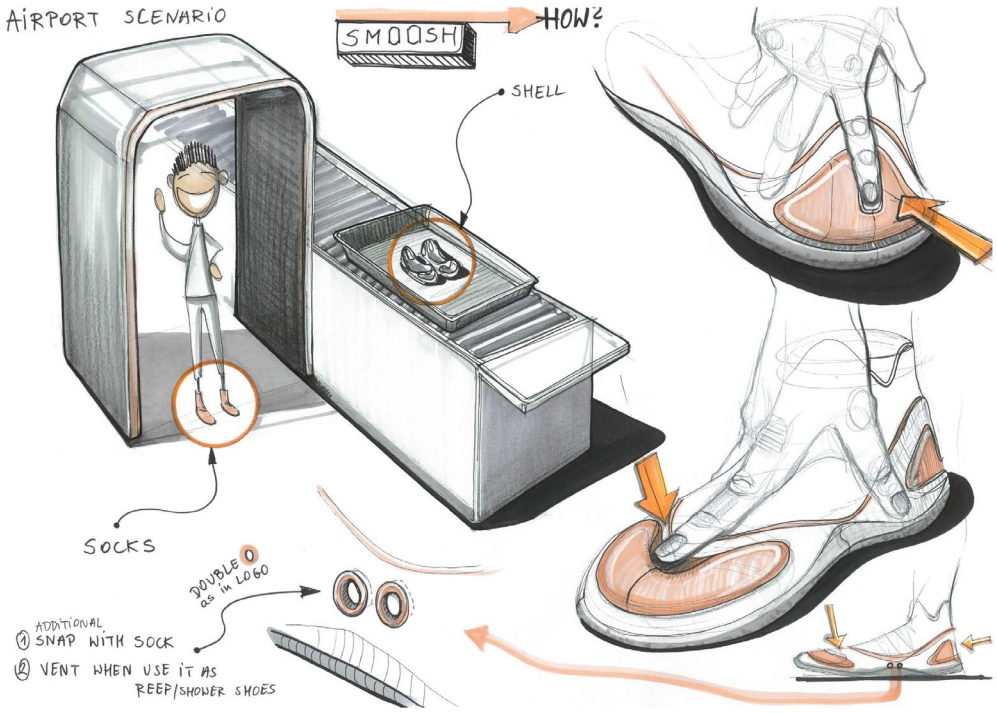


Fig. 4. 12. Airport scenario.

To satisfy fast queuing at airport security checks (see Fig. 4. 12), design features such as a “push-and-release” concept (see Fig. 4. 12) were explored. This included either a cavity in the sock’s soft component for ergonomic release or added to the sock OO piece to hold it in place once the sock is docked. The OO piece was considered as a function-added detail across the project; for instance, as the end of the shoe tongue, allowing it to mix and match and be removed for disposal.

The OO Connector in Fig. 4. 12 on the lateral and medial shoe sides is used either as a snap with the sock or a vent when the Smoosh Shell is used separately, for instance, when worn in the shower. The double ‘O’ was used as a playful analogy with the SmOOsh logotype (see Fig. 4. 14). The placement of the Smoosh logotype on both the shell (see Fig. 4. 8) and OO Connector (Fig. 4. 11) or sole (see Fig. 4. 16) was considered throughout the entire concept development.

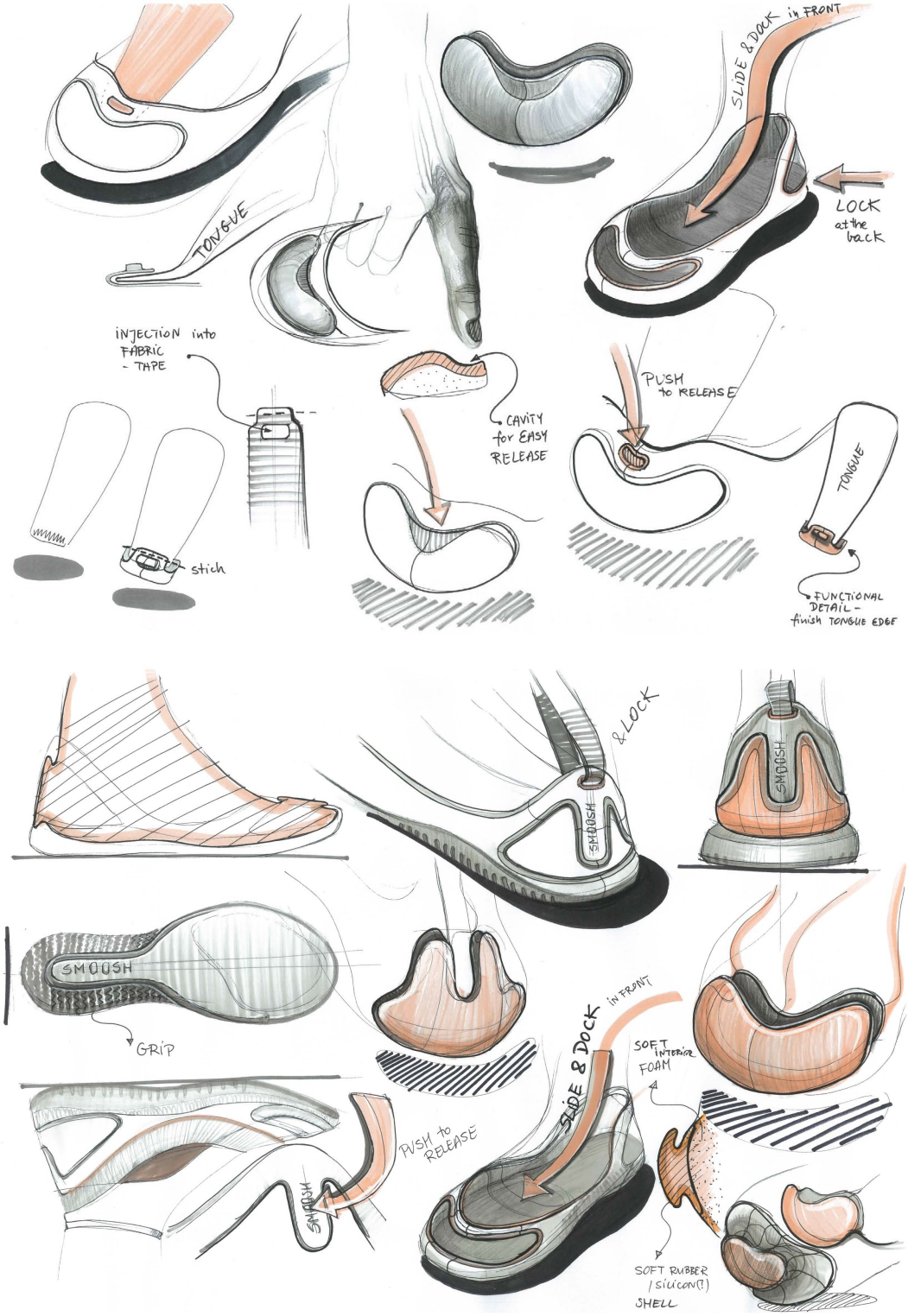


Fig. 4. 13. Development sketches exploring shell and sock connection by functional details, such as “push to release” or shoe tongue.

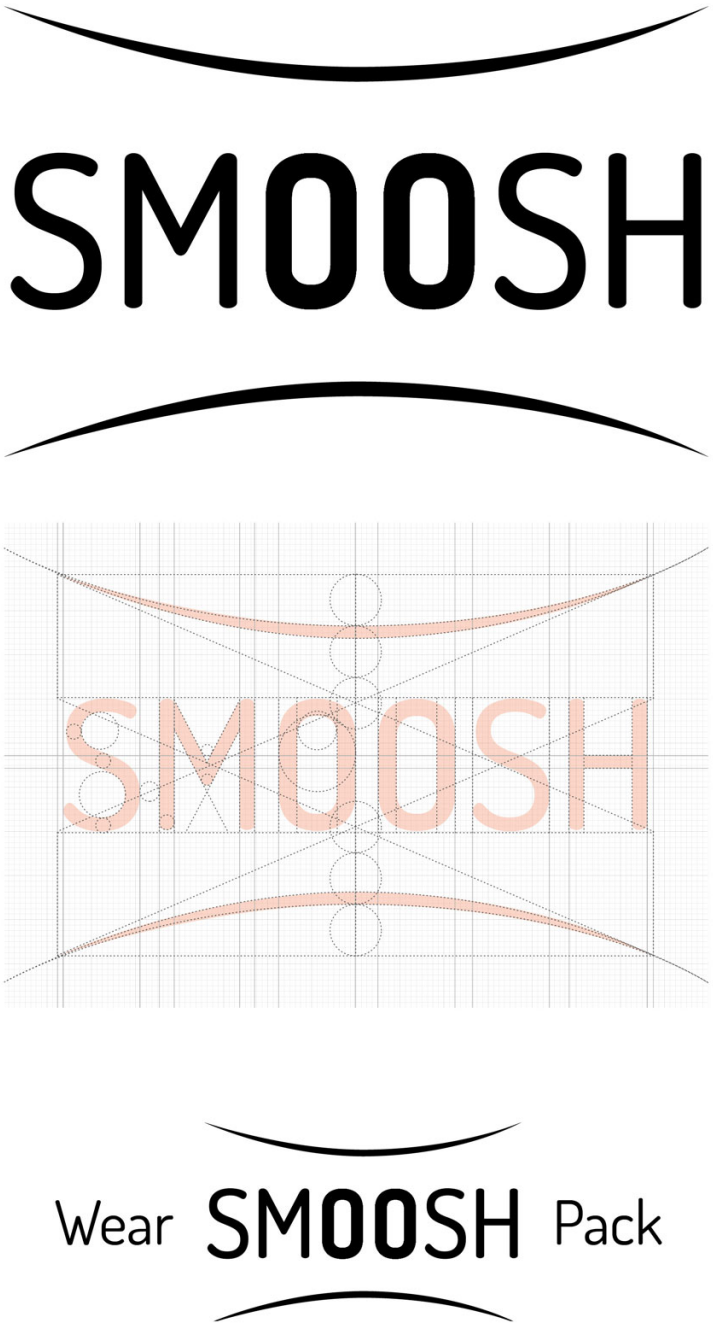


Fig. 4. 14. Smoosh logotype.

Fig. 4. 14 presents a simple logotype for the Smoosh branding. It consists of a rounded font type name with bolded “OO” in the middle and two arched lines at the top and bottom suggesting “smooshing”.

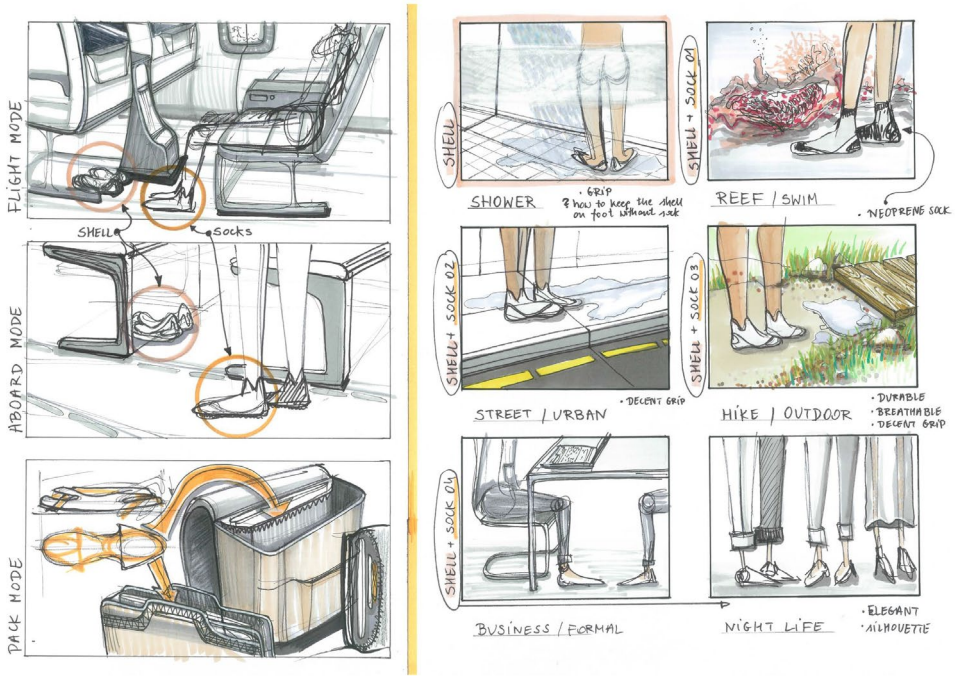


Fig. 4. 15. Scenarios re-framing (clarifying) the end user needs. On the left: flight, onboard mode and pack mode. On the right, exploration of different scenarios to assess how many basic components (shell and socks) DNs need.

