knowing through making

An investigation into the construction of hand-knotted textiles and their collective application as textile space-defining elements within the interior.

by Liesl Wherry

Submitted in partial fulfilment of the requirements for the degree Master of Interior Architecture (Professional) to the faculty of Engineering, Built Environment and Information Technology, UNIVERSITY OF PRETORIA

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Co-Study leader: Elana van der Wath

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“Now all glory to God, who is able, through his mighty power at work within us, to accomplish infinitely more than we might ask or think.”

(Holy Bible, Ephesians 3:20)
PROJECT SUMMARY

Full Dissertation Title: Knowing through making: An investigation into the construction of hand-knotted textiles and their collective application as textile space-defining elements within the interior.

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ABSTRACT

Currently textiles are mostly employed within the interior in a very traditional and conventional way. The discipline of Interior design does not exploit the uniqueness of the material nor does it fully explore its potential. Textiles offer underutilised potentials. If the evolution of the interior design discipline from upholsterer to decorator to interior designer contributed to the devalued status of textiles within the interior, the research aims to re-evaluate this position and to reclaim valuable lost territory through alternative textile applications. These alternative textile applications are a re-interpretation of traditional textile applications and construction techniques.

The dissertation investigates the construction of hand knotted textiles and their collective application in the formation of textile space-defining elements. The process culminates in textile space-making. The in-depth exploration that leads to the creation of these textile space-defining elements, is initiated by the translation of traditional rope knotting techniques into alternative textile fabrication methods. Through this translation the project exploits the unique, and often latent characteristics of textiles as a material that can be flat but three-dimensional, weak but structural and soft but rigid.

With this in mind, the dissertation employs a hybrid research strategy which combines the Practice-based Research method and the Action Research method. ‘Knowing through making’ therefore signifies a definite shift away from the more established research methods that operate from the ‘known to the unknown’ towards Practice-based Research which operates from the ‘unknown to the known’. Further, ‘Knowing through making’ implies research processes where data is ‘created’ or made instead of ‘collected’.

UITSUKEEL

Tekstiele word tans op ’n baie tradisionele manier toegepas in die binnenvoering. Die discipline van binneontwerp benut nie die materiaal ten volle nie en kan dus ook nie die volle potensiaal daarvan verken nie. Tekstiele bied daarom onderbenutte potensiaal. As die ontwikkeling van die discipline van binneontwerp van stoffeerder tot versierder tot binneontwerper, gele het tot die verminderde waarde van tekstiele in die binnenvoering, beoog die navorsing om hierdie waardevolle grondegebied te hervin deur tekstiele op alternatiewe maniere aan te wend. Hierdie alternatiewe toepassings is dus ’n herinterpretasie van traditionele tekstiel gebruikte en konstruksie tegnieke.

Die verhandeling ondersoek die vervaardiging van handgeknoopte tekstiele en gesamentlike toepassing daarvan in die vorming van tekstiel ruimte-definieerende elemente. Die omvattende onderzoek wat lei tot die skepping van tekstiel ruimtevormende elemente, begin by die vertaling van traditionele touknoop tegnieke en alternatiewe tekstiel vervaardigings metodes. Deur die vertaling ontgin die projek die unieke en dikwels verborg eierskappe van tekstiele as ’n materiaal wat plat maar drie-dimensioneel is, swak maar struktureel is en sag maar rigied kan wees.

Met dit in gedagte, pas die verhandeling ’n saamgestelde navorsingsstrategie toe wat ’n kombinasie van die Praktysgebaseerdenavorsingmetode en die Aktsienavorsingmetode is. ’Knowing through making’ dus ’n definistiewe skuif weg van meer gevorderde navorsingsmetodes af, wat gewoonlik beweeg vanaf ’die bekende na die onbekende’ na Praktysgebaseerdeavorsing wat benader word van die ’bekende na die onbekende’. Verder impliseer ’Knowing through making’ navorsings prosesse wat data ’skop’ of maak in plaas van ’insamel’.
In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertation and theses, I declare that this dissertation, which I hereby submit for the degree Master of Interior Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution. I further state that no part of my dissertation has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this dissertation is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

Liesel Wherry
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Chapter one provides a short discussion on interior design and decoration as background to the study. This is followed by the design premise. The design premise leads into a series of research questions, wherein it introduces the concept of Research through making. This is followed by the aims and delimitations clarifying the intent of the study. Further, a hybrid research strategy is introduced. This hybrid research strategy forms part of the dissertation’s contribution and is therefore discussed in more detail later within the document. The section describing the research methods is followed by the definition of terms. The chapter concludes with a chapter to chapter summary of the dissertation.

“
To me the simple act of tying a knot is an adventure in unlimited space. A bit of string affords a dimensional latitude that is unique among entities. For an uncomplicated strand is a palpable object that, for all practical purposes, possesses one dimension only. If we move a single strand in a plane, interlacing it at will, actual objects of beauty and utility can result in what is practically two dimensions; and if we choose to direct our strand out of this one plane, another dimension is added which provides opportunity for an excursion that is limited only by the scope of our own imagery and the length of the rope maker’s coil. What can be more wonderful than that?”

-Clifford W. Ashley, The Ashley Book of Knots, 1944: 8.
1.1. BACKGROUND

The acknowledgement of the interior design discipline as separate from that of architecture is primarily a twentieth century phenomenon (Gurel & Potthoff, 2006: 218). As construction and material technologies have advanced, interior design has evolved and grown with it. As a result, this specialised discipline is rapidly becoming more predominant in the building industry (Edwards, 2011: 231). This contributes positively to the complexity of the field, but creates conflict between the disciplines of Architecture and Interior design as professional boundaries need to be redefined.

For a number of years Interior designers have emulated the process of architecture in order to legitimise the profession of interior design (Hill & Matthews, 2007: 11). Hill and Matthews (2007: 11) states that the interior design profession should assess its relationship with architecture and re-position itself in terms of its masculine counterpart. Further, Havenhand (2004: 35) states that this emulation of the architectural profession unintentionally ‘…supports the system that ensures [interior design’s] supplemental position.’ Not only does this place interior design as supplemental to architecture but also defines interior design as less than architecture (Havenhand, 2004: 40). The idea that emphasis should be placed on the differences between the disciplines of architecture and interior design is expressed by Havenhand (2004: 40) in A view from the margin: Interior design:

“…In a new strategy of interior design that celebrates its marginal position, and therefore a wider, more complete and more robust view of interiority, issues such as materiality, sensuousness, decoration, nurturing, self-expression, desire and mothering which have been de-emphasized in a male, rationalist, architectural framework would be brought to the foreground” (Havenhand, 2004: 40).

Havenhand (2004: 42) refers to elevating the theoretical position of the feminine within the discipline and acknowledging its marginality, as a strategy for establishing a distinct identity for interior design.

Instead of emulating architecture, interior design should emphasize its uniqueness and draw attention to its otherness.

Additionally, the emulation of architecture by the interior design discipline could be seen as an attempt by the discipline to distance itself from interior decorating (Chalmers & Close, 2007: 78; Havenhand, 2004: 35). However, Königk (2010: 40) states that ‘…interior decoration (especially as far as colour, surface treatment, furnishings and material choice is concerned) is an intrinsic aspect of interior design.’ And that to deny [interior decoration] would be ‘…to deny a portion of the discipline’s being’ Hoskyns (2007: 85) is of the opinion that interior decoration utilises many materials and tools that are also key to the discipline of interior design. Hoskyns (2007: 96) further mentions that the discipline of interior design should not exclude these processes but rather ‘…unpick…transform and reclaim them.’

Zamberlan (2013: 110) is of the opinion that it is precisely the decorative aspect of interior design that allows it to ‘…operate as a specialist discipline distinct from architecture.’ Similarly Hill and Matthews (2007: 12) states that by distancing itself from interior decorating, interior design negates the component of the discipline that ensures that it remains unique and its services desirable.

See Figure 1.2. Representation of the perceived relationships between interior design, decoration and architecture, poster 1 (page 6). The diagram is a representation of relationship between interior design, decoration and architecture as part of the reflection process employed within this dissertation. Refer to section 1.5. Methods and CHAPTER 2: Methodology for further clarification.
1.2. DESIGN PREMISE

Historically, textile was the material of choice for the upholsterer and later the decorator (Sanders, 2002). The evolution of the discipline of interior design, from upholsterer to decorator to interior designer ensures an undeniable link between textiles and interior design.

Hoskyns (2007: 85) mentions that even though interior decoration has a long history with textiles, the relationship between interior design and textile is currently problematic. See Figure 1.3. The issue of decoration, on poster 1 (following page) for an overview of the possible reasons for the interior design discipline’s issues with decorating (Sanders, 2002).

Currently the use of textile within the discipline of Interior design is mostly employed in a very traditional and conventional way. The discipline of Interior design does not necessarily exploit the uniqueness of the material and it doesn’t fully explore its potentials. If the evolution of the interior design discipline from upholsterer to decorator to interior designer contributes to the devalued status of textiles within the interior, the research aims to re-evaluate this position and reclaim this valuable lost territory through alternative contemporary textile applications. These alternative textile applications are a re-interpretation of traditional textile applications and construction techniques.

1.2.1. RESEARCH QUESTIONS

1. What are the possibilities or restrictions that hand-knotted rope and rope-like materials offer when making interior textile space-defining elements?

2. What does the construction process and fabrication drawings of a manually constructed textile-based artefact look like?

3. How does ‘Research through making’ manifest when conducted within the interior design discipline?

4. Does the Practice-based Research method offer an alternative approach to the manner in which research is typically conducted within discipline of Interior design?

Due to the nature of the study, these research questions merely form an outline for the study. Further research questions become part of research through making, and can thus be found integrated into CHAPTER 5: Design application. See Table 5.5: Test matrix, poster 12 (page 58). Section 1.2.2. Project overview on poster 1 on the following page, recapitulates some of the points discussed in this and earlier sections. Also see section 1.3. Aims and Objectives and section 1.4. Delimitations on poster 1 (following page).

1.2.3. RESEARCH THROUGH MAKING

This dissertation conducts research through the act of making. Knowing through making therefore does not apply traditional or conventional research methods employed within the discipline of interior design, but investigates, learns and designs by making. Refer to CHAPTER 2: Methodology, for a description of the methods utilized and their application in the design process.

Section 1.2.4. Research through making at Taubman College, poster 2 (page 7) offers an example of an educational facility that offers a research course based on the act of making. The poster section also offers example images of projects completed at educational facilities that offer similar courses to Taubman College. See sections 1.2.4.1.-1.2.4.5. for example images of projects completed at these facilities.

research through making chapter 1
An investigation into the construction of hand-knotted textiles and their collective application as textile space-defining elements within the interior.

1.2. PROJECT OVERVIEW

Currently the use of textile within the discipline of interior design is mostly employed in a very traditional and conventional way. The discipline of interior design does not necessarily exploit the uniqueness of the material and it doesn’t fully explore its potential. If we move a single strand in a plane, interlacing it at will, actual objects of beauty and utility can result in what is practically two dimensions; and if we choose to direct our strand out of this one plane, another dimension is added which provides opportunity for an excursion that is limited only by the scope of our own imagery and the length of the rope maker’s coil.

What can be more wonderful than that?”


1.3. AIM AND OBJECTIVES

The dissertation aims to:

1. Explore the use of hand-knotted rope and rope-like materials in the formation of space-defining elements within the interior
2. Manually construct a textile-based artefact/object as the creative outcome of this exploration
3. To explore and advance knowledge through the act of making by hand within the discipline of interior design
4. To explore and advance the use of the Practice-based Research method within the discipline of interior design

1.4. DELIMITATIONS

- The study will not investigate the chemistry or science involved in the composition of textiles
- Although the study considers a varied selection of textiles, the design investigation is limited to the specific use of hand-knotted rope and rope-like materials as the primary manual construction material
- Although the study does not investigate textile use within the domestic interior but focuses on textile use in public spaces
- Although the test samples that are made employ found materials, the study is not an exercise in upcycling, recycling or reusing of found materials
- The study submits to the method of Practice-based Research where the artefact is the creative outcome of the study, therefore the study is not an analytical one.

KNOWING THROUGH MAKING:

An investigation into the construction of hand-knotted textiles and their collective application as textile space-defining elements within the interior.

Liesl Wherry 11008581

Study leader: Elana vd Wath & Raymund Konigk

Field of study: Heritage and cultural landscapes

POSTER    chapter 16
Knowing through making signifies a definite shift away from the more established research methods that operate from the "known to the unknown" towards Practice-based Research that operates from the "unknown to the known". Further, Knowing through making implies research processes where data is "created" or made instead of "collected" (Sullivan, 2009: 48, 50; Nimkulrat, 2012: 2).

1.2.4.1. 
**Morphfaux**

**Recovering plaster as architectural substrate**

**TAUBMAN COLLEGE**

Steven Mankouche, Joshua Bard, and Matthew Schulte

Research Through Making

2011

MORPHFAUX (see images below) explores the lost craft of plaster. It considers its potential for producing informed architectural environments by means of contemporary digital technology. The research project opposes the flatness of contemporary standard dry wall construction by exploring the variability of plaster. Plaster is a material that can be textured and smooth; and thick and thin. In essence the research seeks alliances between human ability and automated capacity (Taubman College, 2014).

1.2.4.2. 
**Erratic - Digital Geometry and Unwieldy Matter**

**ARCHITECTURE IN THE MAKING: Architecture as a making discipline and material practice**

Daniel Norell and Einer Rodhe

Research project

2014

1.2.4.3. 
**Honeycomb morphologies**

**MATSYS & ARCHITECTURAL ASSOCIATION**

Andrew Kudless

MA Dissertation in Emergent Technologies and design

2004

1.2.4.4. 
**Knit Architectures**

**TAUBMAN COLLEGE**

Sean Ahlquist, Wes McGee, Anthony Waas

Research Through Making

2014
1.5. METHODS

The dissertation focusses on the making of hand knotted rope-like textiles as part of the manual fabrication of textile space-defining elements. With this in mind, the dissertation employs a hybrid research strategy which combines the Practice-based Research method (Candy, 2006) and the Action Research method (Dick & Swepson, 2013).

The Practice-based Research method demonstrates a contribution to knowledge through the making of an artefact as creative outcome. In this dissertation both the process of making and the products of making are an essential part of the research. The method's success relies on the rigorous documentation of the research process as well as the artefact's role within the creative process. Finally, it requires clear research questions, methods for answering these questions and a context in which the research is carried out (Creativity & Cognition studios, 2015; Makela, 2009: 4; Biggs, 2002: 1). See Figure 1.13. Hybrid research strategy (left). Section 1.5.1. Methods overview on poster 3 (page 16), recapitulates this section.

The incorporation of the Action Research method within the framework of Practice-based Research, assists with the act of making. The iterative and cyclical nature of the Action Research method contributes positively to the development of a well resolved artefact. Within this dissertation the Action Research method will allow for questions to be asked and answered within a specific context. Knowing through making therefore signifies a definite shift away from the more established research methods that operate from the ‘known to the unknown’ towards Practice-based Research that operates from the ‘unknown to the known’. Further, Knowing through making implies research processes where data is ‘created’ or made instead of ‘collected’ (Sullivan, 2009: 48, 50; Nimkulrat, 2012: 2).

The hybrid research strategy incorporates various research techniques. Research techniques include:

- Literature reviews
- Precedent studies
- Drawings/sketches
- Observation and documentation
- Analysis and Synthesis
- Making and material exploration

The research strategy is discussed in more detail in CHAPTER 2: Methodology. The Design Process derived from the research strategy (plan, observe and respond) is considered further in CHAPTER 5: Design application.
1.6.
DEFINITION OF TERMS

NOTE: The following terms are collected and composed from various sources, including knowledge acquired through making. Sources are indicated where necessary.

TEXTILES: The term textile is derived from the Latin textilis and the French texere, which means ‘to weave’ (Whewell, 2015). Originally the term represented only fabrics produced by means of weaving. Later however, the term also encompassed fabrics produced by additional methods. Therefore lace, embroidery, nets, threads, cords, ropes, braids and fabrics made through methods of weaving, knitting, felting, bonding and tufting are considered textiles (Whewell, 2015). The term textile within the confines of this study consequently refers to any filament, fibre, yarn or rope that can be processed into cloth or fabric as well as the resultant material.

ROPE: A length of thick strong cord made by twisting (braiding or plaiting) together the strands, plies or yarns of hemp, sisal, nylon, or similar material (Oxford dictionary online, Meriam-Webster online). Rope is also referred to as cordage.

ROPE-LIKE: Any textile that exhibits similar characteristics to those of rope as defined above or that can be knotted and handled in a similar manner to rope.

KNOT: An interlacing of the parts of one or more flexible bodies forming a lump or knob (as for fastening or tying together) (Meriam-Webster online). An intertwined loop of rope, used to fasten two such ropes to one another or to another object. A knot even when not in use, will hold its shape or form (Ashley, 1993).

TENSILE STRENGTH: The average strength of new rope under laboratory conditions (Boatsafe, 2009).

BREAKING STRENGTH (BS): The greatest stress especially in tension that a material is capable of withstanding without rupture. The minimum BS is considerably greater than the safe working capacity (Boatsafe, 2009).

SAFE WORKING CAPACITY (SWC): Safe working capacity, also known as safe load or work load limit, is the maximum load that can safely be applied to a particular type of rope. The safe working capacity for most kinds of rope is between 15% and 25% of the tensile strength. The difference between the BS and SWC is due to the application of a safety factor (SF) (Boatsafe, 2009).

BLOCK AND TACKLE: A Block and tackle is a system of two or more pulleys with a rope or cable threaded between them, usually used to lift or pull heavy loads. The pulleys are assembled together to form blocks and then blocks are paired so that one is fixed and one moves with the load. The rope is never threaded through the pulleys to provide mechanical advantage that amplifies the force applied to the rope (Royal Canadian Sea Cadets, 2015).

