Critical Textile Topologies X Planet City: the intersection of design practice and research

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Biography

Holly McQuillan's work, in the field of zero waste fashion design, articulates sustainable systems thinking and practice. She focuses on issues such as the impact of technology and how these can challenge established design, production and use practices. She co-authored Zero Waste Fashion Design, co-curated Yield: Making fashion without making waste, and developed the award winning Make/Use. Her work always seeks to broaden the impact of zero waste and sustainable fashion design through research, publication, workshops and lectures.

Kathryn Walters is a PhD researcher in the field of smart textile design. Her work explores woven textiles as complex systems, capable of transformative and reactive behaviour based on the synergistic combination of their materials and structure, while simultaneously seeking to investigate the potential three-dimensional morphologies that can arise and derive from flat-woven textiles. Her research aims to demonstrate the potential for emergent behaviour as an alternative to electronic smart textiles.

Karin Peterson's work seeks to relate alternative materials and mediums to processes of dress. It speculates the role of the analogue and the digital, examining these in relation to their function and interaction within a coherent and alternative method for crafting dress, different to that of the currently dominant cut and assemble. The work's context is the intertwined relation of cut and assemble as a method for artistic expression and as a system for mass production, or hyper consumption.

Abstract

This paper discusses the collaborative project the authors undertook for the speculative film Planet City in the context of a research program titled Critical Textile Topologies. It outlines the experimental design research methodology undertaken in the project, and reflects on the tension between design practice and design research that occurred in the development of multimorphic textile-based forms using whole garment weaving. After outlining the project as a whole, two key areas are discussed: the negotiation between expectations relating to design practice and the requirements of experimental design research—in this case the conflicting requirements between costumes made for film and the design research goals of the authors; and the emergence of multimorphic understanding of this kind of interdisciplinary design practice. Planet City provided the researchers with a clear 'laboratory' context to experiment within, rapidly driving the research forward in order to present a speculative vision for the future. The paper presents this research as an example of interdisciplinarity situated at the borderline between practice and research, demonstrating that, when balance is maintained between various practical and research drivers, new knowledge and an enticing vision for the future can be developed.

Keywords

Introduction

This paper discusses the collaborative project the authors undertook for the speculative film Planet City (Young, 2020) and reflects on the tension between design research and design practice that occurred during the development of multimorphic[1] textile-based forms (garments). Planet City is a speculative film, exhibition and book project by Liam Young for the NGV Triennial (2020) [2]. It is set on the day of a city-wide festival celebrating its creation and presents:

> a speculation of what might happen if we ... collapse the entire population of the world into a single city, returning the rest of the globe to wilderness ... The materiality of the city ... is developed around the rule that no new resources will be consumed or extracted to build the city and all of the artefacts within it ... are all made from a process of re-mining our existing world ... (Young, L., Personal Correspondence [email], March 28, 2020)

Background

Critical Textile Topologies (CTT) for *Planet City* has three spaces of collaboration (Figure 1): 1. Within the Research Collaboration (RC); 2. Between RC and the Commissioning Group (CG); and 3. Between RC and suppliers. RC participants for CTT in the context of this project are three PhD researchers: Holly McQuillan is a fashion design researcher exploring the design of textile-forms developed through a lens of zero waste systems thinking. Kathryn Walters is a textile design researcher who explores how the concepts of complex systems and emergent behaviour can lead to new aesthetics and techniques in smart textile design. Karin Peterson is a fashion design researcher exploring the role of the analogue and the digital within methods of crafting dress, challenging the currently dominant processes of cut and assemble through a process of 'reversed crafting' [3] for moulded garment forms. RC had already undertaken an initial successful experiment at the intersection of their research in Experiment 0 seen in Figure

2 (for more information see McQuillan, 2020). None of the RC have a background in costume design. The Commissioning Group (CG) for *Planet City* consisted of director Liam Young, and costume director Ane Crabtree. Liam Young is an educator, architect and Bafta nominated film director, while Ane Crabtree is an Emmy nominated costume designer. Both are based in the US; as a result all of the design process and decision making between CG and RC took place online.
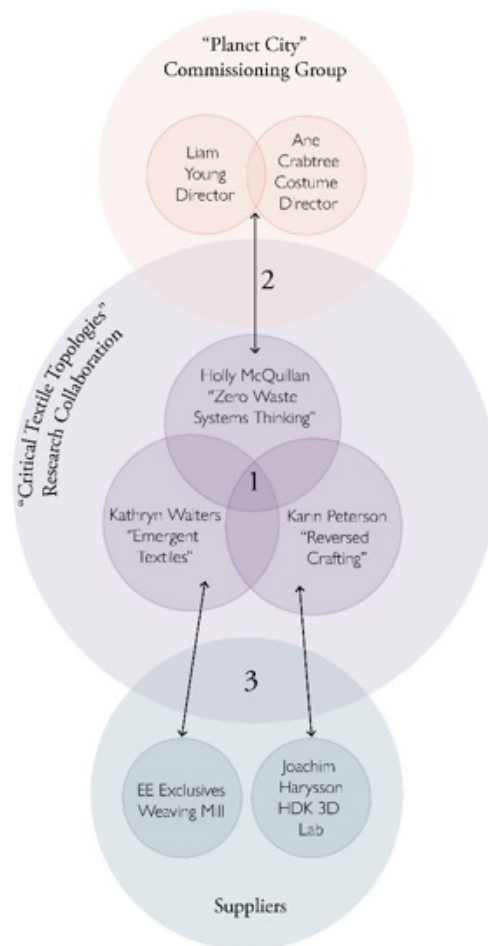