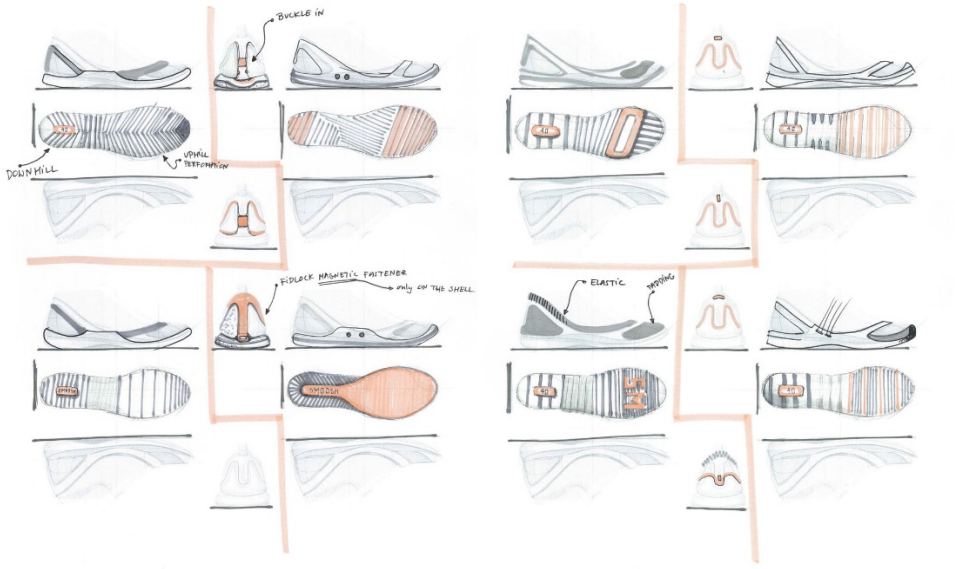


Fig. 4. 16. Explanatory design in scale.

Scenarios (see Fig. 4. 15) clarifying how many sock components would be needed to fulfil DNs' unpredictable travel were also explored. Explanatory design sketches to scale (Fig. 4. 16) explore the shoe's silhouette, volume and proportions, which were further taken through to the CAD modelling presented in the next sub-section.

4.3.2 CAD model development

A significant investigation was undertaken by using CAD 2D drafting and 3D modelling to establish footwear silhouette and product architecture of these correlating components. More importantly, these models established that the use of previously considered buckles, magnetic flaps or fasteners (see Fig. 4. 11) compromise the shoe's collapsibility (see Fig. 4. 17). Much space is needed in order to keep the buckle's utility; namely, unclipping. On the other hand, the magnetic fastener fails to accommodate the ease required for fast airport security checks, which is not desirable for DN's travelling lifestyle. In fact, footwear with metal components need to be temporarily removed for security checks.

The CAD pattern drafting along with digital 3D fabrication pinpointed the collapsible heel structure and the folding sole features of the Overshoe Sole mock-up (see Fig. 4. 5) had fallen short. This insight benefited the design development resulting in the final conceptual design of a utility heel-back strap, smart shoe-in-shoe storage and kerfing.

Fig. 4. 17. 2D drafting as a design exploration and development tool.

4.4 Concept Testing

The objective was to produce several rapid prototypes (see Fig. 4. 18). These were built to test whether:

- The shoe “smooshes” enough to bring a benefit to the end user
- The shoe-shell can be worn separately (without a sock component)
- There is sufficient toe protection
- The placement of functional details, such as connectors, compromise usability, like rigidity causing chafing.

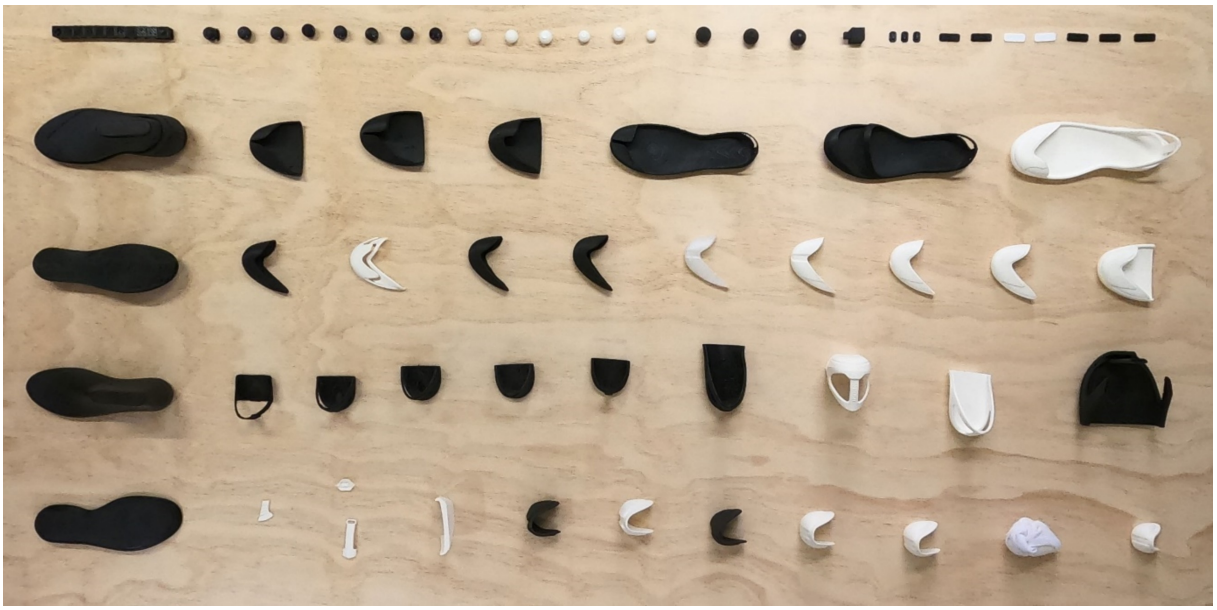


Fig. 4. 18. Selection of conceptual rapid prototypes.

4.4.1 Test: Comfort and usability

Usability tests have established the height of the heel support needed to provide utility (see Fig. 4. 19) and the shape and length of the toe portion (see Fig. 4. 21 and Fig. 4. 22) required to give sufficient protection, while bearing in mind that people have different foot shapes of feet.

Fig. 4. 19. Testing heel usability.

Fig. 4. 20. Testing comfort and usability.

Fig. 4. 21. Testing comfort and usability.

4.4.2 Test: Collapsibility

The objective was to test how the shoe “smooshes”. The aim was to prove that it can collapse enough to bring benefit to the end user. The focus was on the shoes’ heel and toe components and functional details, such as undercuts on the heel portion and a heel latch, allowing or encouraging adaptation.

Fig. 4. 22. Testing heel “smooshes” performance.

One of the most distinguishing features of the Smoosh Shell is found inside; specifically, the undercuts to the material encourage “smooshing” for storage. Such undercuts are located

on the sides of the shell, in both the lateral and medial parts (see Fig. 4. 22). A similar feature was used at the medial and lateral sides of the metatarsal zone, inside the Smoosh Shell to mitigate the splitting between the sock and shell when it flexes during walking (see Fig. 4. 23).

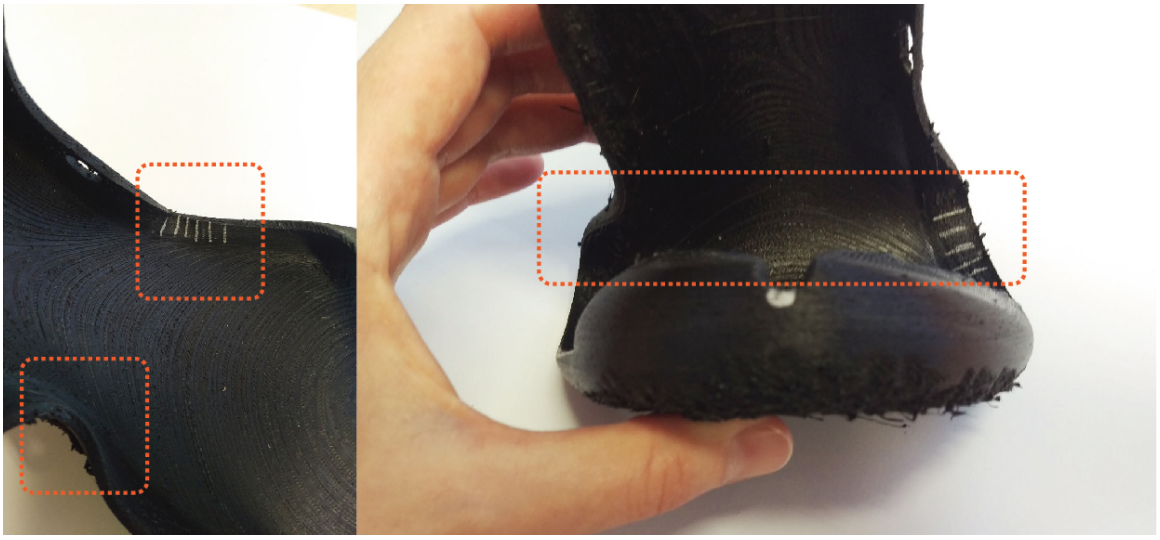


Fig. 4. 23. Testing Smoosh Shell metatarsal portion “smooshes” performance.

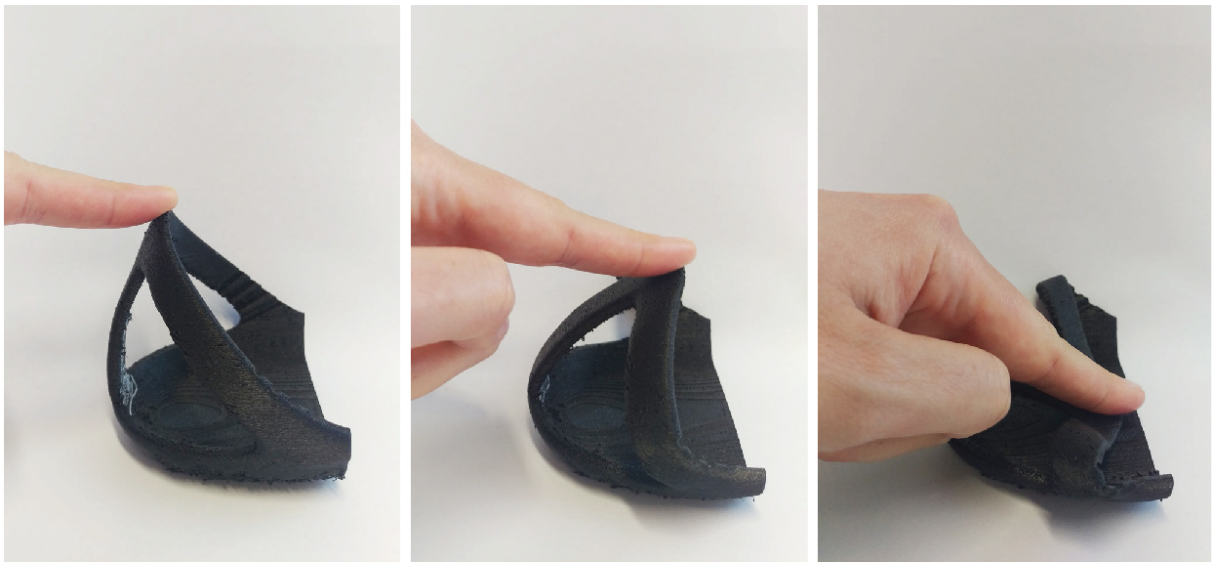


Fig. 4. 24. Testing Smoosh Shell metatarsal portion “smooshes” performance.