DEVELOPED TERMS: The following terms were developed during the design and making process. The terms relate specifically to the fabrication of the textile samples. Application of the terms can be seen in CHAPTER 5: Design application.

CORD TYPE SET: (CTS) Any collection of cords within one sample that are of the same material.

PRIMARY CORD: (Pr) The main carrying cord in any cord type set.

SECONDARY CORD: (Se) The cord secondary to the primary cord in any cord type set.

STRUCTURAL CORD: (SC) Any cords forming the structure or carrying the weight of any Filler cord type set.

FILLER CORD: (FC) Any cords forming the infill or body of a sample and is fixed by means of knotting to any Structural cord type set. The Filler cord does not carry the weight of the sample unit.

ANCHOR POINT: (AP) Any point or fixing place to which a textile can be fixed using various configurations of rigging hardware. (See Rigging details on poster 32, page 84 + 85 for selected rigging configurations).

1.6.1.
LIST OF ABBREVIATIONS

ABOK: Ashley Book Of Knots
AR: Action Research
PBR: Practice-based Research
1.7. CONCLUSION: OVERVIEW OF CHAPTERS

CHAPTER 1: Introduction, is a concise outline of the dissertation. It introduces the reader to the aims of the study as well as provides the boundaries and extent to which the study will take place. CHAPTER 2: Methodology, provides a description and justification for the use of the Practice-based Research method and the Action Research method. This hybrid research strategy informs the decision making process throughout the design development and production. CHAPTER 3: Literature study, identifies and discusses the concepts and theory of traditional and alternative space-defining elements. These concepts form the basis for the design response. CHAPTER 4: Material overview, introduces the reader to rope and rope-like materials, and situates the material of rope within the larger realm of textile and textile production. CHAPTER 5: Design application, presents the conceptual approach, test sites and design response. (All data for the design process is located within the Appendices). The chapter also contains the final technical design solution. CHAPTER 6: Final reflections concludes the dissertation with a personal reflection, a description of the contributions of the dissertation as well as recommendations for further study. See Figure 1.14. Chapter summary (right).

The dissertation document is structured to contain posters as part of the document. The poster number is indicated at the bottom of the page next to the page number. The table of contents indicate posters in yellow text.
“Look what architecture can't do.”

-Petra Blaise
The main focus of the Practice-based Research (PBR) method lies with the making and documentation of the process and final creative product. However, the method of PBR does not specifically emphasize the iterative nature of producing an object. With this in mind, the dissertation employs a hybrid research strategy. This hybrid strategy employs the Practice-based Research method as the main framework and the Action Research (AR) method as a supplementary and supportive strategy.

This chapter is concerned with the description and justification of the research strategies and techniques applied in the dissertation. The chapter starts with a short discussion on PBR and the role of the artefact in the creation of research knowledge. This is followed by situating the AR method within the framework of PBR. The chapter concludes by applying the key processes of PBR and AR to the dissertation in order to formulate an overall action plan for the investigation.

"A true craftsman is not bound to a single idea, as the formal idea often gives rise to a family of variations."

-Tapio Wirkkala, Pipe models, ‘meerschaum’ (sea foam) and nylon, 1974-6.
2.1. PRACTICE-BASED RESEARCH AND THE ROLE OF THE ARTEFACT

Since the 1990’s various creative disciplines such as architecture, design, art and performance have gradually occupied themselves more and more with academic research (Nimkulrat, 2009: 3; Nimkulrat, 2012: 2). The creative practices employed by these practitioners during research, act as the basis for theoretical inquiry and scholarly research and is known as Practice-led or Practice-based Research (Nimkulrat, 2012: 2).

Linda Candy (2006: 1) defines Practice-led Research as research that ‘leads primarily to new understanding about practice’ and

Practice-based Research as research where the ‘creative artefact is the basis of the contribution to knowledge’.

These practice related research methodologies have progressed from being merely supplementary ‘…adopted and adapted social science methods. ’ to complex intellectual advancement of creative practice as a basis for theoretical questioning (Sullivan, 2009: 62; Nimkulrat, 2012: 2). Even though these methodologies with their practice related frameworks are fairly new in the history of knowledge production they attribute the artefact with an authentic role in research (Candy & Edmond, 2010: 20). The Practice-based Research method therefore encourages creative practice from the researcher. The researcher, as a designer, executes the creative process and the production of artefacts as the main aim of the research (Nimkulrat, 2012: 2).

For creative practitioners the made object is generally the reason for the initial activity. Therefore, it is often the case that practitioners create artefacts which form a central part of the practice, but is supported by little or no formal research process. However, within the realm of research, the process of exploration and making provides the opportunity to generate research and knowledge (Candy & Edmond, 2010: 5). Maarit Makela (2009:1), mentions that artefacts can, and have been, regarded as both the answers to research questions and as part of an argument on a particular topic. Makela (2009:1) also suggests that the artefact can be seen as a method for ‘…collecting and preserving information and understanding’.

Even though the artefact is the outcome of creative practice, the knowledge of a creative practice lies within the practice itself (Nimkulrat, 2012: 2). Since the knowledge of the process of making is not evident in the object alone, the creative output produced as an integral part of the research process is accompanied by documentation. This includes a description of the process as well as explanation and textual analysis to support the position. The textual documentation demonstrates critical reflection (Creativity & Cognition studios, 2015).

Similar to any other definition of research, the research component of the Practice-based Research method requires that the understanding and knowledge gained as a result of the research process be clearly and easily transferable (Creativity & Cognition studios, 2015).

Therefore the research should:

- Define a series of research questions or problems to be addressed as well as define aims and objectives in terms of contribution.
- Specify a research context.
- Outline the methods applied to answer the proposed research questions.

See section 2.1.1. Practice-based Research, on poster 3 (page 16) for a listed summary of the Practice-based Research method.

Works by authors such as Nithikul Nimkulrat (Hands-on intellect: Integrating craft practice into design research, 2012), Linda Candy (Practice Based Research: A guide, 2010), Maarit Makela (Knowing through making: The role of the Artefact in Practice-based Research, 2009), may be reviewed under the discourse of Practice-based Research.
2.2. ACTION RESEARCH

Action Research emerged in the 1920's and has since developed on a constant basis to become a dynamic and evolved research method. Action Research gained distinction during times of change (Zuber-Skerrit, 2001: 1). World War 1 and 2 and more recently, a response to globalisation as well as rapid socio-economic change and advancements in technology ensured the dynamic development of Action Research (Zuber-Skerrit, 2001: 2). Zuber-Skerrit (2001:1) states that Action Research (and Action Learning) is more stable and sustainable than other ‘traditional ways of learning, training and research.’ Simply put, Action Research is the cyclical iterative process of an intention or plan, followed by an action, and completed by reflection on that action (Dick & Swepson, 2013: 2; Zuber-Skerrit, 2001: 2).

Once a cycle is completed, a second cycle starts with a revised plan or intention. See Figure 2.2. Action Research process (following page). Action Research is systematic and rigorous (Zuber-Skerrit, 2001: 2). Zuber-Skerrit (2001:3) also mentions that ‘Through reflection we conceptualise and generalise what happened (action). We can then investigate in new situations whether our conceptions were right; that is, we try to find confirming or disconfirming evidence.’

The incorporation of the Action research method within the framework of Practice-based Research, assists with the act of making. Here, the iterative and cyclical nature of the Action research method contributes to the development of a well resolved artefact as well as assists in the documentation process.

See section 2.2.1. Action Research, on poster 3 (following page) for a concise list of the steps that make up the process of Action Research.
PHASE 5.1 METHODS OVERVIEW

The dissertation’s main concern lies with an investigation focused on the making of space through the manual fabrication of space-defining elements. With this in mind, this dissertation employs a cyclical research strategy. The cyclical strategy is the product of the amalgam of the Practice-based Research method and the Action Research method. The Practice-based Research method contributes to the development of a well-received artefact.

PHASE 5.2 ACTION RESEARCH

Action research is, the cyclical iterative process of action and reflection on and in action. Action research is systematic, rigorous, and verifiable (Zuber-Skerrit, 2001:3).

The cyclical process of action research involves the following steps:
- Plan
- Act
- Observe
- Reflect
- Revise plan

The incorporation of the Action Research method within the framework of Practice-based Research assists with the act of making. Here, the iterative and cyclical nature of the Action Research method contributes positively to the development of a well-received artefact.

PHASE ACTION RESEARCH TECHNIQUE SOURCE MATERIAL PURPOSE TIME FRAME PHYSICAL MANIFESTATION Notes
1 Design and make testing model 1 Design and construct MDF, Paint and hardware Like materials, elements with traditional space-defining elements, To inform design and design process 4 DAYS Hardware
2 Investigate space creating elements, To inform design and design process 4 DAYS Like materials, To inform design and design process
3 Investigate textiles as alternative space-definer, To inform design and design process 1 DAY Like materials, To inform design and design process
4 Investigate space creating elements present in intervention site 2 DAYS Like materials, To inform design and design process
5 Investigate textiles as alternative space-definer present in intervention site 2 DAYS Like materials, To inform design and design process
6 Preceding phases
7 Iterative process, refer back and forth
8 Subsequent phases
9 Material exploration
10 Literature Review

(above) Table 2.1. Plan of Action, part 1

COMPLETED TO COMPLETE ON DAY

© University of Pretoria
2.3. Application of the Hybrid Research Method

The creative outcome of the project is demonstrated by means of the hand knotted textile element, while the significance of the knowledge obtained through making is described by means of words. The hand knotted textile plays an essential role in the bearing of the research, and therefore the research could not have been conducted without the hand knotted textile. The written description includes documentation of the research process, in other words, the process of making and knotting the textile space-defining element. The documentation takes the form of tables, sketches and photos. This process of research through making is represented in cycles as prescribed by the Action Research method.

The following key elements are identified by the Creativity and cognition studio as part of the process of Practice-based Research. The basic framework includes:

- A motivation for the project
- A time frame for the works to be performed. See Tables 2.1. Plan of Action, part 1 and 2.2. Plan of Action schedule, part 1, on poster 3 (left).
- The role of the creative artefact in the creative process
- Environments and tools needed to achieve the required output
- Information to be gathered
- Methods for the research and design process (Action Research method)
- Expected outcomes of the research process
- The relationship of the practice outcomes to the argument of the dissertation

The hybrid research strategy is initiated with the provision of an articulated and structured plan that incorporates a variety of research techniques. See Table 2.1. Plan of Action part 1. The plan of action table incorporates some of the key elements as suggested by the Creative and cognition studio and forms a basic framework for the process of making.

The plan of action table includes a number indicating the phase, a description of the action performed within that specific phase, the research technique applied and the purpose for the action. Further information such as the primary source used as basis for the action, the time frame to perform the action, as well as the physical manifestation of the action performed is included. The plan of action is divided into two parts. Part one was planned before the mid-year exam and part two was planned as a response to the results of part one as well as in response to feedback received during the exam. See Plan of Action part two in CHAPTER 5.

2.4. Conclusion

The discussion on Practice-based Research and the role of the artefact as well as the Action Research method provides the outline for the hybrid research method. Further, the chapter introduced a research strategy based on the plan and act components of the Hybrid research method. The Plan of action indicates foreseeable situations where the Design Process allows for more dynamic situations. The Design Process (observe and respond) is discussed further in CHAPTER 5: Design application.

Reflection follows each round of observation and response, as well as each design cycle. Final reflection on the dissertation follows in CHAPTER 6: Final reflections.
The chapter firstly provides an overview of traditional space-defining elements, and secondly, introduces textiles as alternative space-defining elements. This information is summarised in a comparative diagram. The diagram provides an overview of various examples of both traditional and alternative space-defining elements found within the interior and acts as a way-finding mechanism for the ensuing visual investigation. The visual investigation includes sketch diagrams as well as images of the contemporary interior examples presented in the comparative diagram. The unique character of textiles are discussed shortly as well as associations related to textiles.

“...We put thirty spokes together and call it a wheel; but it is on the space where there is nothing that the utility of the wheel depends. We turn clay to make a vessel; but it is on the space where there is nothing that the utility of the vessel depends. We pierce doors and windows to make a house; and it is on these spaces where there is nothing that the utility of the house depends. Therefore, just as we take advantage of what is, we should recognize the utility of what is not.”

-Lao-tzu, Tao Te Ching, 6th century B.C.
3.1.
TRADITIONAL SPACE-DEFINING ELEMENTS

Space is perhaps one of the most complex aspects of the interior. Space could be considered from a number of viewpoints. Clive Edwards, in the book Interior design, a critical introduction (2011:115) states that space is a permeable volume, bounded by the physical nature of a building. This suggests that interior spaces are volumes bound by the organisation of the building around it. Francis D.K. Ching (2007: 94) similarly states that space constantly surrounds us. He explains that the volume of space allows us to move, ‘see form, hear sound, feel breezes, smell fragrances…’ and although the volume of space manifests as a material substance, it is also a formless vapour (Ching, 2007: 94).

Ching (2007: 96) further describes form and space as opposing elements that produce an inseparable reality and that the combination of form and space results in architecture. Therefore, form cannot exist without the consequence of space, and space is undetermined without form. Just as a flat two-dimensional figure on a sheet of paper influences the shape of the remaining space surrounding it; a three-dimensional form is capable of articulating the volume of space around itself. This affords the three-dimensional form with a territory of its own (Ching, 2007: 103).

Ching (2007: 124) divides the elements of form that define space into the two main categories, namely horizontal and vertical. Horizontal and vertical elements of form consist of various configurations which define specific types of space. Where vertical boundaries are simply inferred rather than clearly defined, horizontal planes are still able to define fields of space (Ching, 2007: 124). Ching (2007: 103) refers to horizontal elements that define space as: Base plane, Depressed base plane, Elevated base plane and Overhead plane. Refer to section 3.3. Comparative visual study. Number 3.3.1. - 3.3.4. provide examples of traditional and alternative HORIZONTAL space-defining elements. Further textile-only examples can be found in number 3.3.5. - 3.3.7.

Vertical elements of form play a critical role in establishing visual limits within our spatial fields. Visually, vertical forms manifest more prominently than horizontal planes, facilitating the formation of volume, enclosure and a sense of privacy. Further, vertical elements separate spaces from one another and so establish mutual boundaries between exterior and interior environments (Ching, 2007: 124).

Vertical elements that define space are listed by Ching (2007: 125) as: Vertical linear elements, Single vertical plane, L-shaped plane, Parallel planes, U-shaped plane and Four-planes that form an enclosure. Refer to section 3.3. Comparative visual study. number 3.3.8. - 3.3.12. provide examples of traditional and alternative VERTICAL space-defining elements. Further textile-only examples can be found in number 3.3.14. - 3.3.16.

Traditional or ‘hard’ space-defining elements refer to elements and materials such as: concrete walls, -floors and -roof slabs, dry-walling elements, suspended ceilings, brick walls, steel frames, -structures and –floors. These materials would typically make up the horizontal and vertical planes that Ching (2007: 94-125) describes.
Textiles have the capacity to be light, flexible, translucent, opaque, thick, bulky, fine and delicate, foldable, textured and much more. They provide protection from heat and cold, absorb noise, and give control over the amount of light that enters a space (Kruger, 2009: 6). Textiles also possess unique, sensually tangible, often poetic aesthetics that other static architectural materials often cannot mimic.

While much of the current textile technologies are highly advanced, the basic principles of fabrics have ancient roots. The earliest evidence of woven textiles goes back approximately 7000 years, placing it almost immediately after the last ice age. Textiles were also found in the Palaeolithic settlements in the form of portable tent-like huts clad with animal skins; an example of its long history as an architectural material (McQuaid, 2006: 106; Quin, 2006: 23). The shelters of the Palaeolithic settlements also created some of the first man-made interior spaces.

Further examples of textiles applied in the interior throughout history (As written in A History of Interior Design by John Pile, 2005), are as such: The early Christian, Byzantine and Romanesque interior attributed its colourful roots. The earliest evidence of woven textiles goes back approximately 7000 years, placing it almost immediately after the last ice age. Textiles were also found in the Palaeolithic settlements in the form of portable tent-like huts clad with animal skins; an example of its long history as an architectural material (McQuaid, 2006: 106; Quin, 2006: 23). The shelters of the Palaeolithic settlements also created some of the first man-made interior spaces.

In the book Textile Architecture by Sylvie Kruger (2009), contemporary textile installations similarly illustrate a departure from the traditional applications of textiles and indicate an inclination toward the innovative use of textiles as space-making agents.

The diagram on the following page is based on the categories as defined by Kruger (2009). See Figure 3.2, Textile as space-defining element (following page). It identifies the two main categories of VERTICAL and HORIZONTAL ELEMENTS, similar to those found within traditional space-defining elements. The diagram also identifies a third category as three-dimensional space-defining elements. Further, each category is divided into subcategories as identified in the book Textile Architecture (Kruger, 2009). Even though the main categories correlate directly with those of traditional space-defining elements, the subcategories represented within the diagram do not. Refer to section 3.3. Comparative visual study, number 3.3.17. – 3.3.18. provide examples of alternative THREE-DIMENSIONAL space-defining elements.