Figure 1. The three spaces of collaboration: 1. Within the Research Collaboration; 2. Between the Research Collaboration and Commissioning Group; 3. Between Research Collaboration and suppliers. Arrows indicate direct lines of accountability between specific actors.

As PhD researchers, we are accustomed to analysing and reflecting on our experiences. This paper focuses on our perspective, as it was within the RC that we found the tensions manifested between design research (our normal model of working), and design practice (our interactions with CG). It was also within this space that we moved beyond a multidisciplinary collaboration into interdisciplinarity (Choi and Pak, 2006), developing new tools, terminology, and concepts to work together towards hybrid textile-forms. This interdisciplinary collaboration required frequent communication, made complex by the Covid-19 pandemic, which required the collaborators to work remotely. Frequent video calls were triggered spontaneously whenever a discussion or decision was required. In contrast, CG had a directive role, requiring scheduled weekly updates, which occurred primarily between Crabtree and McQuillan, representing CG and RC respectively.

Research Program: Critical Textile Topologies

The research program (Binder and Redström, 2006) for Critical Textile Topologies (CTT) seeks new relationships between textiles and form in the context of future-making (Yelavich and Adams, 2014) and smart textiles. RC brought perspectives from each of their research specialities which range from textile structures and form development to design methodology, along with a combined awareness of the need for a reduction of pre-consumer textile waste in the production of textile-based forms (e.g. garments). This paper provides a detailed applied example of multimorphic interdisciplinary work undertaken in the space between design research and practice.

Future-making a holistic, circular, zero waste and local world

The aspirational and optimistic context for *Planet City* is closely aligned with the overall goals of the CTT research program, and the film project became a laboratory for testing these

Figure 2. Experiment 0 was an initial test at the intersection of flattening, reversed crafting and emergent/changeable textiles.

ideas further. It is in that way a practice that is interested in design as a process of future-making (Simon, 1969; Yelavich and Adams, 2014) in the context of Circular Design (Ghisellini et al, 2016; Earley, 2017; Niinimäki, 2017; Stahel, 2018; McQuillan, 2019a), and proposes that Ezio Manzini's (2013) notion of 'Cosmopolitan Localism' be included in the speculative future proposed by *Planet City*. Zero waste systems thinking (McQuillan, 2019b) views the relationship between the broader social and environmental contexts of the industry through a

zero waste lens and responds with a systems-based approach which integrates the design of everything from fibre, through yarn spinning, to textile production, in the design of textile-forms.

Lars Hallnäs (2019) distinguishes sustainability as a technical issue from the aesthetics of sustainability. In this manner of thinking the *Planet City* film project is grounded in research into technologies for sustainability, but is also concerned with the possible aesthetics of a radical new way of living.

Methodology

If what is to be found is really new, then it is by definition unknown in advance. There is no way of telling where a particular line of research will lead. (Francois Jacob, 1982, p. 67)

Experimental design research

Imre Lakatos (1971) argued that progress is not a result of individual experiments or studies, but lies in the development of research programs. Koskinen et al. (2008, p. 47) wrote that "progress in research happens only when a study makes an argument and contributes to a research program either by adding new knowledge to it or by correcting it". They describe a design experiment as "pieces of design carried out as a part of a research effort" (p. 46), and clarify that in this process, design work is research—the two are inseparable. The research discussed in this paper is primarily situated in what Koskinen et al. define as a 'Lab' context, where the lab is both digital—in the use of software—and physical—in the development of woven samples and constructed prototypes. As the work was intended for a film, certain requirements (such as the high level of digital prototyping / visualisation, the restriction of the use of green due to

green screen technology and the application of additional finishing to ensure durability) directly impacted the design practice and design research actions undertaken in the lab context.

Given the necessary unpredictability of research experimentation, Hans-Jorg Rheinberger (1994, p. 70) wrote that a "research device has to fulfill two basic requirements": to be stable, while being "sufficiently loosely woven" for unpredictable outcomes to occur. The design of this set of experiments gained stability from previous research by the authors (Figure 2). From this earlier experiment a set of parameters relevant for the Planet City experiments were established. This included: use of heat-shrinkable yarn; the need for a loom with high warp density (over 70 ends per cm), which in turn defined the width, number of weft colours, and warp colour; the goal of zero waste; and the use of a moulding process. These parameters were only 'loosely woven' however, and the exact interaction, combination and expression of these in the design research context remained open throughout the process.