A similar approach was also tested on the toes portion, bearing in mind a previous experimentation with 3D geometry on the stretched fabric (see Fig. 4. 6), as a design analogy for structure, which collapses when needed to be stored or bounces back when needed to be used again (see Fig. 4. 24).

4.5 Final concept design criteria

The consideration of shoe concept and design criteria was built upon DN lifestyle and concept development and refinement. That helped to establish the final concept design criteria to bring benefit to DN lifestyle including utility, usability customization, packability of the Smoosh shoe.

Primary SMOOSH needs:

- Be as flat and thin as possible to minimise luggage space, but not compromise the user's comfort (be easy to pack).
- Should collapse (be flatpack).
- Should use collapsible principles such as *folding*, *hinging* or *creasing*.
- Utilise a modular product architecture to achieve a functional change by components replacement for variant combination and recycling.
- Should offer benefits to the work-travel-leisure lifestyle of the end user.

Secondary SMOOSH needs:

- Components, such as the Smoosh shell and Smoosh socks, should be fully functional pieces, which can be used separately to expand footwear versatility and convenient packing.
- Integrated technical components such as connectors and fasteners should be a coherent detail that allows easy adaptation; for instance, into flight mode.
- Soles should have a decent grip.

Tertiary SMOOSH needs:

- Should be easy to clean or wash.
- Provide foot support and secure fastenings.
- Should be lightweight.
- Should be made of durable and breathable materials.
- Quick dry or waterproof / water-resistant.
- Looks good after removal from the luggage.

05 SMOOSH final conceptual design

5.1 SMOOSH

Smoosh is a conceptual design for flatpack shoes designed for the digital nomads lifestyle characterised by frequent travel. The developed concept was envisioned as a footwear collection with a transferrable range of sock-like shoes that can be docked into the shells outer sole. The shell and the socks are fully functional pieces that can be used separately to expand footwear versatility. Smoosh incorporates adaptive features that allows for convenient packing, and minimizes luggage space.

Smoosh enables hassle-free travel. It contributes to knowledge by providing a novel footwear construction system and adaptive features for traveling purposes. These features address the particular performance requirements of footwear for the DN, such as utility, usability customization, packability, and accommodates the experiential aspects of border control.

The research investigation that underpins Smoosh, established that although rolling is the most common collapsible principle used in the travel apparel and footwear markets, collapsible principles such as *folding*, *hinging* and *creasing* used in this conceptual design are far more desirable for travel shoes.

Fig. 5. 1. The Smoosh Shoe.

5.2 Product Architecture

Fig. 5. 2. Two primary Smoosh components—the Smoosh Shell and the Smoosh Sock—which the end user receives in the Smoosh pack.

The Smoosh shoe concept consists of two primary components (see Fig. 5. 2), such as the Smoosh Shell outersole and the Smoosh Sock. These two components are what the end user receives in the purchase pack. The reasons for utilising such modular footwear construction was for utility, adaptability, versatility and recycling purposes. Separating the Smoosh Shell and the Smoosh Sock, enables the shoe 'to smoosh' for traveling, while both toe cap and heel stiffener provide utility performance and full support potential when the components are docked together.

Smoosh shoe construction, similarly to Yoehlee Teng work (see Fig. 2. 1) provides diversify of looks for new aesthetic, but most importantly it extends the range of application a product can perform, keeping volume down for packing, and providing structure and support for the foot and ankle. Keeping these two pieces as separate components without utilising bonding methods, such as cemented methods used in the footwear industry, enables adaptation, promotes durability and recycling. Footwear is yet rarely recycled. Not only materials but also manufacturing processes preclude shoes from successful and easy disposal. Therefore, having as few components as possible which are not permanently

bonded, was important to enable and encourage the user to dispose of the shoes in a proper manner.

There are some additional sub-components integrated to the Smoosh Shell and to the Smoosh Sock which are contained in the Smoosh Pack. (see Fig. 5. 3). The Smoosh Pillow—which is a heel support—belongs to the Smoosh Sock, and the “OO” Smoosh Connector—which is a latch hard plastic reinforcement—which belongs to the Smoosh Shell.

Fig. 5. 3. Product Architecture.

Both sub-components are integrated with their dedicated primary components—the Smoosh Shell and the Smoosh Sock— during the manufacturing processes and materials used would be selected for their ability to be recycled together.

Having the Smoosh Sock and the Smoosh Shell as the separate components provides yet more benefits to DN lifestyle, such as their customization and convenient partial removal. The convenient shell outer sole removal accommodates the experiential aspects of border control, since the “urge to travel” (Makimoto and Manners 1997, 17) is embedded in the DN lifestyle. Research revealed a diverse range of DN individual style preferences (see 3.2.1.4 Design Personas and Design Scenarios). Therefore, a customizable shell outersole and/or

additional sock could benefit individual needs, such as reinforcement for hiking, fitting and support for pronating or overpronating. As comfort is a multi-facet experience perceived individually and influenced by other facets, such as sole's thickness, or the heel-to-toe drop, modular footwear construction gives unconstrained possibilities to the prosumer[29] client.

5.3 How does it work?

The modular footwear construction is achieved by a Smoosh Pillow which is integrated with the Smoosh Sock. This component is a pillow-like soft heel stiffener which docks-into the Smoosh Shell cavities. This component has several features—keeps the shape when the shoe is in use, locates sock and shell together structurally, and protects and supports the heel and ankle.

Fig. 5. 4. The Smoosh Pillow component.

Several adjustments were utilized to fulfil the primary Smoosh shoe needs, which is being as flat and thin as possible to minimize luggage space without compromising user comfort. The Toe cap and T-shape heel strap (see Fig. 5. 5) were designed to adapt, namely collapse, for traveling and for the easy storing a shoe within a shoe. (see Fig. 5. 6) Several toe

[29] See page 30 and also Kotler (1986).

cap and heel strap were rapid-prototyped (see Fig. 4. 18) and tested during the refinement and development process to allow the Smoosh Shell to be used alone without the sock.

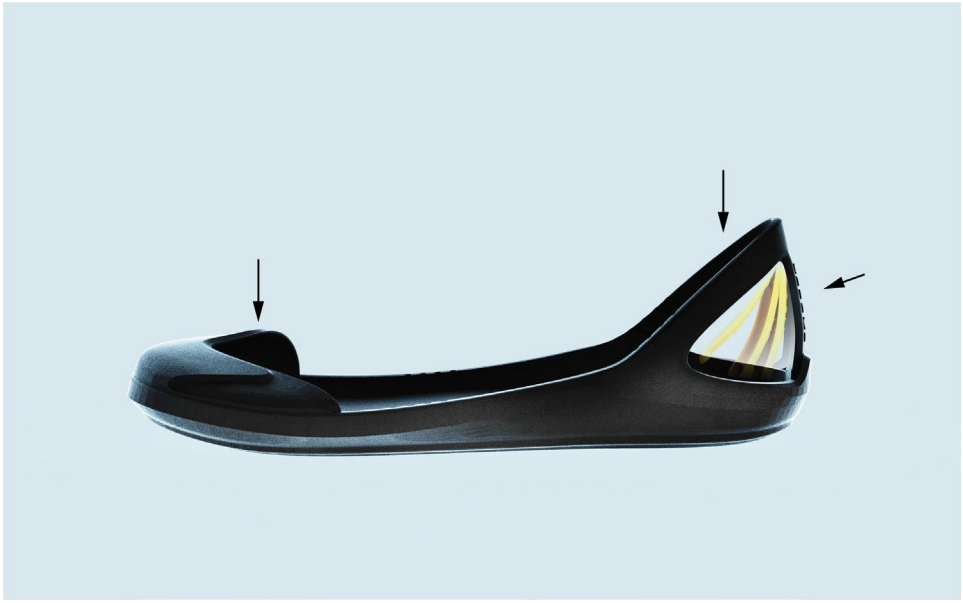


Fig. 5. 5. Collapsible T-shaped hell strap and grooved toe cap encouraging the toe part to collapse.

Fig. 5. 6. Storing a shoe within a shoe benefits the DN lifestyle on-the-go.

5.4 Details

Several product details support this adaptation for travelling and storing.

One of which is a Smoosh latch (Fig. 5. 7) which brings utility to the Smoosh shoe. The latch is located on the back strap of the Smoosh Shell. It holds it in place, while the hard plastic reinforcement provides durability and fits into the latch.

Fig. 5. 7. The Smoosh Shell Latch

The Smoosh logotype is also located on the back strap. The placement of the logotype was utilised to indicate the action needed to collapse the shoe for storing, namely the push-and-release system of the Smoosh Pillow and the Smoosh Sock from the latch. The logotype's letters provide perforation for the easy location of this push to release spot which becomes handy as the user will simply turn a hand and hold the ankle from behind for the shoes release. (see Fig. 5. 8)

Fig. 5. 8. Logotype placement on the back strap.

Further detailing across the Smoosh Shell were utilised to support adaptation for travelling, such as the materials score and kerfings. These subtle details brings performance features, design characteristics and reduces mass and size to fit DN lifestyles requirements.

Material grooving or kerfing were utilised on the medial and lateral sides of the toe cap encouraging the shoe to collapse for storing, and contributing to material reduction. Kerfing were used in the medial and lateral sides of the Smoosh Shell's interior. Locating the kerfing and scoring inside of the shell's outer sole provides better adaptation for managed and designed collapse, than having them outside, and thus a better outersole durability was achieved. Kerfing was also employed on the T-shaped strap (see Fig. 5. 9) to facilitate folding and storage benefit.

Fig. 5. 9. T-shape strap kerfing.

Similarly kerfing was utilised on the metatarsal area of the Smoosh Shell inside (see Fig. 5. 10), the medial and lateral sides, to mitigate the splitting of the shell and the sock during walking.

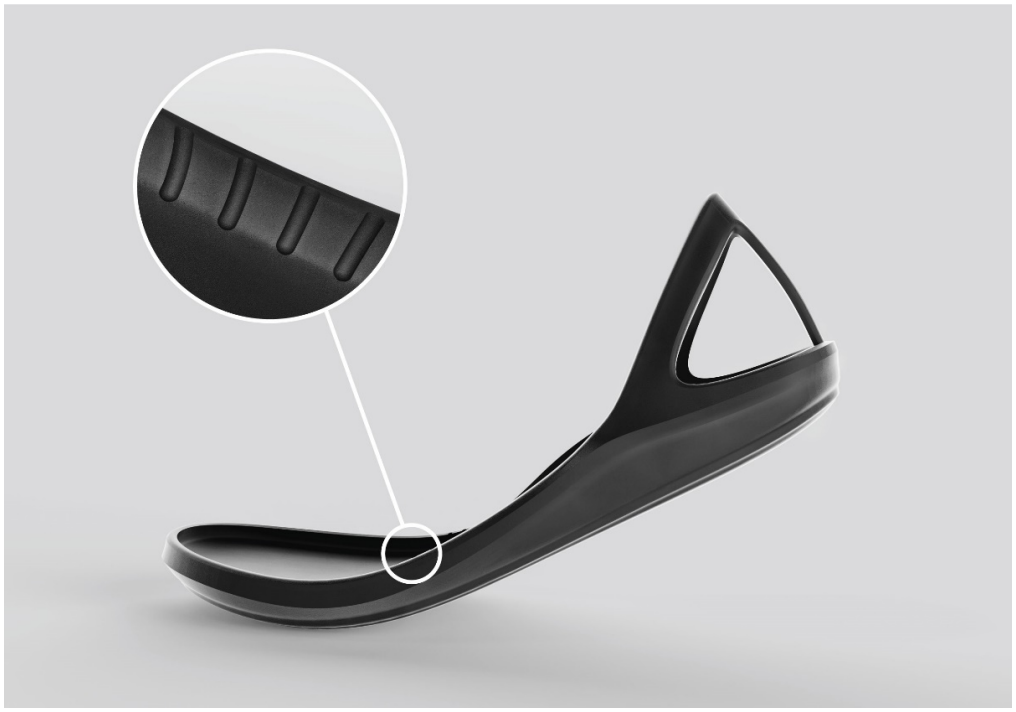


Fig. 5. 10. Sides kerfing mitigates the splitting of shell and sock.