Clive Edwards (2011: 115) explains that other than horizontal and vertical space-defining elements, contained elements also have the potential to define space. They allow for the occurrence of events and accommodate people. Cathy Smith (2004: 96) mentions that contained elements - such as decoration and other interior objects - are often viewed as inferior to the space that is defined by traditional space-defining elements. Smith (2004: 93) focuses specifically on alternative ways of formulating the physical interior environment. She states that the re-appropriation of typical interior materials and objects as traditional space-defining elements challenges the boundaries that make up the architectural envelope. In this case the internal and external limits of interior spaces are questioned, allowing for objects to be associated with functions other than what they were originally intended (Smith, 2004: 96).
3.3. COMPARATIVE VISUAL STUDY

Figure 3.3. Comparative diagram, poster 4 (opposite page) provides an extensive overview of various examples of both traditional and alternative space-defining elements found within the interior. The diagram situates each example within the categories Horizontal elements, Vertical elements and Three dimensional elements. Further these categories are divided into various sub-categories. This ensures a clear and visible link between the familiar traditional elements (left) and the possibly unfamiliar alternative opportunities (right). Sketch diagrams illustrating the traditional manifestation of the space-defining elements are included on the right-hand side of the diagram for reference. This is contrasted by a set of icons for the alternative examples on the left-hand side.

The Comparative overview diagram is the culmination of literature as found in sections 3.1. Traditional space-defining elements and 3.2. Textiles as alternative space-defining element. It also serves as an index or reference point for the succeeding exploration of space-defining elements within this section. The succeeding exploration is divided into three sections namely: horizontal elements (nr. 3.3.1.-3.3.7.), vertical elements (nr. 3.3.8.-3.3.16.) and three-dimensional elements (nr. 3.3.17.-3.3.18.). Lastly it acts as a discussion area for the concepts presented in section 3.4. The unique character of textiles.

Figure 3.2. Textile as space-defining element.

The diagram is adapted from the theory as available in the book, *Textile architecture* (Kruger, 2009).
Figure 3.3. Comparative diagram

Space-defining elements

Traditional space-defining elements

Horizontal elements

Textile as alternative space-defining element

Vertical elements

Three-dimensional elements

Soft space

Hard space

Base plane

Depressed base plane

Combined base plane

Base plane*

Cone

Depressed base plane*

Cone*

Unilateral

Retractable roof

Freestand*

Vertical linear elements

Single plane

1-degree configuration

Parallel configuration

10-degree configuration

Four planes

Curtain wall

Partition

Curtain wall house

Apartment

Rooftop in room

Flexible*

Textile

Pneumatic structure

Tent

Tent

Tent

Tent

Figure 3.3 Comparative diagram
3.3.1. HORIZONTAL ELEMENT
BASE PLANE

A base plane is a spatial field defined simply by a horizontal plane or figure placed on a contrasting background. Perceptible colour contrast, texture or tonal change between a surrounding area and a surface can define this spatial field. The boundaries of the spatial field do not block the flow through the zone (Ching 2007: 103-105).

Figure 3.4. Sketches of base plane (adapted from Ching) below

3.3.2. HORIZONTAL ELEMENT
ELEVATED BASE PLANE

An elevated base plane is an elevated portion with the base plane and delineates a specific territory. The level change defines the boundaries of the spatial zone and interrupts the spatial flow. The boundaries can be accentuated by means of colour of material change. This separates the spatial zone from its surroundings (Ching, 2007: 106-111).

Figure 3.7. Sketches of elevated base plane (adapted from Ching) below

The huge graphic carpets within the Seattle Public Library delineate specific areas of the library. These soft spaces demarcate the limitations of particular activities within the large open plan area. Thus the carpet or base plane creates a spatial zone that allocates specific functions into more defined areas.
3.3.3. Horizontal Element
Depressed Base Plane

The lowered portion of the Base Plane creates an isolated area. This lowered spatial zone is distinctly different from its surrounding context. The vertical elements formed by the depression creates visible boundaries (Ching, 2007: 112-117).

Figure 3.10. Sketches of depressed base plane (adapted from Ching) below.

The large hand knitted playground acts as an elevated base plane on which children can run and play. See section 4.1.2. Hand knitted playground, poster 8 (page 41). The elevation of the base plane creates a spatial zone that is separated from its surroundings. The use of colourful rope accentuates the boundaries of the elevated spatial zone.

A depressed base plane does not naturally form part of soft spatial zones. However the Merooj Trampoline park creates a depressed plane by combining hard and soft elements to form a tensile trampoline structure. This structure includes vertical elements that create visible boundaries to differentiate the depressed zone form its surroundings.
3.3.4. **HORIZONTAL ELEMENT**

**OVERHEAD PLANE**

A plane that establishes a spatial zone through the invisible boundaries created by its edges. The formal qualities of the spatial zone is determined by the height, shape and size of the overhead plane (Ching, 2007: 118-123).

Figure 3.13. Sketches of overhead base plane (adapted from Ching) below

(top) Figure 3.14. Atocha memorial, Madrid, Spain, 2007, Studio FAM (Schott, 2007).

Figure 3.15. (above)

POWERHOUSE MUSEUM LOVE LACE EXHIBITION
Sydney, Australia
2011
Janet Echelman
(Janet Echelman, 2011)

The installation by Janet Echelman is a canopy or fixed expanse of textile that is attached to a supporting structure, forming a spatial zone below. Traditionally a canopy is installed mainly for weather protection, but the installation by Echelman acts mainly as a sculptural structure, yet still defines a spatial zone below.
3.3.5. HORIZONTAL ELEMENT
UMBRELLA

An umbrella consists of a spoked substructure fixed around a ring. This ring moves around a central mast (allowing the umbrella to be put up and down). A textile membrane is spanned over the top creating a prominent spatial zone below (Kruger, 2009: 114). The physical boundaries of the spatial zone is limited to the edge of the substructure and textile membrane and is the most temporary in nature, as the object is often mobile and can always be stowed.

Figure 3.16.
THE UMBRELLAS
JAPAN - USA
1984-1991
CHRISTO AND JEANNE-CLAUDE
(Voltz, 1991)

The Umbrellas, designed by Artists Christo and Jeanne-Claude, were employed in Japan and the USA simultaneously to reflect the differences and similarities between the uses of the object in two inland valleys (Christojeanneclaude). The Umbrellas each articulate their own distinct spatial zones within the vast surrounding landscape. The capacity of textiles to expand and retract around a rigid frame is displayed in the essence of what an umbrella is. Without this characteristic, the umbrella cannot exist.

3.3.6. HORIZONTAL ELEMENT
RETRACTABLE ROOF

Retractable roofs are flexible textile membranes that can be horizontally opened and closed. The primary function is to provide rain and sun protection (Kruger, 2009: 104). Spatial zones created by retractable roofs are temporary in nature as they can be closed and stowed away, but more permanent than the zone created by an Umbrella as it is mostly fixed into place for the mechanisms to function.

Figure 3.17.
RETRACTABLE ROOF FOR THE CENTRE COURT AT
ROTHENBAUM
HAMBURG, GERMANY
1995-1997
ROOF: WERNER SOBEK
(Skyspan, 1999)

The translucent textile membrane used at Rothenbaum provides temporary sun protection but does not block out the sun completely. The retractable nature of the structure allows for a spatial zone to form over a large group of people without inhibiting or influencing movement within the zone formed below.

Figure 3.18.
THE TUBALOON
KONGSBERG, NORWAY
2006
SNOHETTA
(Sannes, 2008)

The Tubaloon textile structure serves as the roof of a stage at Scandinavia’s Kongsberg Jazz Festival. This freeform structure can be seen as a combination of more traditional space-defining elements: such as a single vertical plane combined with an overhead base plane. This creates a very dynamic spatial zone below that interprets qualities of both traditional space-defining elements mentioned.

3.3.7. HORIZONTAL ELEMENT
FREEFORM

Freeform as an element that forms spatial zones, is not defined by either CHING (2007) or KRUGER (2009). However, this type of space-definer can be considered natural to textiles. In other words, it is in the nature of a textile material to be malleable and to be shaped and formed into free forms.

Figure 3.19.
FREEFORM
THE TUBALOON
KONGSBERG, NORWAY
2006
SNOHETTA
(Sannes, 2008)

The Tubaloon textile structure serves as the roof of a stage at Scandinavia’s Kongsberg Jazz Festival. This freeform structure can be seen as a combination of more traditional space-defining elements: such as a single vertical plane combined with an overhead base plane. This creates a very dynamic spatial zone below that interprets qualities of both traditional space-defining elements mentioned.

textile - only elements...
3.3.8. **VERTICAL ELEMENT**  
**VERTICAL LINEAR ELEMENT**

Vertical linear elements establish a point on the ground plane. This makes it visible in space. A single linear element is unidirectional except for that path leading toward its position in space. When located within a defined volume of space a column generates a spatial field by itself by interacting with the defined spatial enclosure (Ching, 2007: 126).

Figure 3.19. Sketches of vertical linear element (adapted from Ching) below

![Diagram of vertical linear element](image)

3.3.9. **VERTICAL ELEMENT**  
**SINGLE VERTICAL PLANE**

A single vertical plane defines the volume it fronts by dividing a volume of space. These frontal qualities establish the edges of two spatial zones. As a dividing barrier the single vertical plane interrupts visual and spatial continuity by means of height which can provide a strong sense of enclosure or division of space (Ching, 2007: 134).

Figure 3.22. Sketches of single vertical plane (adapted from Ching) below

![Diagram of single vertical plane](image)

---

**Apaya Tinka Floor Lamp**

*Israel*

*Ayala Serfaty*

(Architonic, 2010)

The Apaya Tinka Floor lamp is a vertical linear element within a defined volume of space. When in use the lamp not only generates a spatial field through its form, but also by its function. Light emitted from the lamp increases the effect of the vertical linear element within a room.
The large hand knotted curtains created by Petra Blaisse act mainly as a visual space-definer within the shell of the Casa da Musica. See section 3.4.2. Curtain as architecture, poster 6 (page 35). The large glass facades however allow an abundance of light to enter the space, and here the textile space-definer not only acts as a view filter but also a sun filter, blocking harsh light. The curtains together with the glass facade, define the boundary between inside and outside.

The exterior curtains designed by Shigeru Ban is an example where traditional hard materials (walls) were replaced with an alternative soft material (curtain). The softness of the exterior curtain wall makes for a permeable interior space but still creates a boundary defining particular interior and exterior spatial zones. The L-shaped configuration of the curtain is a response to the roof overhang.
3.3.11. VERTICAL ELEMENT
PARALLEL PLANES

Parallel planes define a volume of space between them. The spatial field thus has a strong directional quality. The spatial field is oriented primarily toward the open ends of the configuration (Ching, 2007: 144, 149).

Figure 3.28. Sketches of Parallel planes (adapted from Ching) below.

3.3.12. VERTICAL ELEMENT
U-SHAPED CONFIGURATION

The field of space defined by U-shaped configuration of vertical planes is focused both inwardly and outwardly (Ching, 2007: 150).

Figure 3.31. Sketches of U-shaped configuration (adapted from Ching) below.

The parallel curtain planes create a distinct spatial zone that directs the user of the space towards the end of the passage. Here the use of a single vertical plane (curtain) directs the path of the user. The space-defining elements here are employed mainly for the purpose of circulation and secondly acts as a division of spaces with different functions.

(top) Figure 3.29. KMS Design Agency offices, Munich, Berlin, 2000; LYNX Architecture, (Brooker & Stone, 2010: 128).

Figure 3.30. (above)
CURTAINS IN FRIEZE ART FAIR TENT
LONDON, ENGLAND
2008
CARUSO ST. JOHN
(Kruger, 2009: 59)
the U-shaped configuration of the curtains create a semi-enclosed interior space. Although the curtains form a distinct U-shape, the spatial zone is not completely isolated visually due to the height at which the curtains hang. The curtains thus control and restrict sight lines of users within and outside of the recreation room, creating a specific amount of privacy within the internal spatial zone.

### 3.3.13. Vertical Element

**Four Planes: Closure**

Four planes create a very strong spatial definition. The four vertical planes create an enclosed space with an introverted nature. The boundaries also influence the spatial zones of the larger context (Ching, 2007: 125, 156).

The four planes created by the structural frame and curtains in the Danish Cultural ministry create a strong spatial definition when closed. However the temporal and mobile nature of the curtains within this space allows the normally introverted space to become part of the larger context. The structure with open curtains however enforce a visual spatial zone without constricting flow and movement through the zone.
3.3.14. VERTICAL ELEMENT
ROOM IN A ROOM

Vertical expanses of textile allow convertible rooms— that can be opened and closed at will—to be created within solid walled spaces. Closed textile structures can create spatial zones that become self-contained, temporary havens or individual areas for diverse uses (Kruger, 2009: 60).

Figure 3.37.
KUNSTHAUS BREGENZ, EXHIBITION
BREGENZ, AUSTRIA
2004
THOMAS DEMAND AND CARUSO ST. JOHN
ARCHITECTS
(Demand, 2004)

The temporary room within the foyer of the Kunsthauz Bregenz was created for screening a film. The floor-to-ceiling dark blue curtains move by means of a motor to form an enclosed dark room that can disappear when the curtains are opened. The curtains create a very distinct yet temporary spatial zone within a larger interior space. When closed the curtains disrupt the flow of movement, block views and create a certain sense of privacy. When opened these qualities disappear with the curtains.

3.3.15. VERTICAL ELEMENT
FLEXIBLE

Flexible elements that form spatial zones, are not defined by either CHING (2007) or KRUGER (2009). However, this type of space-definer can be considered unique to textiles. It is in the nature of a textile material to be malleable and to be shaped and formed and re-formed into textile space-defining elements.

Figure 3.38.
CLOUDS
2008
RONAN & ERWAN BOUROULLEC, AND KVADRAT
(Etherington, 2009)

Clouds, by the Bouroullec brothers, are completely flexible space-defining elements. These textile elements can be reduced in size by disconnecting sections of the textile and can be expanded by adding sections. Further, the textile can be used horizontally as well as vertically, or as both horizontally and vertically at the same time. The configuration of spatial zones are endless and the quality of the spaces formed are whimsical and transient.

3.3.16. VERTICAL ELEMENT
FLEXIBLE

Flexible elements that forms spatial zones, are not defined by either CHING (2007) or KRUGER (2009). However, this type of space-definer can be considered unique to textiles. It is in the nature of a textile material to be malleable and to be shaped and formed and re-formed into textile space-defining elements.

Figure 3.39.
THAW
2010
CENTRE FOR INFORMATION TECHNOLOGY AND
ARCHITECTURE
(CITA, 2010)

THAW, a student project done at the Centre for Information Technology and Architecture, explores tensile structures in architecture. The structure is formed by combining the unique capacity of textiles to expand and retract with the stiffness that timber has to offer. The expansion and retractions qualities of the element is translated into the spatial zone that is formed on either side of the vertical plane. Creating a spatial zone with boundaries that change with the flexible textile element.
3.3.17. THREE-DIMENSIONAL ELEMENT TENT

Tents traditionally consist of a supporting structure with a textile skin, allowing for an endless variety of tents. Most tents can be transported, easily set up and taken down. However, certain tents are also used as permanent yet mobile dwellings or as permanent and fixed installations for arenas or exhibition areas (Kruger, 2009: 150). Thus the spatial opportunities offered by tents are very changeable.

Figure 3.40. TENTSILE

2013
KIRK & ALEX
(Tentsile, 2015)

The Tentsile tent exploits the unique ability of a textile to be stretched until it becomes a ‘hard’ surface, as well as its ability to be rolled into a small element that can fit into a bag. The Tentsile tent creates a spatial zone within the interior of the tent with increased separation from the ground plane. This also allows for a secondary spatial zone to be formed below the stretched textile floor plane of the tent.

3.3.18. THREE-DIMENSIONAL ELEMENT PNEUMATIC STRUCTURE

Pneumatic structures are based on the tyre principle, the membrane covering is also the supporting element. The difference in pressure between the interior and the exterior stabilises the structure. Pneumatic structures are often employed to create temporary spatial zones for public events. However pneumatic structures can also be incorporated into building structures as permanent skins (Kruger, 2009: 166).

Figure 3.41. INFLATABLE CONCERT HALL
ARK NOVA MUSIC FESTIVAL
MATSUSHIMA CITY, JAPAN
2011
ANISH KAPOOR AND ARATA ISOZAKI
(Marcelino, 2013)

The purple membrane of the inflatable concert hall, forms an interior as well as exterior spatial zone. This pneumatic structure exhibits the unique character of textiles and its capacity to form spatial zones by becoming its own structure. The large interior spatial zone that is formed is temporary in nature, and will once again form part of the exterior spatial zone when the structure is deflated.

textile - only elements...
THE UNIQUE CHARACTER OF TEXTILES

Traditionally architectural space-defining elements are static, heavy and 'hard'. Where textiles have the capacity to manifest as the complete opposite, Kruger (2009) identifies a number of characteristics of textiles which can be supplemented by those identified by Hendrieka Raubenheimer (2012: 25). Her dissertation WARP + WEFT: Translating textiles into Interior Architecture highlights the character of textiles through manipulation of various textiles and photographing the outcomes. In response to both Smith and Raubenheimer’s findings, this dissertation proposes that textiles have the natural capacity to:

- Expand & retract
- Drape
- Flow
- Sway
- Fold
- Absorb
- Crease
- Screen
- Twist
- Tear
- Unravel
- Ripple
- Be soft
- Be fluid
- Disintegrate
- Be irregular
- Bleed colour
- Be bulky
- Be thick
- Be transparent
- Be fine
- Be textured
- Fold
- Crease
- Cover
- Be delicate
- Be light
- Be opaque
- Stretch
- Knot
- Weave
- Be furry
- Offer acoustic control
- Be structural
- Be tensile
- Be translucent
- Be malleable
- Temporal

See Figure 3.42. Collection of textile images on poster 5 (immediately right) provides example images that illustrate the character of textiles with space. See precedents on the opposite page to accompany this proposition.
3.4.1. ANNUAL INTERNATIONAL MUSIC FESTIVAL
RED BULL MUSIC ACADEMY
Langarita-Navea Arquitectos
Matadero, Madrid, Spain
Event installation (medium-term project) 2011

The Red Bull Music Academy (RBMA) is a ‘nomadic’ music festival held annually. Every year the event takes place in a different city around the world in order for producers, musicians and DJs to exchange knowledge and ideas on an international scale. In 2011 the RBMA was intended to take place in Tokyo but due to the devastating effects of an earthquake at the time, the location was changed. The city of Madrid became the new location and the event was planned and executed in Matadero Madrid in an industrial warehousing complex (Designboom, 2012; ArchDaily, 2012a).