Design accountability: at the intersection between design practice and design research.

On the notion of the entanglement of design research and practice Koskinen and Krogh (2015) argue for 'design accountability' as a method to frame work that exists on the boundary between practice and research. In the context of what they call constructive design research [4] the key premise is that "design research needs to build on design practice so that it can be relevant for practicing designers not only in terms of knowledge, but also in terms of methods, processes, and aesthetic quality" (p. 122). Koskinen and Krogh argue that because constructive design research comes up against the boundary of practice there needs to be a framework in place to "avoid the pitfalls that arise when research gets too close to practice" (p. 126). This paper uses the concept of design accountability (particularly relating to differences in methodology and the 'borderline') to help articulate the problems that arose in this case where the outcomes of the experimental design research are also designed objects for use in a film.

The case of Planet City

In the *Planet City* conceptual framework, materials for the production of all goods are acquired through a theoretical 're-mining of our existing world'. The initial proposal that the RC provided the Planet City CG framed the textile-form garments as an outcome of alternative modes of design and production viewed via the lens of zero waste system design. In this project this hypothetical system included concepts relating to fibre sourcing, production models, use practice and circular design—and the aesthetics that emerge as a result of these. There were three stages to the project: Proposal; Development; and Production (Figure 3).

Stage 1: Proposal

The RC were asked to propose a selection of costumes for the CG to select from. These formed part of a larger body of work from a range of invited artists. As costume director, Ane Crabtree made selections from proposals and guided decisions relating to colour and styling, under the overall vision of director Liam Young. The remainder of the design decisions and making processes were left to the commissioned designers / artists.

The five looks proposed by the RC were pitched as new 'heritage' garments, intended for special occasions and that would be passed down through generations for future festival occasions. The garments were designed utilising Peterson's moulded garment forms (2020), McQuillan's whole garment weaving approach (2019a, 2020), and Walters's emergent textile forms and surfaces (2018). The textile-forms incorporate polyester low-melt component (NSK) yarn which shrinks in response to heat—therefore time becomes an additional design variable (Talman, 2019). This allows form and surface to be moulded and transformed over the textile-form's lifetime. Within the hypothetical Planet City world, they would be produced in the context of a smart urban micro-factory where fibre reclamation, yarn spinning, textile weaving, and form cutting would occur on site. Produced from 100% polyester (a persistent, durable and recy-
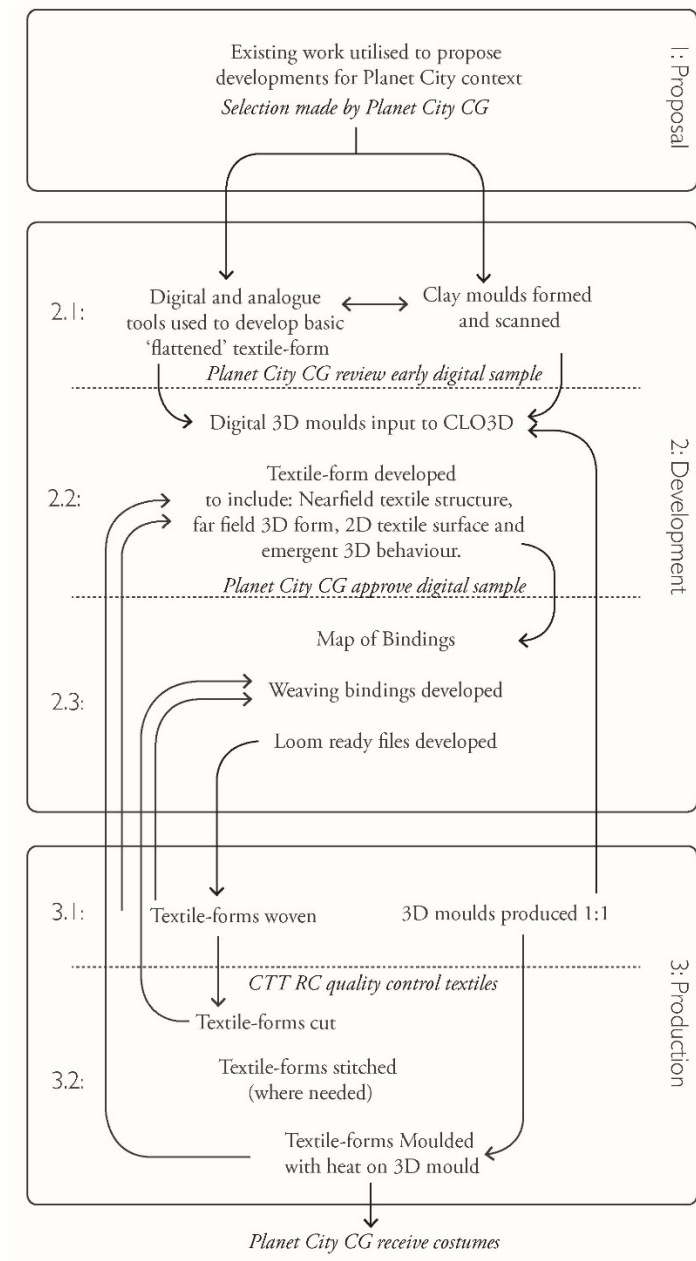
Figure 3. The three stages of development of this project (from the point of view of the RC) are familiar to designers: 1. Proposal, 2. Development, and 3. Production, however the specific processes and their interconnectedness contrasts with conventional fashion design practices.