5.5 Sections

Fig. 5. 11. Smoosh shoe orthographic views.

Smoosh shoe orthographic views (see Fig. 5. 12) and sections (see Fig. 5. 12) provide technical and general information about the scale, volume and details of this conceptual flat-pack footwear design for digital nomads.

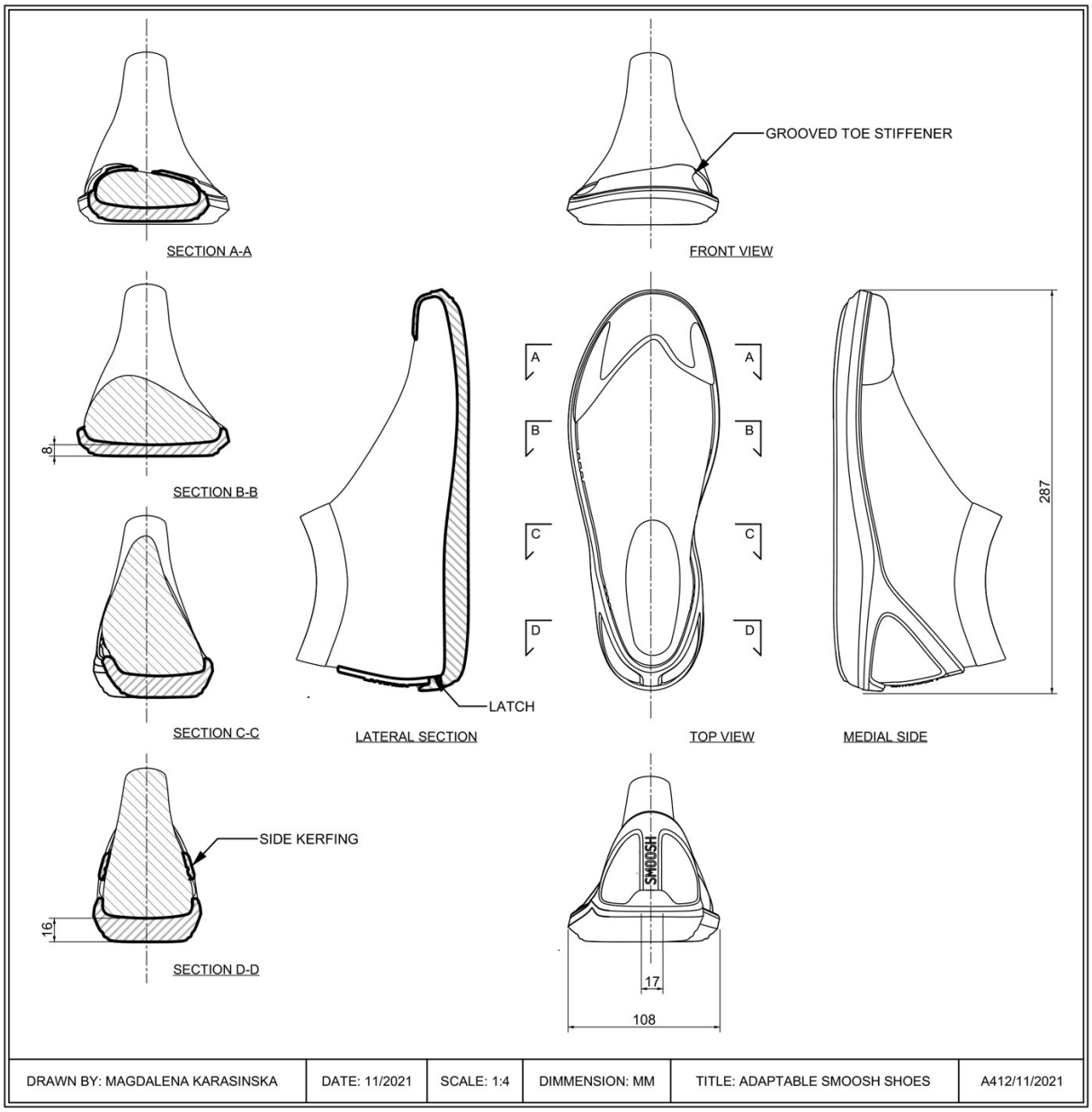


Fig. 5. 12. Smoosh shoe sections.

5.6 Marketing Speculation

The Smoosh concept comprises two main components, the sock and the shell. Due to this modular architecture sock and shell can be varied for particular aesthetic purpose and context (see Fig. 5. 13). This approach was used successfully by Swatch watches, in their product launch of the mid 1980's.

Fig. 5. 13. Smoosh shoe sock and shell can be varied for particular aesthetic purpose and context.

This type of approach, updated to a digital retail portal would fit well with a retailing strategy for Smoosh and the digital nomad's lifestyle. Selecting components online, having them shipped to your current or next destination, being able to update refresh and combine components for your particular aesthetic, context or purpose supports the characteristics for the digital nomads operations and physical needs. The nature of this approach also develops variety from a small range of components. The digital nomad designs their Smoosh for themselves, developing a level of attachment to the product, a sense of self expression, ownership, and engendering brand loyalty.

From a fashion perspective Smoosh retailed in this manner allows Smoosh to be combined with a range of purposes including business, formal, daywear: a black shell and sock for that business meeting, a flash of coloured shell and skin-tone socks for that cocktail party, or as a combination of coloured shells and patterned socks for that fun day out with friends.

Importantly this strategy extends the longevity of the product range allowing updates and ranges in response to fashion trends and styles.

Conclusion

Today's footwear market is saturated with a variety of choices across a broad range of price points, there are only a few designs addressing the lifestyle needs of digital nomads. Research on adaptable footwear and design for digital nomads is scarce and very little work has been published. Consequently this study usefully informs and updates this area of knowledge.

The study gathers and discusses historic precedence from transformable and adaptable fashion apparel through case studies examples. Fashion examples tended to express conceptually broader design issues, where more focused footwear examples tended to address functional features of transformation and adaptability.

These insights matched with strategies of product architecture and component modularity, and focused on this new and emerging footwear niche, the digital nomad, provides new ground for footwear innovation. This has been achieved through a mixed methods design-led investigation, using the iterative design process following three key modes of design research into (and about) design, research through design, research and for (or as) design.

The final outcome of this research, Smoosh shoes, is a conceptual design for adaptive, flatpack shoes. The Smoosh system allows for convenient packing and transition through international border controls. Smoosh provides benefits to the digital nomads lifestyle incorporating a 'push-and-release' design feature, and a modular product architecture, enabling rapid airport transit, mass-customization for the versatile context and needs of DN, and supports footwear recycling. The Smoosh shoe established that collapsible principles of kerfing and hinging are desirable for travel shoes. These adaptive features could be utilised further in footwear design to reduce size or volume.

The Smoosh shoe, being as flat as possible and having a T-shaped heel strap allow the Smoosh shells to be tied together by orienting them face-to-face for storage, minimizing luggage space and co-locating them within luggage storage. Smoosh provides comfort, utility and contributes to the wellbeing of DN lifestyle.

The ability of Smoosh to respond to a range of fashion context demands, is achieved through the ability to mix and match socks and shells, providing versatility from a modest range of components for specific requirements. Marketed through a digital portal, with distribution and delivery at an address of your choice, Smoosh fits into the lifestyle of the digital nomad and their modes of operation and communication.

Smoosh conceptual design contributes to new knowledge and innovation in the non-bonded footwear sock-shell construction and grooved/ kerfing detail that provides utility, adaptability, versatility and effective recycling. The design provides an innovative shoe construction which utilises the Smoosh Sock component that docks into the Smoosh Shell outer sole by the use of the Smoosh Pillow sub-component. The use of kerfing detailing across the shell outer sole, enables adaptability for travel packing reducing volume for the constrained travel requirements.

Smoosh shoes versatility allows stress-free travel, benefiting and adapting to different context and scenarios common to the DN represented in developed personas profiles. Smoosh responds to the DN personas developed for the study and their lifestyle experiences (that formed a reference point for ideation), we can see Smoosh addresses many of these expectations. For example: John (Photographer) reducing time queuing transiting airports, improve packability with electronics/ camera gear required for his work; Hayley (Social Media Influencer) providing versatility or activities, and ability to customize for specific events and climates, and along with this Smoosh provides a narrative in her journey as a mutable fashion accessory; Max (Graphic Designer) an aesthetic quality that allows broad utility across different environments and work contexts; and finally, Luis (IT) Smoosh provides an expression of his own interest with open-source and mass-customization, novel and affective collapsible features, it becomes an expression of his core values.

Smoosh challenges the status quo, of fused and multi-element and multi-materials systems used in contemporary footwear design. It showcases the potential of separating key components through managed design of product architecture and considerations of modularity. This is achieved mass-customization potential allowing the end users to decide the form, function and aesthetic presentation of their footwear.

The approach undertaken in this study has further application in the design and development of products that use integrated and complex product architectures, with fused materials to explore and expand new potentials and benefits that could be achieved through challenging the status quo. An example from the Smoosh study is Smoosh Sock with Smoosh Pillow, reinventing the concept and performance features of a sock component used in footwear. Smoosh individual components challenged us to rethink our understandings of function in relation to key components such as the sock pillow feature and the relationship between structure and collapsibility, expressed in the Smoosh Shell.

This research contributes to knowledge by providing a novel footwear construction system for travel purposes. It proposes that the relationship between sock and shell can be enhanced, providing structural connection with the shell and support for the ankle with, or without the shell.

This conceptual exploration resulting in the final footwear Smoosh concept, provides viable information for further product development. Smoosh, matches adaptability for packing with versatility for context, and variety for fashion with a modest material footprint.

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APPENDICES:

Appendix 1: Case Study: Footwear Deconstruction

Nike Free RN Flyknit

Function:
Lightweight, sock-type, flexible shoes for running that can be used with or without socks.

Use:
To wear the shoe, a person needs to untie the laces, slip their foot in, adjust the tongue and lace the upper to fit tightness to their liking.
The hole in the upper indicates where to slip the foot in.
When the shoes are not being used, the upper can collapse fully; however, the typical athletic S-shape sole silhouette prevents it from being stored as a flat-pack.

Form:
The overall form is dynamic and organic; it follows the organic foot shape, which can be synthesized to the three main areas: toe ball, arch concavity and heel ball.
The sole is a dynamic form with the S-shaped curvature profile silhouette—called the toe spring—typical for athletic shoes. It has a rounded, organic sole with a recess along the sole profile and multiple rounded recesses on the inside of the sole to reduce weight.
The incisions along the bottom edge help with flex and consequently the sole performs and looks better for longer. The EVA material easily creases on non-perforated surfaces and the incisions and recesses were likely used to minimize or prevent that. The sole bottom has characteristic crossed notches used to increase flexibility and overall shoe performance. In the Nike Free edition, the honeycomb shape is used for the sole bottom to improve flexibility.

The shoe form indicates that it is an outdoor, athletic shoe but does not fit with where it could be stored? Or does not tell us how it should be stored? Moreover, it gets dirty during use (as all shoes do) so is unpleasant to touch once dirty.