With a time constraint of only two months, the construction project was approached as a temporary project due to the experimental nature of the proposed intervention and the heritage value of the warehouse, the design team intruded minimally on the existing shell within two months. The design intervention intruded minimally on the existing shell and illustrated ideas such as adaptability and standardization (ArchDaily, 2012a). Due to the experimental nature of the proposed intervention and the heritage value of the warehouse, the construction project was approached as a temporary project with plans for future removal (Designboom, 2012; Langarita Navea, 2012).

The music based programme required internal spaces with very specific acoustic properties. These requirements made the design of textile spaces the perfect solution, and therefore many of the interior spaces consisted of canvas overhead planes and textile bag (fill) used as vertical wall planes. These elements could be easily reconfigured and easily removed but still afforded the spaces with the necessary acoustic properties. The design intervention illustrated the capacity of textiles to be very temporary yet perform a myriad of other functions, such as the definition of spaces with different functions, acoustic control, softening of harsh sound surroundings and offering flexible public interiors.

3.4.2. CURTAIN AS ARCHITECTURE
CASA DA MÚSICA
Rem Koolhaas + Petra Blaisse
City of Porto, Portugal
New build 1999–2005

The Casa da Música is the Portuguese branch of the Rotterdam-based architecture firm, OMA. It was designed by Rem Koolhaas and associates and opened in 2005. The building is an expression of the collaboration between Rem Koolhaas and Petra Blaisse exemplifying the capacity of textiles to enrich space to an aesthetic level whilst simultaneously fulfilling a utilitarian function. The challenges the typical misconceptions of textiles as merely aesthetic or sacrifice the acoustic and atmospheric qualities offered by the textile curtain is used to full effect in the project. The Casa da Música illustrates the potential of exploiting the unique characteristics of textiles in place of traditional hard space-defining elements.

3.4.3. TEXTILE CAFE
MUDAM CAFE AND BOUTIQUE
Ronan and Erwan Bouroullec
Luxembourg
Installation 2006–2007

The Mudam is situated in a large interior space that carries a glass roof. Ronan and Erwan Bouroullec designed and developed a textile pavilion to provide relief from the solar radiation entering the glass roof and establish a soft space on a more human level than the surrounding architecture (The Collection, 2005). The pavilion consists of a woven structure that supports the textile cladding. The textile cladding system is composed of a series of tubular “North Tap” (Kruger, 2009: 124, 125). Other than relief from harsh sunlight entering the glass roof, the textile cladding enhances the space’s acoustic climate and contributes to creating a soft and welcoming atmosphere.

The pavilion illustrates the capacity of textiles to perform both utilitarian and aesthetic functions. Although the textile envelope enables the form and function of a traditionally hard and solid material, the nature of textiles as a material allows it to perform beyond these restrictions. The use of the textile adds a tangible experiential quality to the space below the overhead plane that other traditional materials cannot provide. Further, the pavilion also illustrates how textiles can form an intimate spatial zone by means of a textile overhead plane which is not merely a tent.
3.5. TEXTILE ASSOCIATIONS

Earlier in the study it was argued that the associations or connections that exist between textiles and decorating (Hoskyns 2007: 85) contributed to the devalued status of textiles within the interior as well as their current conventional application within the discipline of interior design. The research aims to re-evaluate this position and reclaim this valuable lost territory through alternative contemporary textile applications. New associations and perceptions can be established through these alternative applications.

Figure 3.46. Textiles, personal perceptions and associations is a heuristic exploration of the materials of textile and rope. The exploration was completed before and during section 3.3. Comparitive visual study. The diagram is not based on empirical data but acts as an observation (See CHAPTER 2: Methodology for further discussion of the methods).

Further, personal associations with the hand-knotted textile, rope and rope-like materials can be found in the forms of small bubble diagrams on specific posters throughout the presentation.

Figure 3.46. Textiles, personal perceptions and associations.

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3.6 Conclusion

The chapter investigated various examples of traditional as well as alternative space-defining elements. These examples provide opportunity for further investigation into the potentials and restrictions that textile as an alternative material offer in terms of space-making. These potentials and restrictions will be discussed in Chapter 5: Design development. Further, the precedents investigated provided a means of discovering the unique character of textiles. The Chapter also briefly introduced certain associations and perceptions that are linked to textiles as a material. These associations and perceptions will be introduced again later in Chapter 5: Design development.
This chapter situates rope and rope-like materials within the realm of textiles and textile production. The discussion includes a set of precedents illustrating hand-knotted textiles as space-defining elements. Next, the chapter investigates the construction and physical structure of rope and introduces rope and knot terminology. Knots are further unpacked by introducing the various knot categories and uses of each of these main types of knots. Furthermore, rope and knot strength is discussed. Overall the chapter serves as an introduction to rope and rope-like material and knotting as fabrication method.

“Indeed, I am not sure but it would be safe to state that the real difference between civilized and savage man consists largely in the knowledge of knots and rope work. No cloth could be woven, no net or seine knitted, no bow strung and no craft sailed on lake or sea without numerous knots and proper lines or ropes; and Columbus himself would have been far more handicapped without knots than without a compass.”

-Verril, 1917: 2
4.1. **ROPE AS TEXTILE**

See section 4.1.1. Rope as textile, on poster 8 (opposite page) for full definition of rope as textile. Further, refer to definition of terms in Section 1.6, (page 9).

...The term textile consequently refers to any filament, fibre or yarn that can be processed into cloth or fabric as well as the resultant material.

The emphasis and eventual outcome of the investigation is specifically aligned toward the application of rope and rope-like materials in the fabrication of textile space-defining elements. The use of rope allows the investigation the opportunity to apply textiles in an alternative manner within the interior. This yarn-based material is well situated within the realm of textiles. It displays the character of textiles and takes on textile functions.

See precedents 4.1.2. Hand knotted playground and 4.1.3. Beaded curtain on poster 8 (opposite page) as examples where rope is employed to create textile space-defining elements.

4.2. **ROPE CONSTRUCTION AND STRUCTURE**

Textile manufacturing is a major industry. At present most commercial textiles are produced by industrial production methods (Peopletree, 2014). However, textiles are still produced by means of pre-industrial processes, otherwise known as traditional manual fabrication techniques. The process of manual textile production follows the same basic steps as that of the industrial process. These steps involve the manufacturing of fibres, which are then processed into yarns. Whereafter yarns are fabricated into textiles (Kadolph, 2007: ii). Industrial textile production methods include knitting, weaving, tufting and fusion bonding, braiding, twisting, combining fibres as well as extruded polymer solutions (Yeager & Teter-Justice, 2000: 97-105). Manual fabrication techniques are limited to weaving, knitting, crocheting and lace making (Peopletree, 2014). The dissertation introduces knotting as an additional manual fabrication technique. See Figure 4.4. Pre-industrial textile production techniques, on poster 8 (opposite page).

Knotting as manual fabrication technique is pure in its capacity to be hand-crafted, whereas other manual techniques such as knitting, crocheting and lace making require additional, albeit basic, mechanical equipment.

Before taking up the matter of knot making, it is necessary to first consider rope (otherwise known as cordage) in general, as both it and the materials that it is made of, help determine its knot-making properties (Animated knots, 2012).

The structure of the cordage can also have an effect it’s capacity to stretch, its flexibility, abrasion resistance, handgrip, aesthetic and more (Penn, 2015; Animated knots, 2012). The three basic types of cordage are classified according to the method of construction (How products are made, 2015). See section 4.2.1. Main rope types on poster 8 (opposite page) for a list of the main rope types.
4.1.2. HAND KNITTED PLAYGROUND

Toshiko Horiuchi creates spatial zones using fibre and textile structures. The production of the hand crafted playgrounds involve the translation of traditional architectural space-defining elements, ideas and references into alternative space-defining elements that respect principles of tension and the forces of gravity.

The Knitted playground not only a sculptural landscape but also an experiential area for children to touch and feel. Toshiko firmly imagines an image drawn and calculates the area, amount of materials and the scale on which to work. These are quite a task and works so dimly until it is completed. The hand knitted playground is constructed of three-knots rope in which Toshiko does a knot by knot within a three span of three months. The completed pieces took Toshiko one year to create and assemble. Conceptually the project is based on the idea of an infant cradled in the womb (ArchDaily, 2012b).

The hand crafted playground is a prime example of how ideas of traditional hard, static space can be reimagined into alternative textile space. Further, the handcrafted playground illustrates how the manual textile fabrication technique of crocheting with rope can be applied large scale to form impressive decorative and useful spaces.

4.1.3. BEADED CURTAIN

The main feature of the new lounge is a beaded curtain designed and made by Hella Jongerius. It consists of hand-knotted yarn and 30,000 porcelain beads. The curtain acts as a space-defining element and enhances the view through the opening towards the East River. Jongerius also designed two new furniture pieces for the lounge area, introducing a revitalised colour palette to the space (Dezeen, 2013).

The beaded curtain in the UN building demonstrates the way in which rope can be integrated into semi-defining elements. The use of porcelain beads in combination with rope illustrates how soft elements can appear soft due to the pliable and flexible nature of rope. Although the rope curtain acts as a soft space-defining element, it ultimately communicates the characteristic of a traditional vertical, single plane space-defining element.

Figure 4.2.a. Hand knitted playground, elevation (archdaily, 2012B).
Figure 4.2.b. Hand knitted playground, plan view (archdaily, 2012B).
Figure 4.2.c. Hand knitted playground (archdaily, 2012B).
Figure 4.2.d. Hand knitted playground, hand knitting procedure (archdaily, 2012B).

Figure 4.3.a. Beaded curtain, Material selection (Jongeriuslab, 2013).
Figure 4.3.b. Beaded curtain, image 1-4 process of making (Jongeriuslab, 2013).
Figure 4.3.c. Beaded curtain, North delegates lounge (Dezeen, 2013).

Toshiko Horiuchi creates spatial zones using fibre and textile structures. The production of the hand crafted playgrounds involve the translation of traditional architectural space-defining elements, ideas and references into alternative space-defining elements that respect principles of tension and the forces of gravity.

The Knitted playground not only a sculptural landscape but also an experiential area for children to touch and feel. Toshiko firmly imagines an image drawn and calculates the area, amount of materials and the scale on which to work. These are quite a task and works so dimly until it is completed. The hand knitted playground is constructed of three-knots rope in which Toshiko does a knot by knot within a three span of three months. The completed pieces took Toshiko one year to create and assemble. Conceptually the project is based on the idea of an infant cradled in the womb (ArchDaily, 2012b).

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4.2.1.1. TWISTED ROPE

The rope making process is very similar to the process of textile construction.

The making of rope involves the twisting of fibres (Figure 4.5: A) to form what is known as a yarn (Figure 4.5: B). The combined twisting of two or more yarns, form a strand (Figure 4.5: C). Three or more strands twisted together form a rope (Figure 4.5: D), and finally when three ropes are combined, a cable is formed (Figure 4.5: E) (Verrill, 1917: 3). See also Figure 4.6. Types of rope, (1) for an example of twisted rope (opposite page).

In order to form a strand, the yarns are twisted together in the opposite bearing from that in which the initial fibres were twisted. Similarly, in order to form a rope, the strands are twisted in the opposite direction from the yarns of the strands. This ensures that the natural tendency for each yarn, strand, rope or cable to untwist, instead serves as a manner of binding it (Verrill, 1917: 3).

Twisted ropes are mainly constructed using natural fibres. The following terms are commonly used within the category of twisted rope:

◘ Three-strand twisted rope (also four-strand twisted).
◘ Lay: The lay or direction of slant, is the direction in which the strands of a rope twists.
◘ Right hand lay or Z-twist: Strand progresses away from the viewer, and rotates clockwise like right hand thread. Right hand lay is typically used for most three-strand or four-strand rope.
◘ Left hand lay or S-twist: Left hand lay or cable laid, is typically used for steel cables.

4.2.1.2. BRAIDED AND PLAIDED ROPE

The use of modern machinery and the advent of synthetic fibres allow for additional rope construction beyond that of twisted rope. Plaited and braided ropes, woven on machines are available in a range of decorative patterns, are tightly woven and don’t untwist as easily as twisted rope (Penn, 2015; Animated knots, 2012). See Figure 4.6. Types of rope (2) for an example of plaited rope and (3-6) as examples of braided rope (opposite page). The following rope structures for braided and plaited ropes are described by Randy Penn (2004) in his book The everything knots book:

Single braid ropes include various braids which have no second layer. These include:

◘ Hollow braid: The construction consists of two sets of fibres that progress around in opposite directions and weave into each other. Hollow braid refers to the behaviour of the rope as it readily opens up to become ‘hollow’. This allows the tail or standing end of the rope to be passed through the rope to form a knotless loop.
◘ Solid braid (simple weave): The construction of the rope consists of two sets of fibres that rotate in opposite directions but with a tighter weave than that of the Hollow braid structure. This structure is mainly applied to smaller diameter general-use lines.
◘ Solid braid (solid weave): The structure of a solid braid, solid weave rope contain fibres that do not progress around the rope. Instead the fibres spiral from the exterior of the rope toward the interior. The solid weave structure is commonly found in general-purpose rope but is not applied to high performance or specialty purpose rope.

Double braid (braid-on-braid) rope consists of a braided interior core surrounded by a braided outer sheath. The load is thus shared between the sheath and the core. The protection offered to the core by the braided sheath is desired but can make it difficult to detect any possible damage to the inner core. Some core and sheath ropes contain cores that are not braided, such as a three-strand rope. The core can also be a composed of different material than the outer sheath attributing the rope with different properties.
4.3. ROPE TERMINOLOGY

NOTE: The following terminology pertaining to rope and the tying of knots, is a direct selection from the American army field manual section FM 3-05.70 (Mongabay.com, 2015). The selected terms will be applied continuously throughout the document.

STANDING PART: The static part of the rope or rest of the rope besides the running end.

RIGHT: A simple bend in a rope in which the rope does not cross itself.

TURN: A loop around an object such as a post, rail or ring, with the running end continuing in the opposite direction to the standing end. A round turn continues to circle and exists in the same general direction as the standing end.

LOOP: A loop is formed by crossing the running end over or under the standing end to form a ring or circle in the rope.

RUNNING END: The free or working end of the rope. This is the part you are actually using to tie the knot.

DRESSING THE KNOT: The orientation of all knots parts so that they are properly aligned, straightened, or bundled. Neglecting this can result in an additional 50% reduction in knot strength. This term is sometimes used for setting the knot which involves tightening all parts of the knot so they bind on one another and make the knot operational. A loosely tied knot can easily deform under strain and change, becoming a slipknot or worse, untying.
4.4. KNOT CATEGORIES

According to Pettigrew (2013) in A few good knots & hitches and bends, knots can be divided into various categories. These basic categories are: Hitches, Loops, Noose, Bends, Binders, Stopper knots, Friction knots, and Lashings (Pettigrew, 2013). Pettigrew (2013: 4) refers frequently to ABoK when describing knots.

The acronym, ABoK refers to Ashley’s Book of Knots (AcronymFinder; Pettigrew, 2013: 4). This book was first published in 1944 and later reprinted in 1993 with amendments. The book contains 7000 drawings representing more than 3800 different knots. It is the principal reference work for knotting as each knot illustration is identified by a number (Pettigrew, 2013: 4). According to Pettigrew (2013: 4)

“With many knots having more than a single name in any one language, the reference number from ABoK has become the equivalent of the Binomial or Latin name in Zoology and Botany.”

However, new knots and some that do not appear in Ashley’s Book of Knots lack an ABoK number.

With reference to both Pettigrew (2013) and Ashley (1993) knots are categorised as:

- Noose
- Loops
- Friction knots
- Lashings
- Binders
- Hitches
- Bends
- Stopper knots

These knot categories are described in more depth on the opposite page. All illustrations from Ashley’s Book of Knots (Ashley, 1993).
**NOOSE:** A noose or snare, sometimes called a running knot, is a variety of loop knot that is tied in hand and, when placed around an object, renders and constricts when the rope is pulled on. It serves a purpose similar to a hitch, but a hitch is tied directly to its object (Ashley, 1993: 203). Figure 4.8. The figure-eight noose. ABoK #1116 (Ashley, 1993: 203).

**LASHINGS:** Lashings is a broad term that covers several somewhat different practices. A lashing may wrap and bind, or else bind only with a multiplicity of turns, a bale, parcel, box, chest, or other container, either for transportation or for storage. It may secure something movable to something that is fixed, with various turns and hitches, so that it cannot shift from its position (Ashley, 1993: 315). Figure 4.11. The loop knot. ABoK #2068 (Ashley, 1993: 315).

**LOOPS:** A loop knot is a closed bight that is tied either in the end or in the central part of a rope. It serves the same purpose as a hitch. However, a loop knot is a rigid knot that is tied in hand and placed over an object such as a peg, post, pile, hook, or the lug of an archer’s bow, while a hitch is made fast directly around an object (Ashley, 1993: 185). Figure 4.9. The bowline. ABoK #1010 (Ashley, 1993: 185).

**BINDERS:** Binders or binding knots are of two sorts. The first sort passes around an object or objects two or more times and the tow ends are snugly tied together; the second passes around an object or objects two or more times and the ends are stuck under the turns. The knots serve two purposes. Either they confine and constrict a single object, or else they hold two or more objects snugly together (Ashley, 1993: 219). Figure 4.12. The Granny knot. ABoK #1206 (Ashley, 1993: 219).