clable textile fibre) at the end of their long life they would be readily recycled and re-extruded to make the next generation of textile-forms.

Three looks were selected by CG (Figure 4), and these became the Sulphuric Tunic, Lazulite Coat and Sediment Trouser, and Feldspar Dress. The research then progressed to an intensive development stage.

Figure 4. The CG selected three looks from the initial RC proposal: tunic (top), coat and trouser (bottom left), and dress (bottom right).

Stage 2: Development

Stage 2.1: In stage 2.1 a range of interrelated and interdisciplinary processes occurred simultaneously, primarily acting as inputs between processes.

McQuillan developed prototypes of the garment forms to a 'basic' flattened form stage using both digital and analogue tools. These developed the design, but also served to facilitate inter-disciplinary and research-practice communication both within RC, and between RC and CG. These took the form of 3D textile and garment renders, paper prototypes, and cross-sectional diagrams of textile structures. The digital prototypes were very important in the process as it was not possible to sample before production, due to the Covid-19 pandemic and time constraints.

The garment forms took into consideration the aesthetic and technical requirements for weaving the surface and structure. For example, while McQuillan's flattening method makes it possible to design all of the garments to not require any assembly, in the weaving process used to produce the garments this additional complexity would reduce opportunities for surface pattern and structural stability—so a compromise was found.

Alongside the development of these flattened forms, moulds were sculpted in clay (Figure 5) by Peterson, and 3D scanned. RC jointly developed surface patterns to be incorporated into the garments, based on AI generated 2D graphics[5] supplied by CG. Initial colours were selected, however issues arose in interpretation of colour via screen, since the yarn samples were late in arriving and were not associated with any international colour standard such as Pantone. There were also technical limitations restricting certain colours due to the use of greenscreen technology for the film.

At the end of Stage 2.1 an online meeting was held between RC and CG and the developed digital prototypes were presented. An earthy colour palette was rejected by CG in favour of highly saturated colours (Figure 6). RC reinforced the message that these digital prototypes were not 100% accurate representations of the finished forms, in either colour, due to lack of yarn colour information from the weaving mill, or surface, due to the emergent aesthetic arising from the production and finishing process.

Figure 5. Small scale clay mould being developed for the Lazulite Coat.

It was at this stage that feedback from CG became more directive, particularly with respect to the aesthetic. These aesthetic decisions had technical implications, but did not significantly impact core research elements and processes. It was nevertheless here that the tension between design practice (driven from both the CG, and the RC) and design research (which was entirely the domain of the RC) began to build.

Stage 2.2: The design research processes in Stage 2.2 became increasingly interdisciplinary and multimorphic, moving into a space where a new language was required to communicate within the emerging field of multimorphic textile-form design, and where each developing out-
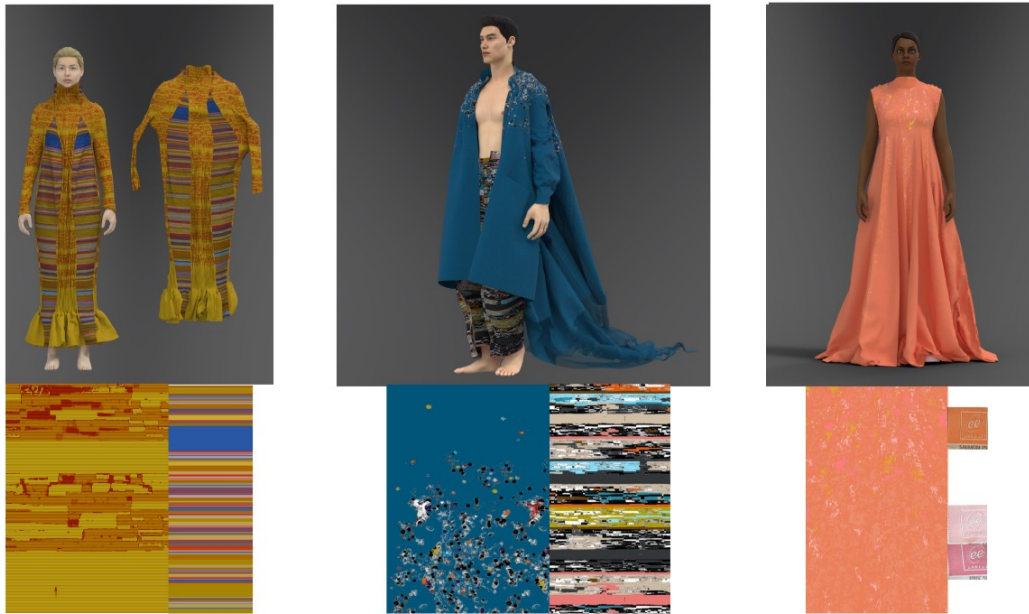
Figure 6. The digital prototypes selected and 'approved' by Planet City CG