The upper comprises a sock-type, knitted, collapsible and flexible part. The toe portion wrinkles causing an unpleasant appearance. When the shoe is not being used, the upper does not hold the shoe form well as there are no toe and heel stiffeners as in other shoes. Structure and stretchiness are achieved by different knits within different parts of an upper.

Human factors that have shaped and influenced the form are the human foot shape, the "last" form and the manufacturing processes of lasting (shaping the upper on top of the last).
Due to the sock-type knitted upper characteristics the same shoe will look different on different types of foot, with the shape of the foot exposed rather than hidden. Therefore, the shape of the toes is visible through the upper, deforming and holding that impression throughout the lifespan of the shoe.

Weight:
191 grams for one shoe.

Size / dimensions: W US9, UK 6.5, EU 40.5. (as stated on the insole label. However typical sizing for 40.5 is a 9.5 US and a 7.5 UK)
Sole dimensions: 105 mm x 280 mm x 27 mm (based on the size EU 40.5)
Sole thickness: varies from 7 mm to 27 mm.
The width allows for a range of foot sizes because that brings comfort to more foot types. They snug the feet very well but some reviewers claim they are too tight or too loose. This is likely due to incorrect size choice or specific characteristics of the reviewers' feet. They come in multiple EU/US standardised sizes, including full and half sizes. Due to disproportionate manufacturing costs, few companies produce half-sizes—only giant corporations like Nike.

Parts:
1) The bottom part: shoe sole.
2) Lasting board (torn during disassembly).
3) The middle part: insole.
4) The top part: upper part with holes for laces.
5) Shoe laces.

Mechanical design:
The moving parts are the shoelaces and removable insole.
The lace is a woven band that pulls the shoe together to hold it to the foot and adjust the instep portion to the wearer's liking. Additional eyelets are added in the last row for a firmer hold or to accommodate a wider instep foot diameter.
Unlacing reverses the process, enabling the wearer to take out their foot from the shoe. To do so, they need to untie the knot and release, then untighten the crossed laces.

Materials:
EVA sole; possibly used to achieves a light weight.
Polyester thread for the upper. Nike has developed variations of their own polyester yarn, each with different denier or tensile properties according to their intended use—more elasticity would be needed in areas that require stretch.
A material comprising strong yet lightweight strands of yarn that have been woven into a one-piece upper, securing the wearer's foot to the shoe platform. This might have been used because of its strength.
Polyester laces that might have been used because of its strength.
Moulded or glued TPU logotype on the shoes' tongues.

Manufacturing processes:
1) Flyknit™ technology, also called 4D knitting, introduced by Nike in 2012. "A one-piece upper design is produced by a CNC knitting machine then assembled with the tongue, lining materials, and reinforcements. The knitting machine is loaded with polyester, nylon, or spandex fibres. The newest knitting machines can handle a mix of fibres and up to 10 colours at one time. The machine can be programmed to knit one upper at a time or 3 uppers with a maximum width of 90cm. Depending on the programming and fibres selected, the upper can be thin and stretchable or thick and stretch resistant. The design opportunities are nearly infinite with fibre options, colours choices, knit densities, and openings configu-

rations" (Motawi 2017, 20).
1a) Polyester sturdy stripes are used to reinforce the shoelace eyelets. They are added or maybe even knitted directly while the upper is 4D knitted.
2) Injection-moulded EVA sole without rubber inserts. "The injected midsole has a thicker, smoother skin than a compression moulded EVA midsole. The injected EVA midsole has a more uniform density and better detail definition than the compression moulded EVA. This unit is very light and very flexible but wears quickly. The injection moulded tooling has a high production rate but the moulds are over $3,000 per size and require an expensive machine" (Motawi 2017, 65).
3) Moulded TPU or rubber logotype on fabric.
4) Laces with aglets. A shoelace consists of only two components: the woven tape that pulls the shoe tightly together, and the aglet, the hardened, taped end that fits through the eyelets.
5) Strobel lasting. This connects the upper and liner.
6) Cold cemented construction process. Used to assemble the upper and sole, as with all running shoes. The sole has a glued reference layer to ease accuracy when matching an upper. It was very difficult to disassemble the upper and sole, so the process may be direct injection, but it could also be due to the texture of the knitted upper.

Costs:
4D Knitting Cost.
The cost depends on the number of colours and fibre types. "A single colour polyester fibre design may cost $2.50, while a multi-colour, polyester spandex combination can cost $7.50 per upper" (Motawi 2017, 20).

APPEARANCE:
Lightweight. Breathable. Supportive.
Overall quality of appearance: as with all Nike products, it is all about the performance and their shoes communicate that.
Besides the colours and large knitted logotype, these are one of their most aesthetically frugal shoes produced to date; thus, although hi-tech and dynamic, they still look like socks.

Colour / surface finish:
Multicolour knitted upper in blue, purple, pink and black. The colours might have been chosen to represent the athletic non-elegant aesthetic; alternatively, neon colours were in fashion then.
Glossy finish; highly textured and chiselled because of the mesh knit.

Graphic identity:
Features a massive characteristic Nike logotype on both sides of the upper. The graphic identity is visually loud. Black logotype and black tongue only attract further attention.
On the later Nike Freeknit version, the company name is set on the back sole heel portion at mid-height.
Moreover, a small logotype is engraved at the sole bottom, 2/3 of the way up the medial portion.

Qualities & Character of the product:
Aesthetic qualities: textured, rough and rather sturdy upper, very light weight.
Perceived attributes: high-tech (4D knit) and rugged (mesh, knit).
Emotional qualities: feels reliable and seems comfortable because of the sock-like appearance, which is reminiscent of wearing socks.
Overall, it feels like it is meant to be an athletic shoe—definitely not elegant, very casual—and because of its high-tech appearance it promises reliable performance. However, as it is a running shoe, at first glance it makes me doubt whether it will provide adequate support in the heel area and whether the fabric is sturdy enough in the toe portion.

Features:
Lightweight. Breathable. Supportive.

Shortcomings:
The bottom sole catches small pebbles and rocks, which are difficult to remove.
The polyester shoelaces are very slippery and therefore the shoe unlaces very often.
The sole has only incuts but not outcuts for flex and therefore does not have a good grip on slippery surfaces, especially once mud gets into the cavities. It behaves like a bald car tire on the mud.
This Nike Flyknit version has a small heel stiffener but the upper has torn at the heel portion, where it was bonded to the sole. This is because of wear and tear from material stress. The latest version is made differently, with a waved heel part, knitted reinforcement and glued ellipsoid-shaped heel reinforcement (it feels like a nubuck leather).
They look very athletic and are not elegant; therefore, they might be mostly suited for sports and outdoor activities.

Strengths:
Unique sock-type upper made of yarn, which reduces the manufacturing waste.
Very comfortable (my personal impression as well that expressed in the customers' reviews).
The waved sole on the heel portion (latest version) allows for them to be easily slipped on (like slippers) without the need to lace them up. Such a feature is great while you travel; for instance, when going to the airplane toilet or while sitting for long hours in the plane when you do not want to take your shoes off.

How this product could be improved:
Laces could be different, as the existing ones are made of a slippery material.

Allbirds Wool Runners

Function:
Lightweight, sock-type minimalistic everyday shoes. Although they are called runners, they are closer to lifestyle shoes. They can be used with or without socks.

Use:
The upper is closed with shoelaces.
When the shoes are not being used, the upper cannot be stored flat due to the heel stiffener and S-shaped sole silhouette and its high heel volume.

Form:
The shoe form is organic, with a silhouette typical for sneakers. It has a larger volume and a draft at the back and across the metatarsal / girth ball portion, which has likely been used to stabilise the gait.
On the inside of the sole there are two types of recesses: four oblong stripes along the girth ball to flex the sole; and three rows of rounded recesses, from the arch to the heel portion, to change the density, to cushion and to remove the sole weight.
The bottom part of the sole is rounded along the edge and has a dotted perforation and very slight recess lines along the bottom. The lines are spread evenly and follow the curvature of the sole and the axis of the ball girth and heel ball portion.
Due to the sock-type upper characteristic—namely no toe stiffeners—the toes are visible through the fabric and deform the fabric in this portion.

Human factors that have shaped and influenced the form are the human foot shape—called the last form—and manufacturing processes, such as lasting (shaping the upper on top of the last).
Due to the sock-type knitted upper characteristics the same shoe will look different on different types of foot, with the shape of the foot exposed rather than hidden. Therefore, the shape of the toes is visible through the upper, deforming and holding that shape throughout the lifespan of the shoe.

Weight:
231 grams for a shoe

Size: W US8, UK 5-5.5, EU 38
Sole dimensions: 105 mm x 280 mm x 35 mm (based on the size W US8)
Sole thickness: varies from 5 mm to 35 mm.
The width is wider than an average shoe to accommodate a wide variety of foot types.
It comes with multiple EU/US standardised sizes, but is only offered in full sizes.
The size of the embroidered eyelet is 12 mm.
The laces are 5 mm thick.

Parts:
1) The bottom part: shoe sole.
2) Lasting board.
3) The middle part: insole.
4) The top part: upper part with holes for laces.
5) Upper lining.
6) Toe reinforcement (silicon or rubber).
7) Shoe tongue.
8) Tongue lining with sizing label.
9) Tongue belt loop.
10) Tongue border tape.
11) Heel stiffener with foam.
12) Heel lining.
13) Two logotypes.
14) Shoe laces.
15) Embroidered eyelet stitch.

Mechanical design:
The moving parts are the shoelaces and removable insole.

Materials:
Midsole: SweetFoam™ (Brazilian sugarcane), which is made with the world's first carbon negative green EVA.
Upper: ZQ Merino wool.
Insoles: "castor bean oil, which emits less carbon than petroleum-based foam, and ZQ Merino wool for a cushiony, moisture wicking, and odour reducing insole".
Laces made from recycled plastic bottles.
The rest of the components—including cushioning foam, Strobel sock and the upper backing—seems to be polyester.

Manufacturing processes:
1) Injection-moulded green EVA sole.
2) Laces with aglets.
3) Embroidered eyelets on the upper.
5) Strobel lasting, which is commonly used in athletic shoes for flexibility.
6) Cold cemented construction process. Used to assemble the upper and sole, as with all running shoes.

APPEARANCE:
A material made up of strong yet lightweight strands of yarn that have been woven into a one-piece upper, securing the wearer's foot to the shoe platform; this might have been used because of its strength.
Polyester laces, possibly used because of its strength.
Moulded or glued TPU logotype on the tongues.
A sock-type upper with one stitch at the heel back portion; made of one outside piece and attached with a double-stitched shoe tongue.
The upper is a sock-type collapsible and flexible part. The toe portion wrinkles causing an unpleasant appearance. When the shoe is not being used, the upper does not hold the shoe form well. The reason for that is that there are no toe and heel stiffeners as in other shoes. A structure and stretchiness is achieved by different knits within different parts of an upper.

Graphic identity:
The outside of the sole has a logotype on the heel portion and on the tongue.

Critique:
Although they are called Runners, they are lifestyle shoes that do not give enough support for sports.
They are not suitable for any slippery surface as there is no sole traction.
The vamp always catches mud, especially when it is wet outside.
Wool Runners are too hot for some climates and for the summer months.
The foot shape is visible in the fabric, especially in the toe portion, where it holds the impression of the user's foot.

Appendix 2: Summary of DN In-depth interviews

The responses collected from the 10 interviews undertaken between 2017 and 2019 presented a diverse range of positions and opinions. As respondants were reflecting on their own lived experience, each interview provided an intimate insight into the remarkably diverse digital nomad group.