**STOPPER KNOTS:** Stopper knots or knob knots are divided into various sub-categories, each with their own purpose. Stopper knots are used for a variety of tasks, from holding up a shelf or attaching a swing, to preventing the rope from unreeving from a block, slipping through a cam cleat or running out of a belay/abseil device. They can also provide security to a knot by preventing the tail from pulling through. They are equally useful in providing handholds on a rope that is being pulled or climbed (Pettigrew, 2013: 32). Figure 4.15. The overhand knot. ABoK #514 (Ashley, 1993: 84).

**FRICTION KNOTS:** The Ashley book of knots classifies friction knots as ‘right angle and lengthwise pull hitches’ (Ashley, 1993: 289, 297). Pettigrew (2013: 34) describes friction knots or slide and grip knots as specialised knots. They are mainly tied using slings made of webbing or cord. The cord used is usually between 60% and 70% of the diameter of the rope it is to be tied around (Pettigrew, 2013: 34). Figure 4.10. The prusik knot. ABoK #1763 (Ashley, 1993: 289, 297).

**HITCHES:** The general purpose of a hitch or crossing knot is to hold together the bights of two ropes, or two parts of the same rope that cross each other, or else to secure the bight of a single rope to another cylindrical object (Ashley, 1993: 213). Figure 4.13. The clove hitch. ABoK #1178 (Ashley, 1993: 213).

**BENDS:** A bend unites two ropes, or two parts of the same rope, generally at the ends. Its purpose is to lengthen the rope (Ashley, 1993: 257). Figure 4.14. The reef or square knot. ABoK #1402 (Ashley, 1993: 257).
4.5. ROPE AND KNOT STRENGTH

Every rope has a specific Breaking Strength. See definition of terms. Section 1.6. (page 9). This means that when a rope is placed under enough strain, it will break (Root, 2005). The safe working capacity or safe working load of a rope is generally considered to be one-fifth of the rope’s breaking strength, or 15-25% of the tensile strength (BoatSafe, 2009). In other words, the breaking strength should be five times the weight of the object that the line will be holding. Even though a rope might have a safe working capacity when brand new aspects such as age, wear and tear, dynamic loading, excessive use, elevated temperatures or extended periods under load will critically affect the strength and safety of the rope (Root, 2005; JB Rope supply, 2015). The strength of a rope as stated by the manufacturer is for new or unused rope (Pettigrew, 2013: 6).

It is understood that all knots reduce the strength of a rope, but some knots are stronger than others. However, considering how important ropes and knots are to a variety of people, sufficient research on the strength of knots within ropes is scarce. The available sources of data often do not indicate how tests were conducted, nor do they indicate the type of rope tested or the age and condition of the rope. As a baseline for this dissertation, The study of knot performance: Exploring the secrets of knotted cordage to understand how knots work by All about knots (2010), was consulted.

The paper examines knot strength and structures that may weaken natural-fibre knots. The author compares the relative strength of a selection of commonly used knots. A straight or un-knotted rope is assumed to have 100% strength (All about knots, 2010). The values listed in the table below refer to the remaining breaking strength of a rope after the specified knot has been tied (Root, 2005).

See Table 4.1. Knot strength comparison, below (The figure indicated does not represent an exact percentage but the general range of strength is accepted as an indication).

For the purpose of this dissertation the following is assumed:

According to All about knots (2010) the strength of a knot is determined by two characteristics of the first curve within the knot:

1. The relative proportion of the full load that falls on the first curve
2. The severity of the first curve, that is, how far it deviates from a straight line.

Table 4.1. Knot strength comparison (Various sources)

<table>
<thead>
<tr>
<th>Knot Type</th>
<th>Knot Type</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong knots</td>
<td>Blood knot</td>
<td>85-90% (Barnes, 1947); 80% (Day, 1947)</td>
</tr>
<tr>
<td></td>
<td>Flemish bend</td>
<td>81% (Frank &amp; Smith, 1987)</td>
</tr>
<tr>
<td></td>
<td>Figure eight loop</td>
<td>80% (Frank &amp; Smith, 1987)</td>
</tr>
<tr>
<td></td>
<td>Double fisherman’s knot</td>
<td>79% (Frank &amp; Smith, 1987)</td>
</tr>
<tr>
<td>Moderate knots</td>
<td>Butterfly knot</td>
<td>75% (Frank &amp; Smith, 1987)</td>
</tr>
<tr>
<td></td>
<td>Bowline knot</td>
<td>60% (Day, 1947)</td>
</tr>
<tr>
<td></td>
<td>Overhand knot</td>
<td>60-65% (Leubben, 1995)</td>
</tr>
<tr>
<td>Weak knots</td>
<td>Overhand bend</td>
<td>50% (Allaboutknots, 2010)</td>
</tr>
</tbody>
</table>

Further, it is also important to note that all components and rigging hardware used with rope or cordage should be suitable to the size and strength of the rope itself. The attachments should be properly installed and fixed and must have a safe working load capacity at least equal to the product with which they are used (Toolee, 2007). Rigging and hardware is covered in greater depth in CHAPTER 5: Design application.
4.6. CONCLUSION

Rope and rope-like materials stem from the same yarn based fabrication methods as textiles, and so can be classified as a subcategory of textiles. The formation of textile space-defining elements by means of hand knotting rope and rope-like materials imply a certain knowledge of the material. The chapter therefore introduced terminology specific to rope and knotting and discussed the main categories of knots and each of their applications. Further, the chapter illustrated examples of the use of hand knotted rope as textile space-defining elements.

The specific material selection and selected colour palette is discussed in CHAPTER 5: Design application.
This chapter investigates, documents and conveys the design process and development. The chapter firstly introduces the conceptual thinking behind the design. This is followed by a description of the design process followed during the production of the hand knotted textiles. Whereafter an overview of the test sites, the site for intervention and the programme is presented. The design process is documented in cycles and each cycle includes a variety of sketches, photo studies, diagrams and textual documentation. All documentation of the design process and development can be found in APPENDIX B and C.

“Always design a thing by considering it in its next larger context—a chair in a room, a room in a house, a house in an environment, an environment in a city plan.”

-Eliel Saarinen

figure 5.1. hand-crafted, knotted textile sample
5.1. CONCEPTUAL THINKING

Throughout the dissertation, the terms traditional and alternative are visible. These concepts are posed against each other and the resulting paradox contributes to the decision-making process. In this way, the dissertation investigates how traditional ideas, methods, material use, and applications can be translated alternatively. The conceptual thinking is illustrated through the following illustrations:

Figure 5.2. Traditional versus alternative diagram (Various sources) (below)
Figure 5.3. Conceptual image board (Various sources) (right)

The conceptual approach diagram represents various manual construction methods that exist within the realm of textile craft. For each method of construction, there are various examples. The examples are also split into the two categories “traditional” and “alternative”. Traditional examples are found left of the cut line, while alternative examples are right of the cut line. The conceptual diagram also serves as a “pasteboard” for a range of small precedents. Textile construction methods explored in the diagram include:

- Fabric (Material)
- Sewing (Post-production)
- Cross stitch (Post-production)
- Macramé (Post-production)
- Knitting * (Pre-production)
- Weaving * (Pre-production)
- Crochet * (Pre-production)

* Represents pre-industrial textile production techniques, where lace-making is the fourth manual fabrication technique.

[Conceptual Approach Diagram]

Traditional & Alternative

- Textiles as traditional decorative material
- Textiles as alternative decorative material
- Permeability, transparency, and temporality

[Diagram of Textiles]

- Traditional
- Alternative
5.2. DESIGN PROCESS

The principles of Action Research - planning, acting, and critically analysing - form the basis of the iterative design process within this study.

The Action Research method is responsive to the design situation in a way that many other research methods can’t be (Dick, 2000) – rendering it appropriate to the investigation of the process of knowing through making.

Figure 5.4, Design process diagram (below), indicates the way in which the Action Research method is applied in this dissertation. Each rectangle firstly represents one of the steps typically present in the process of manual textile fabrication. See Figure 5.19, Typical steps in manual textile fabrication, poster 12 (page 58). In addition to representing the Action Research method within the rectangles, the test sites and intervention site are also indicated within the rectangles as an integrated part of the process.

The process of planning, acting and critically analysing always takes place in the same order, but, the process is not always initiated in the same rectangle (as indicated by the arrows above and below the rectangles). Each design cycle is recorded and the observations made at the end of each cycle forms the basis for the plan of action set out for the ensuing cycle. Refer to Table 5.5, Test matrix on poster 12 (page 58).

The design process takes place within the various sites, which respond to various scales of design investigation. The first two sites are the test sites. The first of the two test sites is focused on detail design (the fabrication of a textile through the method of knotting) and the second test site is focussed more on the spatial manipulation of the textile space-definer. The site for intervention is the final physical manifestation of the textile space-definer. This spatial manifestation realises the theory discussed on spatial definition in CHAPTER 3. The cycles of design incorporate a response to all three of these sites, with planning, acting and critical reflection as part of each of the cycles. (It is however important to note that the iteration process is not necessarily a linear process. The design response might move two boxes to the right on the diagram and then one step to the left. It does not mean that the next design steps would be back to the right.)
5.3. SITES FOR MAKING AND TESTING

Section 5.2. Design process offers a visual representation of the iterative design process. This process is represented by means of a process icon at the top of pages where appropriate. The process icon is based on Figure 5.4. The design process diagram.

The iterative cycles, employing various sites, ensure that design is considered on a larger intervention scale as well as on a more detailed and focussed scale.

The iterative cycles therefore allows for the comprehensive development of the eventual textile space-definer. The three test sites act as neutral ‘areas’ for the making and testing of the knotted textile. Each of the test sites have their own parameters and characteristics. The test site for intervention allows the textile to be tested on human scale, as a spatial manifestation. See APPENDIX A for the process of construction for the Testing frame and Testing box.

See section 5.3.1. Testing frame, 5.3.2. Testing Box and 5.3.3. Testing site for intervention on poster 10 (following page) for a discussion on each of the sites. Tables 5.1. - 5.3. provide feedback in terms of observations made during the design process and the specific response to each of the observations. These observations and responses are findings related specifically to construction of the site, its parameters and issues that surfaced while working and designing within the sites.
5.3.2. **TEST BOX**

The testing box is not designed according to a specific scale but allows for the testing of knotted textiles in a three-dimensional setting. One could imagine the horizontal surface of the box as a floor or ceiling of an interior space and the vertical panels of the box as the walls. Therefore, testing is done to discover spatial responses within the solving of construction details on a scale of 1:1 as with the testing frame.

Construction parameters of the testing box were derived from knowledge gathered throughout the iterative process. See Table 5.1. Plan of Action, part 1, poster 3 (page 16). This includes responses as seen in Table 5.1. (below). Figure 5.7. Test type diagram, page 11 (page 57) indicates that tests completed within the framework of the box would fall under category A and B, rigid and semi-rigid and semi-rigid testing. See APPENDIX A for construction process of the testing box. See Figure 5.8. View of test box (directly below) and Figure 5.9. Test box, scale 1:10, and Figure 5.10. Test box exploded view.

Table 5.2. Test box, observation and response.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>The testing box is not designed according to a specific scale but allows for the testing of knotted textiles in a three-dimensional setting.</td>
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</tr>
<tr>
<td>The physical parameters of the box were derived from knowledge gathered throughout the iterative process.</td>
<td>The physical parameters of the box were derived from knowledge gathered throughout the iterative process.</td>
</tr>
<tr>
<td>Labels were fixed to anchor points within the testing frame.</td>
<td>Labels were fixed to anchor points within the testing frame.</td>
</tr>
<tr>
<td>Cardboard cut-outs resembling the main structural columns within the studio were placed into the box.</td>
<td>Cardboard cut-outs resembling the main structural columns within the studio were placed into the box.</td>
</tr>
<tr>
<td>A threaded rod was added to compensate.</td>
<td>A threaded rod was added to compensate.</td>
</tr>
<tr>
<td>The neutrality of the box makes it unclear where in 'Boukunde'</td>
<td>The neutrality of the box makes it unclear where in 'Boukunde'</td>
</tr>
<tr>
<td>the studio was placed into the box.</td>
<td>the studio was placed into the box.</td>
</tr>
<tr>
<td>Labels were fixed to anchor points within the testing frame.</td>
<td>Labels were fixed to anchor points within the testing frame.</td>
</tr>
</tbody>
</table>

Table 5.3. Test box, observation and response.

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</tr>
<tr>
<td>the studio was placed into the box.</td>
<td>the studio was placed into the box.</td>
</tr>
<tr>
<td>Labels were fixed to anchor points within the testing frame.</td>
<td>Labels were fixed to anchor points within the testing frame.</td>
</tr>
</tbody>
</table>

Figure 5.8. View of test box (directly below) and Figure 5.9. Test box, scale 1:10, and Figure 5.10. Test box exploded view.
5.3.3. TESTING SITE FOR INTERVENTION

The site for intervention forms part of the process of iteration and acts as a spatial informant. Within the structure of the dissertation, the site for intervention acts as a site within which to investigate and display the spatial manifestation of the hand knotted textile. The focus of the study remains primarily on the design process, with the product of the process as the primary research contribution.

The selected site is the first year studio in the Building Sciences Building (Boukunde) on the Main Campus of the University of Pretoria. The building houses the Department of Architecture, with programmes in Architecture, Interior Design and Landscape Architecture. See Figure 5.11. View of test site for intervention (not to scale) and Figure 5.12. Test site for intervention, not to scale, and Figure 5.13. Existing traditional space defining elements.

Observation Response

Working on plan too early in the design process resulted in a very traditional first design response in terms of material choices, form and spatial thinking.

Instead of continuing on plan, design was moved back to the test frame and an exploration of material uses. Inspiration was also taken from various images and resulted in the formulation of image boards. Afterward the design process returned to the site for intervention.

Due to a fairly limited understanding of the potentials and limitations that the material offers, it was hard to determine an alternative spatial response.

A design charrette was done using existing knowledge and skills. This traditional response and understanding would then be 'translated' into an alternative response.

Design on plan reached a certain level of development when new textile ideas or input was needed. Design response was spatially appropriate in terms of movement through space, but form and aesthetic did not speak the same language as the use.

Various images were found online to create an Image board. These images indicate ideas of textiles in tension, textiles as suspension system and cable-stayed structures and designs. Design process returned to section, plan and detailing.

Table 5.3. Test site for intervention, observation and response.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working on plan too early</td>
<td>Resulted in very traditional first design response</td>
</tr>
<tr>
<td>Due to limited understanding of materials</td>
<td>Hard to determine alternative spatial response</td>
</tr>
<tr>
<td>Various images found online</td>
<td>Created Image board indicating ideas of textiles in tension, suspension system and cable-stayed structures</td>
</tr>
<tr>
<td>Design on plan reached a certain level of development</td>
<td>Spatially appropriate movement through space, but form and aesthetic did not match use</td>
</tr>
</tbody>
</table>

Figure 5.11. View of test site for intervention (not to scale).

Figure 5.12. Test site for intervention, not to scale.

Figure 5.13. Existing traditional space defining elements.
5.3.5. REFLECTION (ONE)

During the planning phases of the test sites, certain design and construction assumptions were made. These assumptions were based on knowledge accumulated from precedent studies and literature reviews. See Chapter 3: Literature study. This was used as the starting point for decisions made in terms of the parameters that would be used for construction of the test sites. After designing using the textiles within each of the individual sites, it became clear that some of the initial assumptions were incorrect. A number of changes and refinements could then be made based on the new knowledge collected during the making and testing phase. These observations and responses are discussed within Table 5.1 - 5.3 on poster 10 (page 55).

Research through making implies gaining knowledge through the process of making. The process of designing and testing the test sites clearly illustrated this to me. This was an important step for me as it demonstrates the importance of the process of plan, act, observe and reflect. It also demonstrates the importance of action plans based on knowledge that was gained during the actual making part of the process. Instead of knowledge collected through the typical research style, this type of knowledge could potentially gain a more accurate design response the first time around.

Through reflection certain deductions were made concerning the nature of the test sites. See Figure 5.17. Textile systems in section 5.3.5.1. Analysis on poster 11 (opposite page).
5.3.4.1. MATERIAL USE

NOTE that the dissertation is not an exercise in the reuse, recycling or upcycling of found rope or rope-like materials. The test materials are representative of the final materials but not identical nor indicative of the final aesthetic of material palette. Refer to section 5.3.4. Testing materials (page 56) for more information of the various testing materials and images. Find below the definitions for rope and rope-like materials.

ROPE TYPES

5.3.5.1. ANALYSIS

Three kinds or systems of textile interaction manifest. These systems are illustrated on the diagram to the right.

- Test frame performs as rigid grid system, TYPE A on Figure 5.17.
- Test box performs as semi-rigid system, TYPE B on Figure 5.17.
- Test site performs as most flexible system, TYPE C on Figure 5.17.

This information could not be gained by means of traditional research methods at the beginning of the study. These facts were gained purely by means of testing.

Figure 5.17. Test type diagram.