come became multiple entities at once—nearfield textile structure, far field 3D form, 2D textile surface and emergent 3D behaviour.

Scanned 3D moulds were input as OBJ files into CLO3D, and used to develop the flattened prototypes (Figure 7). This enabled the flattened textile-form to be modified to respond to the 3D mould while developing the surface pattern and textile-form structures to facilitate this relationship. All four processes—3D mould, flattened digital form, surface pattern, and textile-form structure—were developed simultaneously.

Stage 2.3: Once the four processes were finalised, the digital textile-form, along with textile-form structure information, was converted into a Map of Bindings[6] (McQuillan, 2019a). Combined with the surface pattern, colour selection, and loom constraints (such as width and warp colour), weave bindings could be designed by Walters. Each binding produces a colour and layer structure in the final textile-form, and is both dependent on, and an embodiment of, all
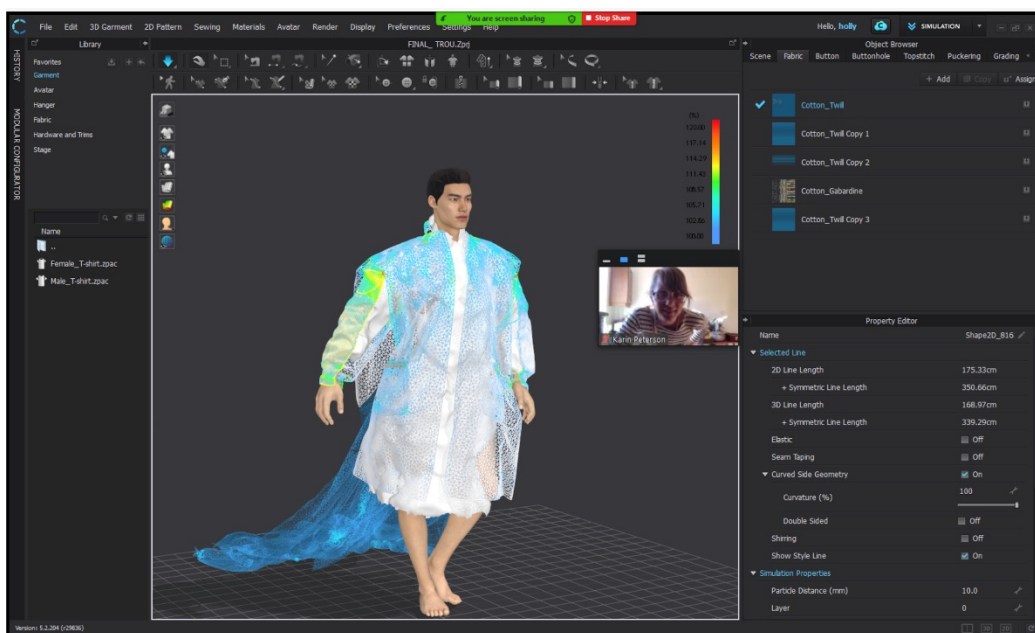
Figure 7. Lazulite Coat mould and flattened prototype being integrated and fitted using CLO3D in collaboration with Karin Peterson (in insert) via screen sharing on Zoom.

the processes described above. Compiled into loom-ready files, they translate the digital design into a form that can be interpreted and made physical through the weaving process.

Stage 3: Production

Once the designs and related files were established, the project moved to a third stage—production. The garments were woven in the Netherlands, then sent to Sweden for cutting, forming and moulding. Key weaving decisions such as weft density had to be based on estimates due to time and Covid-19 travel restrictions.

Stage 3.1: In stage 3.1, loom-ready files were supplied to the weaving mill, with two pieces woven initially. While not entirely successful—and as sampling was still impossible—the two pieces that had been woven could be used to understand the behaviour of the yarns in the specific weave bindings used. Fundamental changes were made to the weave bindings in subsequent

textile-forms, in order to promote shrinkability, alongside widening and stiffening the seams (Figure 8), which had been a point of failure in the initial tunic.