Findings:

- Because footwear is bulky, DNs tend to wear their heaviest or bulkiest shoes on their feet when travelling, even though that compromises travel comfort.
- When asked about their travel experience, they often mentioned the impracticality of shoes when changing zones and climates and during long hours at the airport or on the plane.
- 80% of respondents acknowledged difficulty storing or accessing their footwear within their luggage, especially when shoes are wet or dirty.
- Most respondents, when asked about their footwear usage during travel, indicated that they have started to travel with one or two pairs of shoes on average. They admitted that the most important criteria for travel shoes was utility and a light weight. Their footwear choice was highly conditioned by the upcoming trip destination, and rarely considered in a long-range perspective.
- Although I had assumed that DNs wardrobes were defined by minimalistic characteristics with generic, one colour, no-pattern garments allowing for the mixing and matching of small quantities of clothing, I could not see evidence for such a tendency among the respondents.
- Respondents admitted that having to choose limited pairs limits their on-the-go lifestyle.
- 50% of respondents would like to have at least one additional pair of shoes with them.
- 30% of those interviewed have purchased another pair (or more) of shoes when travelling. The reasons were varied: for an unplanned multi-day hike, a business meeting and for a sports activity. However, the respondents were concerned by the addition of this luggage item due to baggage limitations. They considered getting rid of overweight items by sending them unaccompanied to the traveller’s country of origin.

Interviewee quotations:

“I never know how to pack my travel shoes. My last backpack had a special shoe compartment. The one that I am using now does not have it and my shoes always live with my t-shirts. As you can imagine, that’s far from ideal if it rained before.”

“I tried to follow online-travel hacks such as a minimalist wardrobe but it is difficult to find the right footwear to match it, as for me it is always weather dependent. I often ended up wearing hiking shoes in the city to give me comfort and good grip but I do not like how they look. And I would like to fit in.”

“I travel with Nike Flyknit, which I use mostly in the city, and with Salomon Ultra Hiking Boots as they are fairly light for my long hikes. I also have a pair of Havaianas flip-flops around for showers and the beach.”

“If I am taking an airplane, I travel with my hiking boots on my feet. It annoys me to take them off at the security check but at least I do not need to pay excess baggage fees. If I take a train, I hang them over my backpack but it is not particularly convenient to walk with them like that.”

“I wear Vivobarefoot Primus Lite in black. I liked the idea of being barefoot although I must say it took me a while to get used to it. It is still not easy for me to walk on rocks, pebbles… I always feel them. They are lightweight so they are sort of good for travel, I guess.”

“I take my sneakers off on the airplane or [when] lounging in the waiting room. I wish to have some sort of slip-on shoes to walk around or at least to easily fasten them.”

“I usually travel to tropical zone countries so my most used shoes are Birkenstock sandals and Toms flats. Both are breathable but Toms wear out very quickly. I also have a pair of sneakers around for monsoon weather or when travelling to my UK home-base.”

“I work on a tech start-up from a co-working space. As it is a tech hub as well, we get quite a lot of guests in there. I usually wear casual boots or comfy sneakers depending on the client, I guess. During my lunch break, I often go for a jog so having an additional pair of shoes such as running shoes is always beneficial as you don’t want to be sitting in your run or gym shoes all day.”

“When I started travelling as a digital nomad, I did not know what to take with me. I followed my gut feeling [for] what I might need on my first trip rather than thinking about future plans, really. As Portugal was my first destination and I knew that I would do some climbing there, I took all of the climbing equipment, like lines, bouldering shoes. You know, all of this stuff that

I needed for that activity. A natural way was to take it with me as I like doing it but of course my next travel destination was tropical... no rocks, nor mountains. So, I quickly realised that holding [on] to all this equipment would be too expensive. So, I sent all this back. Funnily enough, I bought hiking boots instead. Now I am enjoying trekking instead."

Appendix 3: Transcript of interview with footwear designer Jamie McLellan

The conversation has been edited for readability.

Interviewee: Jamie McLellan – Allbirds designer
Interviewer: Magdalena Karasinska
Observer: Tony Parker
Date of Interview: 18 October 2018
Via: Skype

Magdalena: Hello Jamie. Thank you for finding time for a chat.

Jamie: Hi Magdalena. I heard something about your PhD project. I am always happy to talk about footwear.

Magdalena: Great. Maybe I will start by outlining the brief of the project, which is a conceptual proposal for a multipurpose, transformable shoe to satisfy the lifestyle requirements of contemporary digital nomads (DNs). The aim is to design a shoe that would be easy and convenient to pack and also transform to support a variety of activities, occasions and purposes that would offer useful and desirable design benefits to digital nomadic lifestyles (working remotely while travelling). The lifestyle involves unpredictable travel, digital work done remotely or on short-term contracts in different locations, typically internationally and over extended periods of time; hence the name Digital Nomad. It has an aesthetic derived from urban fashion, pop culture and plug-and-play work culture. So, the general idea is to look at the footwear components and explore modularity as a utility for variable purposes that DNs encounter. And within that, to also make it easier for disposal. What are your thoughts about the idea?

Jamie: Firstly, the idea is very close to my heart because it is very close to what I did for my major project when I studied at Massey University. I don't know if Tony mentioned this, but when I was doing my major project, I did shoes that were designed to be kind of component based: partly for activity, partly for functional reasons and also just for longevity as well. So, I designed shoes that were based around the ideas of socks and the importance of socks. If you can imagine that, it was like a sock within a sock. The outer sock was sort of moulded on to it. I cannot remember how exactly it worked but the internal sock was against your skin and it could be light or heavy or tall or short and then between two socks was like a footpad, which was like a cushioning component that could be customised. And it was designed this way so

that these shoes could be used in active pursuits, hiking and that sort of thing. Yeah, so this is an idea that I like. I approve it and it is something close to my heart.

I think that there is definitely something that makes me nervous about the idea of shoes that are transformable. Having in mind that it is close to my heart. My biggest fear is that when you try to design something to do a number of jobs it ends up doing none of these jobs well. You know what I mean? It compromises everything. That is my biggest fear. So, I would question what does transformable mean and is that the right thing to pursue here. You could say that my shoe that I worked on was transformable but it was more around the idea of socks that change not the shoe itself. So, I am not saying that it is not the right thing to do but again… to my point, my fear is that if you try to make one shoe do everything it's not going to do any of them well. So, I would be very aware of that.

And I would also just try to understand what exists now for these people? What are they using now because my sense or my suspicion is there are products that they are using to do a variety of things? For contemporary nomads, whatever you call them, backpacking and travelling, being very active, and also socialising and also travelling long distances and in the air, and on the ground, and on the boat and all these things. And I suspect that there are people who have shoes which are actually doing many of these tasks. Possibly not doing them all that well but that might be a good place to start from as well. If it is a pair of Nike Free and if it is, how would you engineer them differently. What do they do that they do not need to do and vice-versa? Maybe this is an interesting perspective to take.

Magdalena: I am aware that it would be more as a generic shoe, which hopefully will bring an improvement of what DMs experience travelling with currently available footwear. For instance, it might be a grip improvement as you mentioned for hiking and so on and so forth. The biggest issue that I have found so far, is that shoes are bulky… it is difficult to actually pack them into a suitcase. And I guess modularity could effectively help with that as well.

Ok. What technologies do you think are important for shoes of this nature?

Jamie: This is a good question. From the top of my head, I don't know. No, that's not true—I definitely have an opinion. Although I am very fortunate to have feet that are kind of forgiving and I have no foot issues that a lot of people suffer from. So, my experience of shoes, personally, is that they don't need to be particularly complicated to do the job I need them to do. However, this is not always the case and I need to be sort of wary of that. Certainly, it felt like that in my opinion.

Coming back to when I was designing my own dream shoes, my opinion was that we are led to believe shoes are these really complex, highly engineering things that need all sorts of patents, devices, trademarks, kinds of names and clever materials and so on. Actually, this is

misleading and in some cases what I was finding was that it was actually causing more trouble than it was solving. A good example was that, you know, a lot of these shoes that are highly cushioned start to take away the perception of the foot and actually can exacerbate the injury. So, my point of view at the time when I was studying, and it holds true today, is that actually shoes can be a lot dumber than they need to be. And they can have less technology than maybe we are led [to believe] they should have. Unless you're trying to shave a twentieth of a second off a marathon time: we can give back the full credit to Nike for doing such amazing work in that space, that sort of super high-performance space. Of course, there are very, very smart and important things you can do to help super athletes going even further. But I think for the mass population it doesn't quite work that way.

However, I would say that the technological components that need to be in there are absolutely around where you: how you build these shoes, where you get the materials from, what are these atoms that you are constructing these things out of, where do they come from and have you sucked them out of the atmosphere or have you dug them from the earth? I think that is far more important for the masses and especially if you want to design a product which is more general and less specialised. In terms of specific technologies, personally I would focus on the way you build the shoe, with the assumption the knowledge exists around how to make a comfortable shoe which is gonna be supportive and have the right cushioning and not give knee and back pain. I think all of this kind of information probably exists and you can probably reverse engineer some of it out of the shoes that are already on the market.

Magdalena: So, the good question now will be, what makes comfortable shoes? How have you defined comfortable shoes? How do you test for comfort?

Jamie: This is a great question! Because I think that comfort is a multi-dimensional experience. It's the initial sensation of a shoe but also it is how that shoe feels after twelve hours. It's how you feel standing in the shoe and how you feel walking long distance, and doing any number of activities. It could be softness, it could be breathability, it could be insulation, it could be waterproofing, it could be rebound and springiness, it can be close sensation of the earth under the foot. Comfort is defined largely by the environment where you are using these shoes. I don't think there is any single thing that you have to do.

I can certainly speak from my experience with Allbirds, to what we do to make our shoes more comfortable and I think it is several things. In the very beginning we didn't know how to make shoes so we worked on the assumption that any seams we had on the shoe—you know, we didn't know how they will behave on the foot, so we worked on an assumption—would likely be removed; that is, we should try to get as close to seamless as possible to ensure that we have any good chance at making our shoes comfortable. I think that was certainly the right

assumption to work towards or to work under. I think what we were finding is that our shoes are quite unstructured, as opposed to many traditional sneakers, which means that if you are not careful, they can be unstable but on the flip side, it can mean that they are very forgiving and very accommodating to a wide range of foot shapes and sizes. So, I think, those are the things in terms of how we designed the upper and the material which went a long way to making our shoes comfortable. So, no seams and also actually leaning into the shoe that was a little more forgiving and elastic if you like. Less rigid.

Obviously with our shoes, we have wool shoes and we have shoes that are made of eucalyptus fibre and they are comfortable in different ways. The wool shoes are very cosy and soft and warm and the wool has lovely temperature regulation and moisture regulating qualities. So, moisture, heat and softness are all factors for us when it comes to comfort, but then again, wool shoes tend to be a little warm in the summer months so we have a mesh eucalyptus knitted textile which has slightly different qualities. It is more breathable, and the eucalyptus fibre is known as Tencel. I think it is called hydroscopic. Actually, the minute you touch it, it pulls the moisture off the surface of your skin and so it has a cooling sensation, which is a momentary type of comfort and that's continuous through the wearing. But I would say that our wool shoes wouldn't work in the Arctic Circle or even far South or North. To the point that you can feel comfort and they still get cold and wet. So, it kind of depends on where these things are going as to how you define the comfort. But that is sort of what it meant to us and how we've achieved, I guess, the reputation for being comfortable.

In terms of more, kind of specific, anatomical and kind of podiatry type comfort, I am not the right person to comment on that. We've just focused on trying to keep, I guess, a foot profile which accommodates as wide range of people as possible. But there will still be people [who] will find our shoes are too flat or have too much arch or are too narrow, too wide. But we've tried to stay sort of general. But I think most shoes companies, you know, that shoes were produced long enough ago that that information exists as to what this average is. So, I would say that you can find that by buying a shoe from the shop and taking some measurements.

Magdalena: Jamie, Tony is here so I will switch the camera to say hello.

Jamie: Hang on, I will do the same. Oh, you look like you are in a prison cell or some sort of interrogation room.

Magdalena: Yes, we are. We are at Massey's meeting room—not much sunlight here.

Tony: Good to see you Jamie. A couple of years ago, you came here and you've spoke to a group of people here at Massey at the Pit and I think I asked you a question but you actually really didn't answer my question, Jamie. So, I will have another crack at it, mate. I would just like you to help Magdalena to be able to understand the design process that you

use. Because we all have our own ways of doing things. You know some of them are doodles, some of them are renders, some of them are make, some of them are just sitting and thinking and then God knows how we sort of visualise from that position. So really basic pragmatic stuff. How do you get the ideas and then how do you move from having something that it is in your mind or a really raw doodle to something which is some kind of prototype?