Table 5.4. Selected testing cordage

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Material</th>
<th>Structure</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sash cord</td>
<td>Cotton</td>
<td>Double braid</td>
<td>Shared load</td>
</tr>
<tr>
<td>2</td>
<td>Sash cord</td>
<td>Cotton</td>
<td>Double braid</td>
<td>Shared load</td>
</tr>
<tr>
<td>3</td>
<td>T-Shirt rope</td>
<td>Viscose</td>
<td>Knit</td>
<td>Stretch</td>
</tr>
<tr>
<td>4</td>
<td>Ski rope</td>
<td>Polyethylene</td>
<td>Three strand twisted</td>
<td>Rotational force</td>
</tr>
<tr>
<td>5</td>
<td>Fabric strip</td>
<td>Cotton</td>
<td>Weave</td>
<td>Increased surface area</td>
</tr>
</tbody>
</table>

Test type diagram:

- Testing textile using structure of textile combined with hard material such as pleated as a structural brace, or testing low and simplified anchor points.
## Test Matrix for Design Cycles

### Action and Observation

**Figure 5.19.** Typical steps in manual textile fabrication

<table>
<thead>
<tr>
<th>DATE</th>
<th>Test Nr</th>
<th>Desired result</th>
<th>Test category</th>
<th>Method</th>
<th>Notes</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/06</td>
<td>17</td>
<td>Square</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05/06</td>
<td>20</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06/05</td>
<td>6</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07/05</td>
<td>3</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/05</td>
<td>1</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09/05</td>
<td>11</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/05</td>
<td>141</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/05</td>
<td>2485</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/05</td>
<td>1114</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13/05</td>
<td>1114</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14/05</td>
<td>1114</td>
<td>Hitch</td>
<td>Knot</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 5.3: Test Matrix

<table>
<thead>
<tr>
<th>DATE</th>
<th>Test Nr</th>
<th>Desired result</th>
<th>Test category</th>
<th>Method</th>
<th>Notes</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>29/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06/05</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04/06</td>
<td>Hitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Scale change occurs when design moves here and test idea to another. Other tests would be done where design changes are done.*
The diagram represents the process of making. The process starts at the identification of three types of space (numbered 1, 2, 3). Each type of space requires a different type of textile. This is divided into categories of density. The arrows indicate the path of the process, while the number within the dark blue circle indicates the test number. The test number on the diagram correlates with the test number as found in the TEST MATRIX. All procedures and observations are documented in the Test Matrix. Refer to the key below the diagram for further instruction.

Figure 5.20: Flow diagram.
5.4.1. Thick textile 1

From the onset of the first test, the framework for the creation of the first textile sample was based on the proposed programme. The programme requires three basic types of interior spaces: private space, semi-public space and public space. The design response investigates three types of textiles that would fulfill the requirements for each of these interior spaces. The first cycle focuses on a material that is thick and dense.

Conclusions were reached in terms of:

Possible spatial functionality: The sample is quite thick and can act as a strong visual barrier. The sample could potentially be used to create a space-defining interior space. The textile can be stretched easily due to material selection.

Aesthetic and tactile quality: The completed knotted textile has a defined and organized knot pattern on one side and a less structured pattern on the other side. The textile feels soft to the touch and has a very pliable and malleable quality to it.

Knot and material selection: The initial knots were done instinctively as a way of fixing two pieces of rope together. The T-shirt rope allows for ease of knotting. Due to the width and stretch of the rope-like material, a substantial length of rope results in a small sample surface area. Research on the knot type and category took place after the completion of the first textile sample.

Potential: The textile sample allows for stretchability, flexibility, coverage, density. It can also act as a visual barrier, influence the acoustic quality of a room and be visually appealing.

5.4.2. Thick textile 2

Thick textile 2 is a response to the observations made after the construction of thick textile sample. Conclusions were reached in terms of:

Possible spatial functionality: The sample is quite thick and can act as a strong visual barrier. The sample could potentially be used to create a space-defining interior space.

Aesthetic and tactile quality: The completed knotted textile has a defined and organized knot pattern on one side and a more unruly pattern on the other side. The textile gives way when pushed onto it. The textile is slightly more rigid than thick textile sample 1. The openings between the knots are larger than in thick textile sample 1.

Knot and material selection: The wider textile strip allows for larger more bulky knots to be formed and therefore causes larger openings in the finished sample.

Potential: The textile sample is visually appealing and should be employed in any wall space, defined or undefined allowing for visual connection between spatial zones. The softness of the textile sample could potentially alter the feel of an interior zone. The nature of construction allows for various configurations of colour and pattern which need to be explored further.
The spacing of the Primary Cord by means of a board product is a response to the initial observation that the thick textile sample appeared ‘flat’. Secondly, the form and functionality is a response to the spatial quality of the proposed site of intervention. The sample aims to offer the user the opportunity to adjust the conditions of the interior space as a response to light, sound and visual influences.

**Conclusions reached in terms of:**

- **Possible spatial functionality**: The adjustable panels within the sample allow for customizable spatial zones. The textile sample is noticeably deeper than samples 1 and 2, allowing for the creation of a more articulated spatial definition.
- **Aesthetic and tactile quality**: The sample is reminiscent of a drift, evoking ideas of interior furnishings and decoration yet remaining quite traditional due to the board. Knot and material selection.
- **Knot and material selection**: The use of a board product as horizontal definition gives the sample a hard, more traditional quality and appearance. The material choice should be reconsidered.

Possible potential: The adjustable nature of the sample allows for adaptable spatial zones.

**5.4.4. Adjustable space-definer iterations**

The first adjustable space-definer employs hard board materials. The tension of the adjustable space-definer makes use of the thick textile samples from test one and two. The sample aims to offer the user the opportunity to adjust the conditions of the interior space as a response to light, sound and visual influences. The use of the softer textile transforms the traditional hard blind into a softer alternative.

**Conclusions were reached in terms of:**

- **Possible spatial functionality**: The adjustable panels within the sample allow for customizable spatial zones. The textile sample is noticeably deep than samples 1 and 2, allowing for the creation of ‘thicker’ spatial definition. The softer, more permeable nature of the textile would potentially respond better to environmental factors than the solid hard board. These factors could include sunlight, auditory and visual influences.
- **Aesthetic and tactile quality**: The sample is reminiscent of a window blind evoking ideas of interior furnishings and decoration. The textile would accentuate these ideas of decoration, softness and femininity.
- **Knot and material selection**: The fusing knots employed are not ideal and should be reconsidered. Main knot and material selection discussed on page one.

Possible potential: The adjustable nature of the sample allows for adaptable spatial zones. The soft textile in this design opportunity is terms of soft space.

**Possible potential**

The adjustable nature of the sample allows for adaptable spatial zones. The soft textile in this design opportunity is terms of...
5.4.5. Rigidity

The board as horizontal element is naturally rigid. When replacing the board with a textile sample the rigidity is reduced. Knot choices in terms of tying as well as other 'hard' materials need to be added to the textile to provide adequate rigidity. Conclusions were reached in terms of:

Possible spatial functionality: The tying methods and insertion of stiff materials (such as a dowel) allow for rigidity within the textile sample. The rigidity is employed to ensure structural stability of textile-space dividing elements.

Aesthetic and tactile quality: The use of the dowel as rigid material within the textile does not detract from the soft and fluid quality of the textile sample. Knots for tying feel strong and rigid and provide a finished and rounded look to the product.

Knot and material selection: The knots used for tying provide ample structure.

Possible potential: The textile sample can span further and with more ease than without added rigidity. This would allow for larger sections of vertical or horizontal space-dividing elements to be covered or divided. The tying techniques investigated can be employed at various stages throughout the construction process.

5.4.6. Spatial exploration

When certain points within the sequence of the design process is reached, a jump in scale occurs. Between test 12 and 13 the spatial intervention was investigated on plan and various quick perspective sketches.

The following conclusions were reached:

When assessing the sketches and plans drawn it is apparent that conventional design methods result in conventional design proposals. This is especially noticeable in the form that the plans take on as well as the representation of solid volumes inserted into the existing space.

Knowing through making focuses on the creation of data instead of the collection of data. The importance of this process is clear in the design that resulted when the focus of the research was shifted to more conventional methods.
5.4.7. Lighter textile

The lighter textile sample is a response to the conclusions reached during the rigidity cycle. The lighter textile sample is the second type of textile that can be applied in the formation of semi-private spatial zones. (See process diagram).

Conclusions were reached in terms of:

**Possible spatial functionality:** The textile is considerably lighter than thick textile sample 3. The textile could sufficiently define semi-private spatial zones.

**Aesthetic and tactile quality:** The openings between knots are larger and provide less visual obstruction than the thick textile sample. The knot sequence creates an organized and recognizable pattern. The sample is looser than sample 1 and 2.

**Knot and material selection:** The selected rope-like fabric provides sufficient bulk for the construction of a textile that resembles thin but is lighter and less dense. The selected knot type remains as is and provides opportunity for the adjustment of the overall textile pattern and look.

**Possible potential:** Similar to previous textile samples, the nature and composition of the textile allows for variations in colour and pattern. The reduced weight of the textile is beneficial overall in terms of structure, fixing points and methods of insertion.

---

5.4.8. Planar irregularity

The planar irregularity cycle returns to the original textile samples created. The cycle employs the same knot as applied to the first sample tests, but introduces subtle changes in procedure.

Conclusions were reached in terms of:

**Possible spatial functionality:** The sample is quite thick and can be used to create a strong visual barrier. The sample can be used to delineate private interior spatial zones.

**Aesthetic and tactile quality:** The knotted textile has a defined knot pattern on one side and a more irregular pattern on the other side. See section 1.6. Definition of terms. Developed terms on page 9. The textile sample is very different from that achieved during the first sample tests. The textile feels soft to the touch and has a very pliable and malleable quality to it.

**Knot and material selection:** By simply changing the direction of knotting the result is changed completely. The structural behaviour of the textile responds in a significantly different manner than that of the textile sample one and two.
image board 1

AESTHETIC, TEXTURE AND DETAIL

Figure 5.54. Image board (Various sources).
56

FINAL KNOT SELECTION

Figure 5.55. Collection of selected knots (Right). Illustrate the specific knots that were selected after the Design cycles (See section 5.4.1-5.4.8). Each illustration includes the name of the selected knot, its ABOK number, a short description, and the selected size to represent the knot. The tying process of the knot is also illustrated directly below each knot icon. Each knot icon can also be found at the top right hand corner of certain pages to indicate its use.

KNOT SELECTION

STEP BY STEP

OVERHAND KNOT

ABOK # 114

The overhand knot is the simplest of the single-strand stopper knots, and is tied with one end around its own standing part, to prevent being pulled away.

DOUBLE FISHERMAN’S KNOT

ABOK # 1615

The Double Fisherman’s Knot is also known as the Grappling knot or Double Ensign Knob. This variation of the Fisherman’s knot is very versatile and is used in search and rescue operations. All variations of the knot need to be under strain, and in situations when the knot needs to be easily untied other knots are preferred.

SIMPLE NOOSE KNOT

ABOK # 114

The simple noose knot is closely related to the Overhand Knot, the first knot of the Horse being made with a slight instead of a single end, as in the Overhand. It is often employed above, when at sea, its simplicity being its greatest recommendation. It can be tied both in the light as well as in the end of a rope.

LARKS HEAD KNOT

ABOK # 2485, 56

The Larks Head is also known as the Clove Hitch. It is most commonly used in square knotting or Marine. Square knotting is started with a series of cord made Set to a Foundation cord by means of the Larks Head Knot.

CLOVE HITCH KNOT

ABOK # 1176-1180, 1773-1777

The Clove Hitch is a simple yet useful Hitch. It is used to secure more complex hitches, to hang things, to make rope fencing, to temporarily moor small boats, in straining where it is tied around a Carabiner and as a general utility knot. The Clove Hitch can be tied in the light or with the Wrist End.

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### Table 5.6. Plan of Action, part 2.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Action</th>
<th>Research Technique</th>
<th>Source</th>
<th>Material</th>
<th>Purpose</th>
<th>Time Frame</th>
<th>Physical Manifestation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Investigate spatial interaction and characteristics</td>
<td>Observation Design response</td>
<td>PHASE 6</td>
<td>N/A</td>
<td>Determines spatial interaction</td>
<td>Instrumental processes</td>
<td>Sketches, plans, sections, perspectives and spatial interpretations</td>
<td>Technical processes, risk back and forth between PHASE 2 &amp; 3. Spatial intervention will be guided by the result of the design processes and recorded on paper to maintain consistency.</td>
</tr>
<tr>
<td>12</td>
<td>Set up documentation procedures for testing</td>
<td></td>
<td>PHASE 6</td>
<td>N/A</td>
<td>In adhere to rigorous documentation procedures of the process</td>
<td>1 DAY</td>
<td>Architecture and data for data collection and documentation processes</td>
<td>The documentation procedure is involved in the processes after the first phase of design has been completed.</td>
</tr>
<tr>
<td>13</td>
<td>Test new and re-use materials on a spatial level within testing model 2</td>
<td>Paking</td>
<td>Research and observation</td>
<td>PHASE 4.1</td>
<td>N/A</td>
<td>Materials and spatial characteristics and scope of spatial intervention</td>
<td>Continuous processes</td>
<td>Photographs, sketches and progress documentation as well as possible models and maquettes</td>
</tr>
<tr>
<td>14</td>
<td>Document conclusions</td>
<td>Analysis</td>
<td>Synthesis of data in order to reach a conclusion</td>
<td>PHASE 4.1</td>
<td>N/A</td>
<td>Synthesis of data in order to reach a conclusion and well-defined conclusions</td>
<td>Continuous processes</td>
<td>Produced data in a well-structured and comprehensive manner.</td>
</tr>
<tr>
<td>15</td>
<td>Investigate types of hand or rig equipment</td>
<td>Paking</td>
<td>Research and observation</td>
<td>PHASE 4.1</td>
<td>N/A</td>
<td>Materials and spatial characteristics and scope of spatial intervention</td>
<td>Continuous processes</td>
<td>Photographs, sketches and progress documentation as well as possible models and maquettes</td>
</tr>
<tr>
<td>16</td>
<td>Integrate spatial intervention according to intervention site</td>
<td>Design response</td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Integrating spatial intervention with the design of space</td>
<td>1 WEEK</td>
<td>Plans, sections, perspectives, physical processes</td>
<td>Technical processes involving design on various scales, mixing tests and forming between the construction level and the spatial level.</td>
</tr>
<tr>
<td>17</td>
<td>Plan and control selection</td>
<td>Design response</td>
<td>Synthesis of data and presentation site</td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Materials and spatial characteristics and scope of spatial intervention</td>
<td>Continuous processes</td>
<td>Photographs, sketches and progress documentation as well as possible models and maquettes</td>
</tr>
<tr>
<td>18</td>
<td>Investigate and determine rigging method</td>
<td>Paking</td>
<td>Research and observation</td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Materials and spatial characteristics and scope of spatial intervention</td>
<td>1 WEEK</td>
<td>Sketches, detail sections</td>
</tr>
<tr>
<td>19</td>
<td>Technological literature</td>
<td>Analysis</td>
<td>Synthesis of data and presentation site</td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Determining spatial intervention and the method of setting up</td>
<td>TO BE DETERMINED</td>
<td>Sketches, detail sections</td>
</tr>
<tr>
<td>20</td>
<td>Documentation</td>
<td>Analysis</td>
<td>Synthesis of data and presentation site</td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Documentation to give an overview of methods</td>
<td>TO BE DETERMINED</td>
<td>Technical processes, risk back and forth between PHASE 2 &amp; 3. Spatial intervention will be guided by the result of the design processes and recorded on paper to maintain consistency.</td>
</tr>
<tr>
<td>21</td>
<td>Phase marking fabrication methods</td>
<td></td>
<td>PHASE 4</td>
<td>N/A</td>
<td>Identification</td>
<td>TO BE DETERMINED</td>
<td>Technical processes, risk back and forth between PHASE 2 &amp; 3. Spatial intervention will be guided by the result of the design processes and recorded on paper to maintain consistency.</td>
<td>Technical processes involving design on various scales, mixing tests and forming between the construction level and the spatial level.</td>
</tr>
</tbody>
</table>
5.8 DEVELOPMENT OF SCENARIOS

During the testing and making phases (using the testing box), the textile scenarios were developed. The following images illustrate the initial development of the scenarios as well as the form and use of the textile space definers on a spatial level.

TEXTILE PLANE ONE, POSITION 1 (above left and right).

The textile plane is adjustable by means of a pulley system. Position one defines a spatial zone below the mezzanine as either a digital classroom or an informal seating space. North of the textile plane is a formal studio space and exhibition space.

TEXTILE PLANE ONE, POSITION 2 (above left and right).

Position two defines spatial zones three and four. Zone three combines the space underneath the mezzanine with the existing formal studio space. Spatial zone four is now an enclosed area on top of the mezzanine with sides from the west using the stairs.

LARGE SUSPENDED TEXTILE, POSITION 1 (above).

The large suspended textile plane is considered a combination of horizontal and vertical planes. The structure is suspended by two static, permanent anchor points.

The exhibition and digital presentation sees the textile suspended from the existing overhead plane and fixed in position to define a more enclosed or removed area at the south west corner of the existing studio space. This area can be used in various formations for digital projection and exhibition or presentations. Here the staircase incorporated within the proposed mezzanine act as amphitheatre seating.

5.8 DEVELOPMENT OF SCENARIOS

During the testing and making phases (using the testing box), the textile scenarios were developed. The following images illustrate the initial development of the scenarios as well as the form and use of the textile space definers on a spatial level.

Figure 5.58.

Figure 5.59.

Figure 5.60.
5.9. DESIGN RESPONSE

The boukunde site for intervention acts as a shell for the textile intervention, firstly a hard element is inserted into the space - a cable-stayed mezzanine. This structure is not a textile space-defining element itself but sits within the formation of space. See Figure 5.61: Design intervention diagram (bottom). With textile space-making in mind the mezzanine structure is designed to be as lightweight as possible, conceptually alluding to permeability and lightness. See section 5.1. Conceptual thinking on page 9 (page 90).

5.9.1. PROGRAMMING

The commitment of the Department of Architecture to innovate, combined with the desire of the interior design disciplines to define and differentiate themselves from the discipline of architecture, creates the unique opportunity for the design of an INTERIOR DESIGN MAKING STUDIO for the department. See Figure 5.63: Diagram of proposed programme (right) for a bubble diagram indicating the different functions of the proposed programme.