Simultaneously, full-scale moulds were produced from the 3D scanned clay models, by 3D printing with bioplastic (Figure 9), and CNC cutting of polystyrene blocks. The moulds were produced in collaboration between Peterson and HDK lab technician Joachim Harysson.

Stage 3.2: Once the fabric arrived, a careful process of cutting (Figure 10) began. While CNC laser cutting could theoretically be used, cutting was done by hand, requiring both a technical understanding of the construction of the textile-form, and haptic sensitivity. Finally, a small amount of sewing was required to form each garment.

The textile-forms were shrunk over the corresponding 3D moulds (Figure 11). Heat activates and shrinks the NSK yarn where form and surface manipulation is desired. This moulding stage also involves design decisions, as how much, where, and in what order the textile is shrunk leads to different surface and form outcomes, impacting the final garment aesthetic. Figure 12 shows the completed garments.

Reflections and findings: Design research vs design practice

Even at the early stages of the design process there was tension between the established costume design practice of CG and the emergent and unpredictable nature of experimental design research. Digital prototypes were produced by RC to indicate an experimental direction, however we were aware that the visual language of these digital prototypes could be interpreted by the CG as 'finished' in the context of costume design—this miscommunication was important to avoid. This tension is discussed by Koskinen and Krogh when they discuss the role of prototypes in design research versus practice—stating that design researchers see prototypes "like hypotheses in science rather than preparations for production" (2015, p. 124).

Figure 8. Three variations of the Sediment Trouser woven across the width of the loom. After failing in the initial tunic, the seams for the remaining garments were widened and the bindings changed. The crotch seam (at bottom) affects the surface pattern, an example of the impact of multimorphic design practice.

Figure 9. The Sediment Trouser mould was 3D printed using bioplastic. It was printed in parts to facilitate removal from the shrunken textile-form.

Figure 10. Cutting the crotch seam of a version of the Sediment Trouser. Cutting the layers apart is required to release the 3d form from the 2d textile.

For RC, research and design practice occurred at all three stages. However, in the conventional design process, once the design was 'approved' by CG, the design would be finalised and the goal become realising the proposed outcome. RC were required to operate at Koskinen and Krogh's 'borderline' (Koskinen and Krogh, 2015) between being researchers and acting as commercial designers—the tension of working to a brief, but incorporating still-developing research. This impacted the development process, with RC required to present a quite detailed proposed outcome for approval by CG at an early stage, whereas in a solely research context the outcome would be free to emerge from the process without predefinition. While it was emphasised by RC that elements of the making process were unpredictable, with the shrinking process in particular affecting both form and expression, it was not clear that this was fully understood by CG. As commissioners, they were interested in the wearable outcomes of our

Figure 11. Sediment Trouser shrunk over the mould shown in Figure 9. The shrinking process alters fit, form, fabric behaviour, density, texture and the expression of surface pattern.

research, whereas as researchers, we were interested in exploring the processes that led to those outcomes, and the interplay between process and result.

As a clear example of the design research vs design practice binary, conflicts arose between the technical / performance requirements of costume made for film and the design research goals of RC, and in regards to the emergence and establishment of aesthetics. The aesthetic of previous research work by the RC was driven by technical and functional considerations, an aesthetic choice nevertheless. By comparison, the woven surface pattern aesthetics required for the Planet City project added a layer of complexity to the technical and functional elements developed in the research process, overlaying the making process that they embody.

The results from the first weaving session reiterated this tension between our roles as researchers and as designers. As researchers, the outcome of a single successful garment, and a second piece that demonstrated areas requiring development, would have fed into a period

Figure 12. Top to bottom, left to right: Sulphuric Tunic, Lazulite Coat and Sediment Trouser, and Feldspar Dress photographed before sending to Commissioning Group in LA.

of reviewing and analysing the findings, and developing new ideas. As designers with a tight timeframe, we needed to deliver three looks that met the requirements and expectations of CG with little opportunity for reflection. This tension reveals the power differential implicit in the

role between commissioner and designer, not normally present in our role as (PhD) researchers. As researchers, we can justify our work in a multitude of different ways, but as designers, we must hew to the expectations of CG, delivering not new knowledge, but artefacts that look and function in specific ways. In this way, we were responsible for the successful delivery of costumes for the film context as defined by the brief. In this relationship we yield some of the power to interpret these artefacts: it can seem that the only context that matters is the one imposed from outside. Additionally, as design researchers first and foremost, we were responsible for maintaining some of the structures required for experimental research. Complex notions of authorship in terms of the overall outcome also needed to be managed.[7] While the costumes are now owned by Liam Young, and are presented in a complex web of music, digital architecture, other costumes and dance, authored by many different people, the theory, methods and attribution remain ours. Working between research and practice, these threads are as entangled as the yarn in the textile-forms we wove.