Jamie: Interesting. That is a very deep and personal question. I will try to answer better this time. I mean, I think, for me, I feel very fortunate I guess to have a very clear sense of what I believe in, the product that I have any involvement with should, not look like, that's the wrong word, but how it should be conceived and what kind of ideas it should embody. There is a process and I will get to it in a minute in terms if it's sketching or rendering or making. But I think for me really, and I think I've learned this… I would say that what really crystallised for me is my deep fascination with designing furniture. Furniture as an object, for me, is about trying to look at the object, understand what is its sort of functional purpose or what kind of problem that it's trying to solve through that function and then to try to figure out how could I do it with the least amount possible. What is the engineering of this thing that actually doing that job or functioning in the way it is intended? What is this piece of engineering, how can I strip this away to make a reduction and just boil everything else off so that it's left with the essence? What is that? What does that look like and, then, how I can take that? Is there anything interesting in that alone [that] is fascinating enough to really celebrate? And if so, let's do that whilst making everything else as quiet as possible. And making that (usually) one key engineering mechanism or moment, making that really, really beautiful. And leading everything else to sort of be quiet. Because what I find is we [designers] tend to like to overdesign everything. We want every opportunity for design, we want to infuse design and that's only natural. And what I feel like sometimes is not only do you end up designing just for the designers, you end up confusing the messaging.

So, I really believe that if you can find that one, singular element that is really special and is the core engineering or function of the object and find the way to celebrate that, and it make beautiful and maximise it while minimising everything else, then you end up with a, I think, not only conceptually interesting object that has a very clear narrative but you also end up with something that the consumer can understand in a very easy way. So, I feel like every single object that I've touched is very clear for me to say in a one-line story: what is that this object celebrating— an elevator pitch, if you like. So, [with] the wool shoes, it was very clearly all about the wool. So, the wool was such a magic product and so unique and so unusual to put on a piece of footwear, that it makes sense not to do anything else. To do the least amount possible everywhere else so as not to confuse the messaging and to make the biggest impact and have the most resonances. I am not saying to ignore everything else—every other little

detail needs to be considered—but it's just [that] every other little detail is in service of that bigger celebration, which is the wool.

And so, whether it is a piece of furniture, and the structure that holds this piece of furniture together, whether it is a beer tap, and what is that purpose of that object's existence, maybe it is a billboard for the brand, whether it is a kayak which needs to cut through the water and it becomes beautiful itself. You know, that's the way I look at the objects. It is not just skinning the object, it is not just styling the object but it is about kind of creating a narrative around the beautiful engineering of an object, or the beautiful material qualities of the objects. Is that answering the question? That's an approach, I guess.

Tony: Yes, it definitely answers the question at a kind of philosophical level and I completely get where you are coming from. Now let's talk about what sort of, kind of much more pragmatic, methods and processes you use? Obviously, there is a lot of going on in your own mind, Jamie, and all designers are like that I am sure, but what fascinates me and I think would be interesting for Magdalena is to help her find her way to understand that space between imagination and realisation. It is the thing that really fascinates me. So, I am interested in what sort of tools you use to externalise your ideas and to realise them to the curtain level? When you can leave them in the hands of highly skilled others, either engineers, technicians, whatever they are, to actually get on and then what you have to do is then have a close relationship with those people to make sure they are not kind of allowing the impurities, if you like, to kind of getting to the baking to make this thing come out the way it was intended.

Jamie: What I absolutely love about my training in New Zealand at design school—because I really believe that it goes back to what set of skills we were infused with—is the idea of looking at the problem, almost without any external influences. I think we were encouraged to think completely innovatively, in completely novel ways. We were taught to think for ourselves and in a way, I feel like, it doesn't quite exist in other parts of the world, and for that I am super grateful.

However, I would say that there is something that happens abroad, and in the other way I think that it is unhealthy, that is why I think actually [there] is a tension, where there is iterative way of thinking that students are taught abroad, which I think can be really unhealthy because it doesn't set you up with a way of looking at the problem with a very pure and unique setting. However, I do think that there is something really important about the idea of leapfrogging. So rather than trying to do everything yourself—and I feel like it is kind of tied to our existence as a country, the nation at the bottom of the world, where for a long time we had to do everything by ourselves—I think what the Europeans are particularly very good in doing is iterating on

things that have gone before or leapfrogging on knowledge that already existed, rather than finding knowledge themselves from scratch.

So, I think I've got pretty good at understanding that and there is also a very fine line also where you are either leapfrogging on somebody else's knowledge or you are being derivative of somebody else's work and you really need to be careful not to fall into the latter when you are actually taking somebody else['s idea] and deriving something from that. You have to be very, very aware of that because otherwise you risk crossing into plagiarism, almost. So, that's not to suggest you do that at all but I just think, there is huge value in not doing all the groundwork that somebody's done before to just get to a baseline that's already out there. You need to learn to take existing knowledge and that's why I encourage you to go and figure out what works on a shoe that it is already out there that these urban nomads are using now and how you can leapfrog from that, rather than starting from a blank piece of paper and trying to imagine something from scratch. Because I sense that you will speed your process massively.

I feel like that's not really answering the process, but on the other hand it is about going and really immersing yourself in what exists and then using that. And what you might find is that it happens subconsciously, and you don't even realise that it's happening, but just by being aware of the landscape of solutions, you will start to see the white space for new solutions or opportunities to put some of these ideas to work in another space.

So that's how I feel and my biggest regret at university was not really paying attention to design history as much as I realise now that I should have. And I know that it was kind of my fault for being young, naive and I always feel like I was catching up to what this whole design gig was about when I was at uni, or maybe design history wasn't made interesting enough for me. I do not necessary think that this is the case either or maybe it wasn't clear to me how important it was as a designer going forward to understand what's going before so you can leapfrog rather than learn it all again from scratch, when somebody else already learned that.

You know, I lived in Italy after I worked, you know when I was a very young, junior designer and I had a boss at that time who was constantly showing me stuff and constantly pulling out references and constantly making me aware of what was happening all around me and it was super stimulating and at that point the penny dropped. And wow, there is a whole world of richness and discovery here. I was going out to get inspired. That starts subconsciously informing the way you make decisions and the way you see problems anyway. That's the process. I think that "hacking" is a word I use a lot, but I feel like hacking is something that's really important. It is so hard as a designer to, the temptation is always to hold on to your ideas or not share it with anyone because it is like exposing yourself, like standing in front of the room naked. I always tell clients and people that it is a first idea and this first sketch or first

bad prototype or first hack things. There are a hundred excuses you have to make for them. However, it's so important you get it out there and you do that process and you expose it to people rather than waiting and waiting until one day it's perfect, because it will never be perfect. It will get to production and still won't be perfect.

So, my process depends on the object oftentimes as well, but I would say that with the footwear there's definitely some hacking. There is a lot of making, and it also depends on the type of footwear as well. I was just thinking about the flip-flops. There was a lot of hacking and it was really, really valuable hacking. And to understand the comfort of these very minimal shoes. You know, we would make, and I am not exaggerating here, we probably made 150 different flip-flop prototypes of different types of construction and configuration and connections and terminals and buttons and so on. It is very crude: we bought existing flip-flops, we ripped the straps and we made our own webbing and 3D-prints and foam. And I think that in isolation each of these objects is pretty ugly or probably very crude or raw but what is really beautiful is when you have two hundred of them on a table: the texture of this exploration [could not be] more beautiful to me. Flip-flops that have been worn to death and we have got dirt and grime and I think those are a beautiful object. You photograph them on a white backdrop and it looks like an artifact from millennia ago. And they have the same kind of patina of experience or something. I think hacking is very important. That's why I would encourage you to go and to get out there and find out what is working very well, and try to hack that better or do the tasks you think it needs to do. For me personally, I do a lot of drawing. I often joke because I know that my drawing is nothing like it used to be when I was at school. Tony, you would cringe if you would see it.

Tony: No, I wouldn't cringe: it would be fascinating.

Jamie: I actually, literally sometimes says "Tony Parker would literally hate what I am drawing". And it is really funny because my first drawings, when I worked for Fisher & Paykel and I had a boss who draw these crazy chicken sketches of how the assembling is gonna get there and how these fridge gaskets would interface with a door which interface with another component. I used to think that there were very bad drawings but it somehow fascinates me and now I draw exactly like that guy. I think often it is about getting the idea out as quick as possible and capturing it and explaining it.

We still do a lot of renders; we start in 2D and [use] a lot of Illustrator. I love how much depth and texture and colour you can get and very quickly put on the image. Sometimes it looks a bit almost like a collage but when you blur your eyes you can get a sense of texture and outsole and with more time you can start putting some shaping and some highlights and some shadows. So, we use a lot of that. So, I think that really it would take the place of what

would previously be marker renders for me. And then, 3D is something that we use a little of. It is interesting actually, our suppliers use a lot of 3D, so we are often getting visuals back from suppliers in the form of digital models, which you can spin around, which have texture and stuff like that. But we do not know how to do that in house. In terms of hard object stuff, we still do a lot of solid work and 3D renders. I can do a bit of CAD, I am not really good in organic stuff, so we have people who do that stuff for the outsoles and for visuals. So that's about the process. I've got some little sketch pages which I can share with you and which might give you a sense of what is in my brain, how my brain works, because often these are mixed with questions and text and notes to myself. They look like a beautiful mind, kind of downloaded. And Tony, you need to promise to not reverse my degree.

Tony: That's the thing that fascinates me. I do rendering and stuff, sometimes I use marker because I still find it really quick. But sometimes I use a programme called Infinity Designer which is a bit like the latest version of, an up-to-date version of Free Hand. I found it so completely frustrating that I've left it behind and got this programme. I use that to kind of enrich the chicken sketches which I do and also, I agree that the faster you can get to scale, the actual scale that you are working with, the more realistic your decision making and your understanding the issues you are dealing with is. And getting there fast.

Jamie: I think that's a great point. I feel like I've made some horrific errors by staying on the computer too long. Like really bad. Like huge commitments to big tools that work in completely the wrong scale.

Tony: They are called "boating" and we've all got them in portfolio. You talk a lot about comfort and you talk a lot about the physical nature of comfort, but if you can, could you talk about the aesthetic? An idea of someone's identity and stuff like that.

Jamie: Yeah. Interesting. That sounds like a curly question to answer.

Magdalena: Having discussed the design process, could you maybe tell us something about the material selection or its development. What sort of processes do you follow on the materials that make Allbirds known? As far as you can talk about it, of course.

Jamie: There are not such secrets that you can give away and all of a sudden you can go and develop your own material. I'm not so worried about that. I can't give you specific figures, numbers or anything.

I'm trying to figure out what is useful to you as well. But we obviously have a team here who are focused on sustainability and on material innovation and they come generally from the sciences or an engineering background. There's a couple of things that I've learned since I've been here with Allbirds. Firstly, it feels like we are in a time where if you can dream what this material would be, there is a really good chance that you will be able to find the sustainable

solution for it. What I've learnt, and it is kind of disappointing and exciting at the same time, is that companies spend decades developing sustainable versions of materials that they produce. You know, the materials that do not use petroleum chemicals, that don't produce the wastes or hazardous kinds of bio product. However, they tend to be expensive, and because of the greed and the cost structure of companies past they haven't be able to employ them. And what's so lovely about our position is that, firstly, we don't have—you know we started from nothing two years ago, we launched, we didn't exist over two years ago and we don't have a whole infrastructure that we try to support—thousands of hundreds of stores around the world yet that have the whole sale costs' structure tied to them. So that means that we can sell shoes directly to the consumer. What I'm getting to is that we can spend more on materials and sell the shoes at the same price. Compared to somebody who has the wholesaling, like to Footlocker or a sport chains. It is a little disappointing, because you realise that there are a lot of these materials that have existed for quite a long time and they just haven't been used because they are too expensive and the companies are too greedy and consumers are too greedy as well. Consumers do not want to pay more for a material that is biobased or has a low carbon footprint, or is recycled or whatever it might be, so it is depressing but at the same time it is super exciting and it means that there are all of these incredible materials that are actually really good for the world. If not good at least better and we can use them without compromising the look and feel of the design. So, the assumption might be if you can use something that is green, or biobased or whatever it might be it's better for world. The assumption might be that it's gonna be inferior, aesthetically or whatever, and it's just a wonderful realisation.