5.9.2. SCENARIO ONE - DIVISION OF GROUP WORKSPACES

Scenario one allows the user to create a visual barrier between group working spaces. Each textile unit can be manoeuvred individually to suit the needs of the user at the location of the mezzanine and at the top. All of the units can stretch up to two storage spaces above and below the mezzanine can be doubled by the user. The textile is restricted to two vertical planes.

5.9.3. SCENARIO TWO - DIVISION OF INDIVIDUAL WORKSPACES

Scenario two offers the user more flexibility than scenario one. Each textile unit can be completely detached from the structure, allowing the user to relocate the sample to a different location. This allows the user to create a more private or enclosed space. The individual unit is equipped with colour-coded carabiners allowing various configurations of space.

5.9.4. SCENARIO THREE - DIVISION OF ROOM FUNCTIONS

Scenario three offers the potential of subdividing larger interior spaces. This allows for the creation of temporary space within an interior setting which could potentially house different functions. Within the design studio scenarios three includes the creation of a temporary digital projection space within an exhibition area.

5.9.5. EXISTING CONDITION

Figure 5.64 (left) indicate the areas where students currently have their design studios. Table 5.8 (below) indicate the number of students for each discipline in each of the years. The Honours student occupying the Western wing of the test site for intervention (first year studio) will be relocated to the OPEN AREA indicated in red on the plan. Figure 5.65 (bottom) illustrate with a collection of images, the current condition of the test site for intervention.

<table>
<thead>
<tr>
<th>Year</th>
<th>Interior Architecture Landscape TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>First year</td>
<td>88</td>
</tr>
<tr>
<td>Second year</td>
<td>14 60 16 98</td>
</tr>
<tr>
<td>Third year</td>
<td>28 50 20 98</td>
</tr>
<tr>
<td>Honours</td>
<td>12 12 43 65</td>
</tr>
<tr>
<td>Masters</td>
<td>7 26 14 46</td>
</tr>
</tbody>
</table>

5.9.6. ALLOCATION OF STUDENTS

Table 5.8 (above) shows that for the three different years and disciplines, the number of students varies. The number of Honours students is the least compared to the other disciplines.

Figure 5.61: Boukunde site for intervention as empty shell

Figure 5.62: Scenario sketches 1, 2 & 3 (boxed below)

Figure 5.63: Diagram of proposed programme (right) for a bubble diagram indicating the different functions of the proposed programme.
look and feel
THE MAKING STUDIO

Figure 5.66. Look and feel (moodboard).

POWDER COATING SAMPLES

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5.10. SPATIAL DESIGN RESPONSE

The basis for the design of the textile space-defining element is presented in the first part of this chapter in the form of design cycles, reflections and observation and response tables. The information and ideas discovered throughout the making process fully informs the spatial design response that follows.

The making process continues throughout the design development in order to enrich and contribute towards the more conventional spatial design process.

The textile samples and knowledge collected from the making process directly informs the basic textile unit. The basic textile unit is then altered to create the various spatial responses that follow. These space-defining elements are presented as part of the three scenarios as discussed earlier on poster 23, page 69. This is indicated when appropriate at the top right corner of the poster pages.

Sections 5.4.1. - 5.4.8. on posters 14-17 illustrate the initial design detailing cycles. Differently than with conventional research methods, research through making, introduces a process where smaller focussed detailing takes place before detailing on a larger scale. This section however looks at design detailing as part of the spatial manifestation. The design detailing takes place on the test site for intervention.

This section covers the following detail areas:

◘ the cable-stayed mezzanine
◘ the balustrade
◘ textile unit one & two
◘ rigging details
◘ the conceptual development of textile unit three

The location of each of these details are indicated on Figure 5.78. Section 1 - scenario one and two with detailing, poster 29 (page ). A small development sketch is added as reference.

NOTE:
All scales indicated on drawings (plans, sections and details) apply only to full scale poster prints. All drawings indicated within the book are ‘not to scale’.
LEVEL 4 PLAN
STUDIO LAYOUT
SCALE 1:100

MEZZANINE PLAN
STUDIO LAYOUT
SCALE 1:100

SPATIAL USE DIAGRAM

- Exhibition space
- Interior design studio space
- First year studio space
- Informal seating area
- Formal seating area
- Tannent area
- Digital exhibition space
- Making lab
**ELECTRICAL LEGEND:**

- Double wall socket at height indicated above finished floor level.
  - Junction box compact wall-mounted combined socket in faux linen, 85x85mm
  - Colour: Mint green, RAL 6009
  - Part number: 6529/8
- Double wall socket surface mounted to underside of concrete overhang at height indicated above finished floor level.
  - Junction box compact wall-mounted combined socket, 100x100mm
  - Carbon socket switch on yoke with surface mount box.
  - Colour: Black, Code: ST001
  - With additional magnetic upholstery insert.
  - Colour: Grey, Code: CS001
- 306x306 mm Cable knit pouffe.
  - Colour: Burnt orange.
  - Code: 6102016343001
- 306x306 mm Crochet pouffe.
  - Colour: Burnt orange.
  - Code: 6102016343001

**FIRE RETICULATION:**

- Big Dry powder fire extinguisher: 1/288 sqm.
- Fire hoses 1/360 sqm.
- Fire hose reel 1/500 sqm.
- Fire Escape.
Existing main structural columns
countertop
SEATING SPACE (seats 25)
eexisting floortiles
line of concrete overhang overhead
concrete beam overhead
line of mezzanine overhead

Removal of two strips of existing floor tiles, replace tiles with timber flooring insert
Brass edging strips to be placed on either side of timber insert
Shoulder eye bolt floor anchor-point (AP) recessed into timber strip within 70 mm diameter cutout
FIRE EXIT

amphitheatre seating (seats 20)
tread: 900
riser: 435
stair: 300
riser: 145

Coffee table to double up as stackable plinths

DESIGN STUDIO (seats 20)
eexisting floortiles

proposed overhead grid within existing ceiling plenum, to be used for suspended exhibitions

MATERIAL AND SAMPLE STUDIO (seats 10)
recycled rubber flooring

Figure 5.70.
LEVEL 4 PLAN
STUDIO LAYOUT
SCALE 1:50

Figure 5.71.
MEZZANINE PLAN
STUDIO LAYOUT
SCALE 1:50

© University of Pretoria
CEILING PLANS 1:100

LAYOUTS AND CALCULATIONS

NEW MAIN STUDIO CEILING PLAN
SCALE 1:100

EXISTING MAIN STUDIO CEILING PLAN
SCALE 1:100

NEW MEZZANINE CEILING PLAN
SCALE 1:100

Figure 5.75.

Figure 5.76.

Figure 5.77.

POSTER chapter 576
### CEILING LEGEND:

- Underde surface of existing concrete soffit, all holes to be filled and soffit surface to be sanded and painted.
- Underde surface of soffit to be painted with RASCON, water-based, very flat sealing paint. Colour: Brilliant white.
- Existing 400 x 400 mm suspended ceiling tiles with concealed T-grid TO BE DEMPOLISHED and replaced with NEW 400 x 400 mm suspended ceiling tiles TO BE DEMPOLISHED and replaced with.
- New aluminium extrusion downlights to be installed to conceal existing downlighting units.
- 154 mm plywood sealed with WOODOCOTE water-based, quick dry varnish as per PHEDUS plywood ceiling to be sealed with a water-based quick dry varnish.
- Existing 400 x 400 mm suspended ceiling tiles with concealed T-grid TO BE DEMPOLISED.

### LIGHTING LEGEND:

- Existing luminaries to be removed permanently.
- Existing luminaries to be cleaned and lamps to be replaced where needed with SW 4W "T8" fluorescent lamps 5000K as per OSRAM.
- Existing luminaries to be removed from soffit and moved back 700 mm, toward the Southern interior wall.
- 6x 58 W continuous surface mounted LED luminaire as per REGBENT to be fixed onto underside of plywood ceiling to be fixed against flat end of lipped channel as indicated on plan. Luminaires to be filled with 24VDC, 230V single LED strip lighting as per OSRAM.
- Dimmer switch, one way, with Crabtree classic range light cover. Stainless steel cover plates as per CRABTREE.

### LIGHTING CALCULATION:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Type</th>
<th>Luminaires specification</th>
<th>Lamp specification</th>
<th>Quantity x lamp (luminaires x lamps)</th>
<th>Luminous flux</th>
<th>Total Watt</th>
<th>Total Luminous flux</th>
<th>Utilization Factor*</th>
<th>Maintenance Factor*</th>
<th>Working plane area</th>
<th>Average Illumination [lux]</th>
<th>Efficiency (lumen/Watt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Existing</td>
<td>Surface mounted luminaire with reflector</td>
<td>Powder coated white</td>
<td>58 W &quot;T8&quot; light colour 840 [cool white] (LUMILUX L58 W/840) by OSRAM</td>
<td>140 x 2</td>
<td>5200 lm</td>
<td>58 W</td>
<td>1456000</td>
<td>90 lm/W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADJUSTED</td>
<td>Existing</td>
<td>Surface mounted luminaire with reflector</td>
<td>Powder coated white</td>
<td>58 W &quot;T8&quot; light colour 840 [cool white] (LUMILUX L58 W/840) by OSRAM</td>
<td>129 x 3</td>
<td>5200 lm</td>
<td>58 W</td>
<td>1341600</td>
<td>90 lm/W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>New</td>
<td>90 x 100 continuous surface mounted LED luminaire</td>
<td>Charcoal grey (CG) [Linear Maxi surface] by Regent Lighting</td>
<td>24 W/m single LED strip light as per OSRAM</td>
<td>264 m</td>
<td>2420 lm/m</td>
<td>24 W/m</td>
<td>638880</td>
<td>100 lm/W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*LLMF and LSF for LED strip lighting information not available. Values used for calculation taken from similar lamp type to allow for calculation.
5.10.1. DEVELOPMENT OF CABLE-STAYED STRUCTURE

This mezzanine structure is not a textile space-defining element in itself but assists in the making of space. With textile space-making in mind, the mezzanine structure is designed to be as lightweight as possible. The mezzanine structure is also designed to appear as permeable as possible. Connection and fixing details are designed to remain exposed. Similar to the way in which a knot simply is what it is, revealing its structure.

The existing interior volume consists of a virtually column free floor area. Due to the clerestory windows within the space, the concrete roof structure seems as if it floats. Two main columns or walls within the interior space act as the structure for the roof. The newly proposed cable-stayed mezzanine is suspended from the existing structure by means of cables. In this manner, the mezzanine does not make use of any additional columns, allowing for an open floorplan without obstruction.

The final form of the mezzanine was influenced by the following factors:

- Natural light
- Meeting points between existing structure and proposed mezzanine
- Structural fixing points for suspension cables
- Existing studio layouts (in terms of student allocation)
- Proposed programme and function of the mezzanine
- Maximum potential for textile intervention

The main factor that influenced the final form of the mezzanine, was the fact that the test site for intervention merely acts as a space to test the spatial manifestation of the hand-knotted textile. This means that the mezzanine structure’s main feature is to ensure maximum testing potential. The final form does not necessarily represent the ‘best’ layout in terms of movement and placement of furniture, but allows for maximum utilisation concerning the textile unit.
Existing clerestory window

Existing luminaire to be moved 700 mm from edge of concrete overhang towards southern interior facade

Existing windows boxes, cladding to be cleaned and prepared for painting.

Existing power skirting on custom bracket, skirting to be used as housing for electrical cables for lighting and sockets of new mezzanine structure

Existing 10mm shadowline between paneling and crit space

Existing concrete soffit, all holes to be filled, all damage to be repaired. Paint surface with Duramite and prepare for priming. Paint underside of soffit with PLASCON waterbased, 'one coat ceiling paint', Ultra matt finish

Existing concrete overhang to partly carry new cable-stayed mezzanine floor

Custom edge strip to cover two layers of 16 mm plywood and one layer of 6 mm rubber flooring

90 x 100 continuous surface mounted LED luminaire as per REGENT to be fixed onto underside of plywood. Luminaire to be fitted against flat end of lipped channel as indicated on plan. Luminaire to be fitted with 24W/m single LED strip light as per OSRAM.

Figure 5.82. Sectional perspective and callout details

Figure 5.81. Sectional perspective and callout details

CABLE STAYED-STRUCTURE, EDGE DETAIL

SCALE 1:10

Figure 5.80. DEVELOPMENT OF MEZZANINE FORM

DEVELOPMENT OF MEZZANINE FORM (immediately left and below)
5.102. DEVELOPMENT OF TEXTILE UNIT

The textile unit specifically designed for Scenario 2 - division of individual workspaces, acts as the base unit for all the Scenarios. The textile unit has a set of parameters that are adjusted during the fabrication process to suit the parameters and requirements for each of the scenarios. See poster 32 for the fabrication process on page 84.

Further each of the textile units works in conjunction with a rigging system. These rigging systems are what connect the 'soft' and the 'hard' elements. Here the 'soft' elements or textile space-defining elements are the alternative space definers and the 'hard' elements such as the mezzanine and the existing testing site for intervention, act as the traditional space definers. These rigging systems are discussed in greater depth on poster 32 on page 84.
5.10.3. DEVELOPMENT OF RIGGING SYSTEMS

The basic rigging details are designed to accommodate the various textile units. The basic rigging details are presented on this poster. Further, the rigging details for the textile unit for scenario 2 are presented in more depth on this poster. See Figure 5.90 - 5.94. These rigging details are indicated where appropriate on sections and further details.

WHAT IS A BLOCK AND TACKLE?

A block and tackle is a system of two or more pulleys with a rope or cable threaded between them, usually used to lift or pull heavy loads. The pulleys are assembled together in a pile and then their heads are joined so that one is fixed and the other moves with the load. The system is thread, or rope, thread through the pile to provide mechanical advantage that amplifies the forces applied to the rope.

PARTS OF A TACKLE

See Figure 5.97. Parts that make up a tackle (right).

1. Standing block: The block that is anchored and is not moving. This block changes the direction of the running part.
2. Moving block: The moving block is attached to the running end of the rope (the end of the cargo end).
3. Fall: The fall is the rope that is rope through the block.
4. Standing part: The standing part does not move. It needs to be secured to either the standing block or some other fixed position.
5. Hauling part: The hauling part is the part that is pulled.

Mechanical Advantage: Mechanical advantage is the effect of using blocks and ropes to act as a force multiplier. It is the amount by which the pull on the hauling part is multiplied by the tackle. This, in general, is equal to the number of parts of the fall at the moving block (www.rcsccwarrior).

GUN TACKLE

See Figure 5.98. Pulley type options (right).

A gun tackle is made up of two single sheave blocks. A gun tackle has a mechanical advantage of 2. (Opahlanite) Your effort (E) acts upward upon the arm (EF), which is the diameter of the sheave. The resistance (R) acts downward on the arm (FR), which is the radius of the sheave. Since the diameter is twice the radius, the mechanical advantage (M.A.) is 2 (constructionknowledge.net).
Fixed head single sheave standing block with cam cleat and becket, max. rope diameter 10mm

Single sheave moving block with becket and eye

GUN TACKLE
10 mm pre-drilled powder coated galvanised mild steel base plate with connection plate fixed to underside of concrete beam with Chemical Anchor bolts as per engineers specifications

22 mm diameter 1 x 19 open strand stainless steel structural suspension cable with open body turnbuckle and non-articulated (fixed) jaw

Code: RONSTAN ARS2M22
Finish: Satin polish #4 (240grit) as per RONSTAN RD1

Rope guide eye

Figure 5.91. ANCHOR TO BEAM DETAIL - SCALE 1:10

Moving block, POSITION 3

42 mm mild steel circular hollow profile fixed to main bearer beam with round flange bearing and mounting shaft

Colour: Umber grey, RAL 7010

22 mm diameter 1 x 19 open strand stainless steel structural suspension cable with open body turnbuckle and non-articulated (fixed) jaw

Code: RONSTAN ARS2M24
Finish: Satin polish #4 (240grit) as per RONSTAN RD1

General purpose hand winch with enclosed mechanical components powder coated finish, Model HW1500
Lifting capacity: 340kg
Pulling capacity: 680 kg
Gear ratio: 41.0:1
Lowest point of winch handle at 2155 AFFL, wind winch to place textile in storage position

60x60 mm timber handrail fixed onto powdercoated mild steel flat bar Colour: Umber grey, RAL 7010

Custom edging strip

100x100x8 mm Square pre-drilled baluster post base plate, with square post base cover plate fixed to steel beam with M6 bolts

25x25x2,5 mm square profile balustrade post fixed at 1000 mm centres

6 mm woodscrew
Balustrade saddle fixed to mid post with 6 mm square drive self tapping screws

8 mm cotton rope with steel core, rope to be finished with Flametect nitro water-based fire proofing spray (hydrophobic and non-corrosive to metals)

#2485 ABOK, Larks head knot
8 mm cotton rope, to be finished with Flametect nitro water-based fire proofing spray (hydrophobic and non-corrosive to metals)

M6 bolt secured with spring washer and nut

Figure 5.92. ANCHOR TO MEZZANINE DETAIL - SCALE 1:10

Excess running end of main hauling rope

Custom rope cleat (lower half)

Custom rope cleat (top half)

Running end with rope ‘sally’

Textile in storage position

Figure 5.93. ANCHOR TO FLOOR DETAIL - SCALE 1:5

Figure 5.94. RIGGING DETAILS SCALE 1:2 (left)
5.11. DOCUMENTING THE FABRICATION METHOD

This section provides instructions on the fabrication and construction process of a basic textile sample unit. The type of content and way that the fabrication process is displayed is based on a combination of different principles found in both knitting stitch patterns and friendship bracelets. A knitting stitch pattern typically consists of a description plus an image, diagrammatic instructions accompanied by a symbol key or a set of traditional instructions (Dummies, 2015). See Figure 5.99: Knitting stitch pattern (Craftcookie, 2015) on the opposite page. Friendship bracelets are handmade decorative bracelets knotted from hemp, yarn, linen, silk or cotton. Traditionally Friendship bracelets are worn until they wear through and naturally fall off the arm. The knotting process for making a Friendship bracelet is related to macramé or square knotting (Wisegeek, 2015). See Figure 5.100: Friendship bracelet pattern (Friendshipbracelet, 2015) on the opposite page for an example of a bracelet knotting pattern and knot instructions.