Reflections and findings: Interdisciplinary, multimorphic design research

Despite the tensions between design research and design practice, by building on a foundation of existing research, the experiments in this project deepened our understanding of interdisciplinary and multimorphic design research and practice. At the intersection of fashion and textile design research there is an interdisciplinary field we call Textile-form design (Figure 13). Building on common understandings of the role of textiles and their behaviour in order to generate form, the methods developed from Experiment 0 (Figure 2) through to the outcomes presented for Planet City (Figure 12), reveal shared tools (such as paper models), and the need to generate new ones (Map of Bindings)—particularly in the socially distanced context of Covid-19. They also reveal a conflicting use of words—understandings of words such as 'structure' and 'form' depend on each discipline's notions of scale, or contrast, as in 'pattern'

(surface design) for textiles, compared to 'pattern' (as form template) for fashion. We needed to establish new vocabulary to remove confusion and aid collaboration, and to communicate the actions, outcomes and methods used.
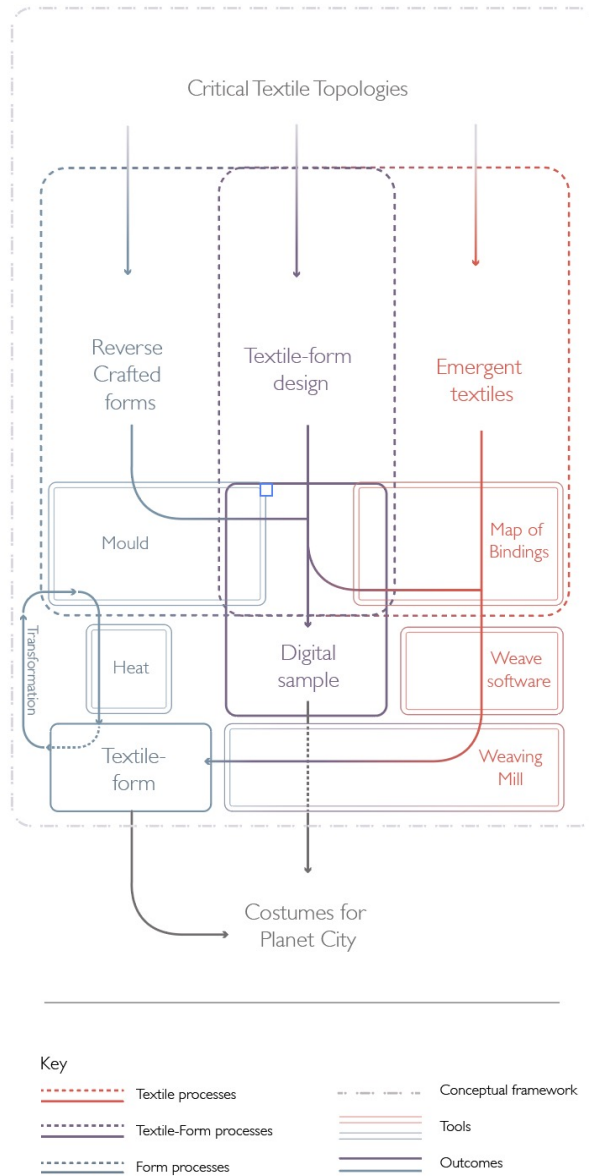

Figure 13. The intersecting space of the research, between form and textile design, outlining the conceptual framework, processes, tools and outcomes of the project.

This research reveals some of the differences between the ways designers in each field relate to textile-things even when both are involved in their design. Woven textile designers primarily work from the scale of yarn and weave binding, up to the scale of surface pattern repeats. In contrast, fashion designers work at the scale of the body, and while they may 'zoom in' to features of a garment, they do not usually approach the yarn scale—particularly when using woven textiles. Thus while the two disciplines may overlap at the level of surface pattern and garment features, their scales differ from there. So the notion of multimorphic design practice and object emerged out of the perspective that is required to design these kinds of textile-forms—we needed to holistically understand multiple forms, states, times and scales of each piece.

The difference between the fields can be illustrated by the view each discipline has of cutting into textiles. Woven textile designers see cutting as a destructive act. For fashion designers, however, cutting is a constructive act, required to generate form. Within the context of the RC, this expresses itself as an additional level of complexity in the textile-form: areas of the textile must be designed to be cut at the level of weave structure—strictly a one way process, as the whole textile-form needs to be rewoven if a section is damaged. This points to the multimorphic, interdisciplinary nature of this research collaboration. It is no longer possible to separate the garment form from the textile: the form defines the textile, and the textile defines the form. This inseparability applies throughout the design process, where every decision has consequences for the textile-form whole and as a consequence notions of 'ownership' of discrete parts of a project become completely entangled.

Conclusion

The context provided by Planet City aligned closely with the contextual framework of the authors' research program, providing a clear and tangible context to apply ongoing research.