Magdalena: I had a similar impression after doing my research on biomaterials. And I am aware that companies have explored material developments for years, and clearly you can spend a whole PhD solely on that topic. I guess, my question is, how do you select the material conceptually? Is there a material that exists that it is worth looking at?

Jamie: Absolutely heroic materials have existed for years. I think what is innovative about the wool is the fact that we re-contextualise it to use it in footwear. So yes, there's been quite a lot of development and making it work; however, the knowledge around what we need to do to manipulate the material to work was quite clear. It was just more trial and error. Not develop the material, but kind of design it, I guess. And it is the same with Tree Shoes, which are made of eucalyptus fibre, which has existed for quite a long time. There are couple of different forms: there is rayon (I think it is called), which is sort of the same fibre, I guess, but the manufacturing process is unrestrained as it uses a lot of water and energy; whereas the Tencel fabric, that has existed in fashion for quite a long time, is a closed loop system where there is no wastage and all chemicals are recycled. So, it is much better for the environment.

That material existed for quite a long time. It just hasn't been used in footwear. So, you know, you might find that you don't need to go and figure out how to turn mushroom into leather. You might find that there is something out there already that's good.

One of the things that I learned here about sustainability, is that you are much better to focus on energy used for the production and in the materials rather than the energy used in the lifecycle or recyclability or biodegradability. You're better off focusing on the front end and what the carbon cost is. Cotton is an interesting one. You think that cotton is a natural material but is uses tonnes and tonnes of water—so much—so it can be very problematic. So, it is not always as simple as [if] it is a natural material, [then] it is better than synthetic. It is a complex edit.

What else? All of our products that we produce, we have the whole team of material development which focuses on yarn and polymer. People are looking at the yarn that we are using. Everything that we produces is knitted in some way, shape or form. The wool is knitted in a circular knit ended up as a textile. The tree shoes are 3D knitted on the digital machine where we just knit the upper with a bunch of the spools of yarn.

We spend a lot of time looking at the knit structures and the way they perform, and the way they hold their shape, equal to the way they stretch and recover, or the way they breath or insulate. Or we are looking at how durable they are. How they hold the colour. So, it is sort of a microscopic way of looking at our design. And then the polymer team is looking at outsoles— the rubbery components of the shoe—and looking at how best we can drive carbon out of there. A good example of that is the Sweet Foam that we use, which is the sugar cane derived EVA foam, where instead of using ethylene petrochemicals, we are using ethylene that comes from fermented sugar canes from Brazil. Again, it sort of comes back to that we are not re-inventing the materials here but we are actually finding a way to get the ingredients for the materials from a better more natural source. So, with Sweet Foam you effectively get rubber, which is no different to what you have on a pair of Nikes. It is just that here, all the carbon molecules in it have come from growing plants, which effectively suck carbon from the atmosphere, rather than taking the carbon molecules from oil that has been under the ground for many years.

Magdalena: So, it is a carbon-negative material?

Jammie: Yeah**.**

Magdalena: What I get from your footwear design process, it seems to me that you almost treat design of the upper and outsole separately? Is that right? And if that is the case, what do think about the adhesives, such as the toxic glues, that are used in the footwear industry? This seems like the last piece of the puzzle that doesn't fit Allbirds' approach. And I

guess, my thinking about the variety of components, treating it as a system or modules, was also coming from the fact that glue is problematic in the footwear industry. Is the glue something that you are also trying to re-consider or address through Allbirds design? What sort of direction do you think Allbirds might take in this area?

Jamie: It is something that we think about. I think that there are two ways of doing it. The first one is mechanical connections, like stitching, or you can mould directly onto the material. So, you are sort of skipping the gluing phase. You build the shoe upper and then you put the mould over and you inject directly onto it. This is not unique to us. It is something that has been around for a very long time and there are traditional Spanish shoes, for instance, which use it all the time. It just requires different times of tooling and a different type of process and not all materials are suited to it. For instance, if you use expanding foam, which has a large expansion rate, then it might expand 140% or 150%, so you can't do it directly onto the material. Where it is a sort of one-to-one type of material where you mould it and it doesn't expand drastically then you can [apply it] in the same mould onto the upper of the shoe. So that's the interesting one. And obviously, you can stitch it on, which is very traditional. And I guess you are limited to the strengths of any one of these stitches. Even if any of these stitches fail, you can always repair it. It is reparable, I guess.

Magdalena: I guess that there is also quite a bit of discussion around artisans and cobblers as possessing forgotten skills. Nowadays, it is cheaper to buy a new pair of shoes than actually repair them. Is this something that you are looking at; that is, re-soling footwear at some point?

Jammie: I guess some materials are better suited to be glued than mechanically fastened. So again, the same as foam expands and you can expand on the upper, it is not so easy to stich foam material onto the upper either. So, you really end up with glue. So, for us is more thinking about driving out all of the nasty carcinogenic solvents from that glue. And so it's more about the workers, than the environment, really, to make sure that they are not exposed to anything. There is also a bit of off-gassing that happens once the customer has the shoe, which is probably a bit negligible by the time it got to them. Otherwise, I personally I don't know anything beyond that. You might want to talk to the material person. It is not my area of expertise.

Magdalena: Ok. I don't want to hold you too long, so here comes the last question about the pitfalls. What should I avoid when designing footwear? Where should I not go? What should I avoid? And also, could you tell me something about your university project, which you said was a modular shoe.

Jamie: I guess, my project at school was more about having a point of view. It was not necessary to design something for the production. But I designed something that actually gave me a job and it was my last opportunity to design something truly conceptual before I had to go off and then design the things that actually have commercial value. I don't think that was the pitfall, but I clearly remember that at the time I realised that it was the purpose of design. So, it wasn't to be conservative or anything like that, wasn't to be realistic even. It was actually to really dream far of mind. That was kind of liberating. It is so funny; it was like 1999 and digital cameras first came out and I've got some photos of it, which was like 300 pixels. I think I still have it somewhere. If I do find it, I will send it to you. But seriously, they are very strange shoes. They were like inspired by goats and they were based on socks. They were pretty wacky. But to me it was about a dreamy concept. And I sort of feel like, the more… strange I made them, the more longevity they have. If I had made them too tight to trends, that point in time—1999—then by 2003 they would have been outdated. So, what I realised is that the weirder I could made them, the longer they would last in my portfolio, and they kind of did. But it's been so long, that I can barely remember the process.

Having the really strong point of view on the industry was very helpful. For me, it was like ok, these Nike shoes with their big airbags, all the technological space race that was happening at the time, and I guess, we are seeing it happen again, it was just marketing. And I wanted to design something that was actually the reaction against that. And that was really helpful. I think having your point of view is good beyond just having a target market. To have an opinion of what is wrong, and what you would like to fix. That can be really helpful. And I would check that you are not trying to fix everything; rather, focus on one thing. So, if you are trying to design a shoe that's modular or whatever, and you do nothing well, and you are trying to solve too many problems and actually not solving any of them.

Magdalena: Yeah, I see what you're trying to say. The footwear context is a huge topic. It is easy to feel overwhelmed by the science behind the footwear and the market saturation as well. You almost feel like there is everything already there. Saying that, modularity ticks all the boxes really… benefitting DNs. It gives variety to manufacture and allows for mass-customisation or disposal, which is not often seen in the footwear industry, I guess.

Jammie: Something that might be helpful then: when I think about the early modernists, [I think about] how exciting it must have been to have this radical vision. You know, they believed in this thing so much that everyone around them would believe that it is about being minimalist and modernist. It was just different. It must have been so empowering; it must be cult-like. I am just wondering if you can find something like that. If that might help you to figure out what this thing is going to be.

Maybe it is about imagining more than just the footwear but actually the future, how these people would exist. And you know our future is changing faster than [times] have ever changed. In many ways, it's a really terrifying time. So, what does it look like in twenty years' time? Are we ever allowed to travel around the world? Are we even allowed to board airplanes? You know, we are still living at this point, where we care about the environment but we care about jumping on a plane and going half-way across the world "instagramming" ourselves. Surely, that will be a point, where we will reach these targets, not to cross over into sort of this horrific future. It's going to be really uncool. It's going to be like going to Africa and shooting the Rhino, or something. Maybe you need to imagine the future, not what will be on these people's feet but what it's actually gonna be like.

So, maybe putting on a futurist hat might help you to conceptualise what you design for, before you zoom in to the footwear again. And you know, you have a wonderful opportunity to focus a huge amount of time on thinking about this problem, and I would be really heartbroken if the only thing that you would solve is some sort of aesthetic [issue]. I think that styling things only have a lifespan of six months. So maybe, it should be a big, more radical opinion and I don't know what it is. I think the more radical you can think, the more longevity this project would have and maybe it would be bigger. Just be sure to be pushing this project far enough, I would say.

Magdalena: That's been great. We wondered, we dreamed and we talked about some solid footwear design processes. Thank you, Jamie, this has been very insightful. All the best.

Jamie: Pleasure. Hope it's been helpful. Feel free to drop me a line if you have any questions. And keep me posted with your progress, it sounds fascinating. Especially having in mind that it is close to my heart and what I have done in the past.

Appendix 4: Human Ethics approvals

Human Ethics Notification - 4000018292

humanethics@massey.ac.nz 11 Oct 2017, 12:25
to A.Lindsay, Magdalena.Karasinska.1, V.Karaminas, M.E.Thomas

HoU Review Group

Ethics Notification Number: 4000018292
Title: Surveyed and Interviewed Digital Nomads and Flashpackers. These are people who work and live in different locations across the World.

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

If situations subsequently occur which cause you to reconsider your ethical analysis, please log on to http://rims.massey.ac.nz and register the changes in order that they be assessed as safe to proceed.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

"This project has been evaluated by peer review and judged to be low risk. Consequently it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research.
If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Dr Brian Finch, Director (Research Ethics), email humanethics@massey.ac.nz. "

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish require evidence of committee approval (with an approval number), you will have to complete the application form again answering yes to the publication question to provide more information to go before one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

You are reminded that staff researchers and supervisors are fully responsible for ensuring that the information in the low risk notification has met the requirements and guidelines for submission of a low risk notification.

If you wish to print an official copy of this letter, please login to the RIMS system, and under the Reporting section, View Reports you will find a link to run the LR Report.

Yours sincerely

Dr Brian Finch
Chair, Human Ethics Chairs' Committee and
Director (Research Ethics)

Human Ethics Notification - 4000022221

humanethics@massey.ac.nz 26 Feb 2020, 10:03
to Magdalena.Karasinska.1, V.Karaminas, humanethics

HoU Review Group

Ethics Notification Number: 4000022221
Title: 3d scans, records and pictures of feet to support my PhD design project. The working title of this research is 'One shoe fits all' - transformable shoes for contemporary nomads.

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

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If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director (Research Ethics), email humanethics@massey.ac.nz. "

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish require evidence of committee approval (with an approval number), you will have to complete the application form again answering yes to the publication question to provide more information to go before one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

You are reminded that staff researchers and supervisors are fully responsible for ensuring that the information in the low risk notification has met the requirements and guidelines for submission of a low risk notification.

If you wish to print an official copy of this letter, please login to the RIMS system, and under the Reporting section, View Reports you will find a link to run the LR Report.

Yours sincerely

Professor Craig Johnson
Chair, Human Ethics Chairs' Committee and
Director (Research Ethics)