The final garments embody the potential of Planet City—a world in which manufacturing is local, circular, and zero waste. It allowed the authors to manifest an outcome that is the result of their process in a hypothetical context—a representation of the possible aesthetic outcome of this holistic approach.

After describing the three stages of the design research process we reflect and discuss the findings that emerged. It is clear that the requirement to use primarily digital communication modes for physical outcomes was problematic, and the interconnectedness of interdisciplinary, multimorphic research involving physical 'things' was made more difficult due to Covid-19. However, it ensured the development of clear language and communication strategies utilising digital tools such as CLO3D and Zoom.

Design accountability (Koskinen and Krogh, 2015) describes three areas of common pitfalls when operating in the space between design practice and design research; for us the key areas of tension we encountered relate to the role of methodology and prototypes, and the difficulty of maintaining our position when operating at Koskinen and Krogh's 'borderline' of design practice and experimental design research. Despite the tension between design practice and design research which occurred, this paper provides an example utilising a flexible approach to generate satisfactory design and experimental research outcomes. We argue that by building on the stability that Rheinberger (1994) argues needs to exist in experimental systems, we were able to maintain our position at the borderline between research and practice.

The notion of this practice being interdisciplinary and multimorphic emerged out of the inseparability of the textile and form. In inter and transdisciplinary research (where the object of research is a physical thing) practice needs to be multimorphic as the various scales, perspectives and skills involved are entangled. This entanglement applies throughout the design process, and was abundantly clear in this project where every decision had consequences for the textile-form whole and for each contributor to the textile-form. Furthermore, theory, meth-

ods, and outcomes become entangled. Even once the outcome is delivered to the commissioning group, traditional notions of 'ownership' and 'authorship' remain entangled—distributed clearly along lines of physical objects, which are now 'owned' by Planet City, but attributed to us—while the theory, methods, and knowledge remains woven into the combined practises of the researchers.

As designers and researchers we need to develop ways of working collaboratively in a rapidly changing world where traditional methods of design development may no longer be possible. We need to be able to communicate within the interdisciplinary teams necessary to tackle the problems we face, without losing the essential element of risk-taking at the core of experimental design research, and while relinquishing traditional notions of ownership. Planet City embodies the notion of design as future-making and the Critical Textile Topologies RC sought to provide examples of both an aesthetic vision of a future that is enticing, and the means for producing it.

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Notes

[1] A 'multimorphic' object is that which is many things at once, encompassing both physical and theoretical states and able to be read and understood at many scales, axes, and dimensions simultaneously. They exemplify multiple physical and theoretical concepts through both their matter and what they represent or articulate (McQuillan, 2020).

[2]The NGV Triennial (December 2020 - April 2021) features major new commissions and recent works from designers, artists, and architects, spanning geography, perspective, and genre. https://www.ngv.vic.gov.au/exhibition/triennial-2020/

[3]Reversed Crafting is a method which argues for the importance of front end craft knowledge in the use of 3D digital techniques. In this case a form is moulded from clay, and 3D scanned to be used in the textile-form process (Peterson, 2020).

[4]Others call this 'research through design' (Frayling, 1993) or 'practice-based research' (Mäkelä & Routarinne, 2007).

[5]The AI generated graphics in this case were the result of an algorithm which took as input a wide range of images tagged with geographic data (such as GPS location) and blended them into a hybrid 2D image.

[6]Map of Bindings (MoB): The 3D form flattened into a 2D plan indicating specific weave bindings used for weaving a Woven Textile-form. Often referred to as "artwork" in conventional weaving.

[7]Planet City full credit list: Director Liam Young. Production Design Liam Young. Visual Effects Supervisor Alexey Marfin. Costume Director/Producer Ane Crabtree. Original Score Forest Swords Vocals EMEL. Visual Effects Case Miller, Aman Sheth, Vivian Komati, Yucong Wang. Lead Researcher Case Miller. Researcher Pierce Myers. Narrative Consultant Jennifer Chen. West Coast Costume Assistant Courtney Mitchell. East Coast Costume Assistant Ela Erdogan. Costume Artists Holly McQuillan, Karin Peterson, Kathryn Walters (Zero Waste Weavers), Aneesa Shami (High Altitude Bot Herder), Yeohlee Teng (Code Talker), Courtney Mitchell (Beekeeper), Ane Crabtree (Nomadic Worker, Algae Diver, Drone Shepard). Fibre Artist Janice Arnold. Mask Artists Liam Young (High Altitude Bot Herder, Code Talker, Algae Diver, Drone Shepard), Zac Monday (Zero Waste Weavers), Aneesa Shami (Zero Waste Weavers). Costume Still Photography Driely S. Costume stills Photoshoot Produced by Eva Huang. Performed by David Freeland Jr, AJ and Miguel Alejandro Lopez, Joy Brown of Jacob Jonas The Company. Commissioned by NGV Melbourne. Curator Ewan McEoin.