See section 5.9.1. Knot pattern instructions on poster 32 (following page) for the full description and instructions on the fabrication process of an individual textile unit.
Lace ribs 2

Description
A lace rib stitch variation with narrow vertical stripes. See also Lace Ribs I and Lace Ribs II.

Difficulty level: Easy

Instructions
You need a stitch number multiple of 10 + 11 + 2 edge stitches. Repeat the pattern between the arrows as many times as you like.

Work right and wrong side rows as shown in the chart. Right side rows (1, 3, etc.) are worked from right to left. Wrong side rows (2, 4, etc.) are worked from left to right.

Symbol Key
- edge stitch
- knit 1
- purl 1
- 1 yarn over
- s1p 1 knitwise, knit 1, pass the slipped stitch over
- purl 2 together

Traditional Instructions
Row 1: edge st, p1, p2tog, k3 * yo, k3, p2, p2tog, k3; repeat from * to last 6 sts, yo, k3, p2, edge st.
Row 2: edge st, sl1kw, k1, pso, p3, yo * p3, k2, sl1kw, k1, pso, p3, yo; repeat from * to last 6 sts, p3, k2, edge st.

Repeat rows 1 through 2.
**FABRICATION INSTRUCTION SHEET**

### S11. DESCRIPTION

- **Dimensions**: 900 x 2100 mm
- **Flat surface area**: 1.89 sq/m
- **Approximate weight**: 8-12 kg dependent on type of Filler cord

A rectangular sample composed of cotton rope as Structural cord and Fabric strips as Filler cord. Structural cords and Filler cords are tied together with the use of a Simple Noose Knot (See diagrams indicating left hand oriented knot and right hand oriented knot).

### S112. KNOT PATTERN INSTRUCTIONS

#### YOU WILL NEED:

- Approximately 40 m of 7 mm sash cord or cotton rope as Structural cord (SC). This can be a braided sheath with either a twisted or braided core. Cut these into 9 equal pieces. Temporarily whip the running ends using masking tape.
- Approximately xxx m of 15 mm wide strips of fabric as Filler cord (FC). The strips can be sewn together without a seam. You will need 8 separate strips of equal length.
- 18 eye bolts (M6 or M8 works well)
- 9 spring gate carabiners (6-8 mm works well)
- A Large working frame with M6 or M8 hole (depending on eye bolt size) evenly spaced approximately 100-120 mm apart at the top and bottom of the frame. **NOTE**: Holes at top and bottom of frame should line up.

#### SETUP

See Figure xxx: Knot pattern diagram and Figure xxx: Knot pattern (symbol) key.

- Securely fix one row of 9 eye bolts at the top of the frame, these will be the Top Anchor Points. Securely fix one row of 9 eye bolts at the bottom of the frame. The bottom row of eye bolts should line up vertically with the top row of eye bolts. Clip one carabiner onto each of the top eye bolts. The bottom eye bolts will have no carabiners.
- Ensure that all SC are secured to carabiner at top AP with a larks head knot. Running ends hang freely or if more rigidity is required, running ends can be passed through the eye. The knot is made using the FC. Each row, indicated by a gridline has to be finished consecutively, starting with row A left to right, row B left to right. Do not start the next row if the previous row of knots are not completed. All knots running down one structural cord follow a left hand-right hand pattern.
- Important: Dress each knot after tying. Orient print to Facing side.

### TERMS:

<table>
<thead>
<tr>
<th>Term</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cord</td>
<td>P</td>
</tr>
<tr>
<td>Secondary cord</td>
<td>S</td>
</tr>
<tr>
<td>Structural cord</td>
<td>SC</td>
</tr>
<tr>
<td>Filler cord</td>
<td>FC</td>
</tr>
<tr>
<td>Anchor point</td>
<td>A</td>
</tr>
<tr>
<td>Facing side</td>
<td>F</td>
</tr>
<tr>
<td>Backing side</td>
<td>B</td>
</tr>
</tbody>
</table>

**TERMS:**

- **CORD TYPE SET**: Any collection of cords within one sample that are of the same material
- **PRIMARY CORD**: The main carrying cord in any cord type set
- **SECONDARY CORD**: The cord secondary to the primary cord in any cord type set
- **STRUCTURAL CORD**: Any cords forming the structure or carrying the weight of any Filler cord, cord type set.
- **FILLER CORD**: Any cords forming the infill or body of a sample and is fixed by means of knotting to any structural cord, cord type set. The Filler cord does not carry the weight of the sample unit.
- **ANCHOR POINT**: Any point or fixing place to which a textile can be fixed using various configurations of rigging hardware
- **FACING SIDE**: Facing side is the side of the sample unit that you see while knotting.
- **BACKING SIDE**: Backing side is the side of the sample unit that faces away from you while knotting.

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KNOT PATTERN (SYMBOL) KEY:

- Anchor point (Eye bolt with carabiner)
- Grid line or row allocation (Guide only)
- Left hand oriented simple noose knot (See instructions)
- Right hand oriented simple noose knot (See instructions)
- Structural cord, double strands of 7mm cotton rope
- Filler cord, double strands of 15mm fabric strips

KNOT PATTERN DIAGRAM:

KNOT INSTRUCTIONS

EDGE VARIATION KEY:

1. ABOK #2485, Larks head knot
2. Large eye splice and with whipping
3. Dowel or steel circular pole as AP
4. Rope as AP
5. ABOK #1717, Half hitch-permanently siezed with whipping
6. FC running end hangs free
7. SC running end hangs free, finish rope tip with clear whip end dip, finish running end with stopper knot.

UNIT EDGE VARIATIONS

The standard textile unit can be constructed using either a frame or dowel as top anchor point (as described in section xxx: Knot pattern instructions). Further, this anchor point can remain as part of the finished product or can be replaced with one of the variations as seen below.

EDGE VARIATION KEY:

- ABOK #2485, Larks head knot
- Large eye splice and with whipping
- Dowel or steel circular profile as AP
- Rope as AP
- ABOK #1717, Half hitch-permanently siezed with whipping
- FC running end hangs free
- SC running end hangs free, finish rope tip with clear whip end dip, finish running end with stopper knot.
5.12. MATERIAL SELECTION

The initial testing and making of the sample units were done using Design Team, printed cotton fabric strips. See Section 5.3.4. Testing materials on page 56. However, although cotton is a renewable resource, it has a severe environmental impact (Kadolph 2007: 48). Cotton is a water-intensive crop and mainstream farming methods make extensive use of agricultural chemicals. Although the cotton industry has improved recycling efforts, processing cotton remains an environmental concern (Kadolph 2007: 49). Organic cotton is a more environmentally friendly option, however additional costs related to lower fibre yields and the absence of hazardous chemicals results in organic cotton costing approximately twice as much as conventional cotton (Kadolph 2007: 50).

Further issues such as durability, light resistance (colour fastness), overall appearance retention and maintenance influenced the final decision on fabric fibre selection. See Table 5.10: Fibre ratings related to performance (Kadolph 2007: 28) on the opposite page, for a comparison of various fibre types. The final selected fibre type is a polyester and cotton blend. See Figure 5.103. Material selection, Fabric samples and Table 5.12. Fabric specification on poster 34 (following page). Polyester is sometimes referred to as ‘...the workhorse fibre of the industry.’ and is the most widely used synthetic fibre (Kadolph 2007: 13). See Table 5.11: Properties of polyester on the opposite page (Kadolph 2007: 132).

5.12.1. FINISHING AND MAINTENANCE

Due to the nature and overall focus of the project finishing and maintenance is only briefly considered.

Finishing:

Fire retardence is defined as ‘the resistance to combustion of a material when tested under specified conditions’ (Kadolph, 2007: 375). Flame-retardant finishes can be used on fabrics such as cotton, rayon, nylon and polyester. These finishes should be nontoxic, noncarcinogenic and be durable enough to withstand approximately 50 washes. Further, they should not affect texture or hand of the fabric and should also not contain any unpleasant odours (Kadolph, 2007: 376).

Most topical finishes require special care in laundering in order to preserve flame resistance.

The fabric strips will not receive any additional finishing; however, the rope will be finished with Flametect Nitro Water-based fire proofing spray/dip. This finish is hydrophobic which will help protect the cotton rope against water and dirt.

Maintenance:

The temporal nature of the textile installation means that textile units that are dirty, damaged or fatigued can easily be replaced. The textiles can be hand-knotted on site and assembled in place of the textile unit being removed.

Further than this, any additional cleaning can be done through regular vacuuming of the textile as well as scheduled dry cleaning or washing of the textile unit. Vacuuming can be done by staff on site.
Table 5.10.
FIBRE RATINGS RELATED TO PERFORMANCE
(Kadolph, 2007: 28).

<table>
<thead>
<tr>
<th>Rating</th>
<th>Abrasion resistance</th>
<th>Thermal retention</th>
<th>Resiliency</th>
<th>Light resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Aramid</td>
<td>Wool</td>
<td>Nylon</td>
<td>Glass</td>
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<tr>
<td></td>
<td>Fluoropolymer</td>
<td>Acrylic</td>
<td>Wool</td>
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<td></td>
<td>Nylon</td>
<td>Modacrylic</td>
<td>Nylon</td>
<td>Modacrylic</td>
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<td></td>
<td>Olefin</td>
<td>Polyester</td>
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<td>Spandex</td>
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<td>Lyocell</td>
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<tr>
<td></td>
<td></td>
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Table 5.11.
PERFORMANCE PROPERTIES OF POLYESTER
(Kadolph, 2007: 132).

<table>
<thead>
<tr>
<th>Properties of polyester</th>
<th>Importance to consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resilient- wet and dry</td>
<td>Easy care</td>
</tr>
<tr>
<td>Dimensional stability</td>
<td>Machine-washable</td>
</tr>
<tr>
<td>Sunlight-resistance</td>
<td>Good for curtains and draperies</td>
</tr>
<tr>
<td>Durable, abrasion-resistant</td>
<td>Industrial uses</td>
</tr>
<tr>
<td>Aesthetic superior to nylon</td>
<td>Blends well with other fibres</td>
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</table>
knotting instructions

FABRIC SELECTION

Table 5.12.
FABRIC SPECIFICATION:

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<td>FC7</td>
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</tbody>
</table>

Figure 5.102.
KNOT PATTERN DIAGRAM
SCENARIO ONE

Figure 5.104.
TEXTEILE UNIT SCENARIO ONE
Material Selection, Fabric Samples

5.12.2. ASSEMBLY PROCESS

Basic assembly for the individual textile unit is discussed in Section 5.9.1. Unit edge variations are the previous poster. This section provides a brief overview for the assembly of textile unit scenario two.

**STEP ONE**
Fixing Standing block to existing structure. See Figure 5.9.1. Anchor to beam detail on poster 32.

**STEP TWO**
Fixing Moving block to Standing block. See Figure 5.97. Parts that make up a tackle on poster 32.

**STEP THREE**
Ballustrade with custom rope cleat. See Figure 5.92. Anchor to mezzanine detail on poster 32, and Figure 5.87. Anchor to mezzanine detail front view on poster 31.

**STEP FOUR**
Fixing point to mezzanine floor. See Figure 5.93. Anchor to floor detail on poster 32.

**STEP FIVE**
Fixing point to existing floor. See rigging detail 2 (RD2) on poster 32 for more detail.

**PARTS FOR ASSEMBLY:**
(for one textile unit)

- 2x Fixed head single sheave standing block with cam cleat and becket, max. rope diameter 10mm
- 2x Single sheave moving block with eye becket, max. rope diameter 10mm
- 2x Heavy duty stainless steel oval basket carabiner with straight double-locking screw-gate and swivel eye. Assorted colour locking gates.
- 2x 8mm Nylon teardrop rope thimble with side keepers
- 6x Heavy duty stainless steel double eye swivel hook, removable eyes.
- 4x Large eye rope splice with whipping

**ORDER OF ASSEMBLY**

**TEXTILE UNIT SCENARIO ONE**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Rand per Unit</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton Cord</td>
<td>7 mm diameter Cotton rope Colour Natural</td>
<td>38m</td>
<td>R16.00 p/m</td>
<td>R608.00</td>
</tr>
<tr>
<td>Textile Infill</td>
<td>Calico 2800 mm wide roll cut into 100-120 mm wide strips, 56 strips 5000 mm long</td>
<td>56</td>
<td>R16.00 p/m</td>
<td>R960.00</td>
</tr>
<tr>
<td>Carabiner</td>
<td>Heavy duty stainless steel oval basket carabiner with straight double-locking screw-gate and swivel eye. Assorted colour locking gates</td>
<td>2</td>
<td>R80.00</td>
<td>R160.00</td>
</tr>
<tr>
<td>Double Eye Swivel Hook</td>
<td>Heavy duty stainless steel double eye swivel hook, removable eyes</td>
<td>6</td>
<td>R80.00</td>
<td>R480.00</td>
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<tr>
<td>Eye Bolt</td>
<td>Stainless steel double eye swivel hook</td>
<td>2</td>
<td>R16.00</td>
<td>R32.00</td>
</tr>
<tr>
<td>Thimble</td>
<td>8mm Nylon teardrop rope thimble with side keepers</td>
<td>2</td>
<td>R6.00</td>
<td>R12.00</td>
</tr>
</tbody>
</table>

**COSTING PER UNIT:**

**FABRIC SPECIFICATION**

**SCENARIO ONE**

(Not to scale)
5.13 SCENARIO THREE
INITIAL DEVELOPMENT

The textile unit for scenario three is constructed with the same knots as in the textile units for scenario one and two. The knotting pattern for scenarios one and two are 'Ł at' patterns. This means that the textile sample unit can be knotted using the knotting process as described in poster 33. (By means of a knotting frame). However, the knotting pattern for scenario three would be slightly different. See figure 5.106, right.

Due to the three-dimensionality of the scenario three knotting pattern, the basic flat pattern first had to be fully developed. This basic flat pattern then forms the basis for the development of a three-dimensional knotting pattern. The images below illustrate the initial development of the textile unit for scenario three.
INITIAL DEVELOPMENT

Figure 5.108 (below) indicates the initial textile fabrication diagram for the three-dimensional knotting patterns. Further development would indicate knot count and structural cord length. Once these two aspects are determined, approximate material usage and weight can be calculated. This would allow for more accurate specification of rigging hardware, rails, and pulleys.

Figure 5.109 indicates the preliminary development of a textile unit for the computer lab. This installation is a combination of the individual textile unit and a further development of the three-dimensional textile unit.

SECTION 3 - COMPUTER LABS

Figure 5.110. View of testing box with textile, scenario three (above).

ADDITIVE TEXTILE INTERVENTION

COMPUTER LABS

Figure 5.111. (below) indicates the initial textile fabrication diagram for the three-dimensional knotting patterns. Further development would indicate knot count and structural cord length. Once these two aspects are determined, approximate material usage and weight can be calculated. This would allow for more accurate specification of rigging hardware, rails, and pulleys.

Figure 5.110. Indicates the preliminary development of a textile unit for the computer lab. This installation is a combination of the individual textile unit and a further development of the three-dimensional textile unit.

1. Build scaled model
2. Measure lengths of string, these form the Primary cords
3. Calculate lengths of Secondary cord
4. Determine knot density in order to determine length of Filler cords.
5. Make scaled sample piece of large textile
6. Determine weight of final textile
7. Adjust fixing hardware and structural cordage

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5.14. POSSIBILITIES AND RESTRICTIONS OF HAND-KNOTTED TEXTILES

Due to the parameters and requirements of the Hybrid research strategy, possibilities and restrictions of the hand-knotted rope and rope-like textiles were discovered and discussed throughout the making process. All observations, in terms of the possibilities and restrictions, can be found within Table 5.5, Test Matrix on poster 12, page 58. With each possibility or restriction (design cycle test result), a response and plan followed. These steps are documented graphically in Figure 5.20, Flow diagram on poster 13, page 59. Further, the major possibilities are discussed in the reflection sections of the design cycles and can be found on poster 14-17, page 60-63.

The knowledge gained through the process of making in terms of the material, the manner in which it responds to certain influences and the spatial possibilities and restrictions are applied during the intervention design cycles.

In summary,

- Textiles, specifically hand-knotted rope and rope-like textiles, possess an aesthetic and metaphysical quality that cannot be duplicated with the use of traditional or conventional ‘hard’ space-defining elements. Therefore, textiles offer opportunity for unique spatial manifestations.
- Textiles create a unique connection between the user and the interior environment as it is always ‘present between the body and the hard fabric of the building’, (Hoskyns, 2007: 87). To add to this, Hoskyns (2007:87) says that:

For interior architecture not to include soft furnishings [textiles] is to strip the discipline of its relationship with the body, positioning it with the building rather than the body.

- Textile performs well in tension but does not naturally perform well as a ‘structure’ under compression.
- Textiles or fabric is naturally flat, but hand-knotted rope and rope-like textiles are inherently textured and bulky, offering opportunities for acoustic and visual spatial design responses.
- Textiles possess characteristics that allow for spatial responses that are adaptable and temporary. The temporality of textiles further offer interest in terms of user interaction and change.
5.15. CONCLUSION

This chapter introduced the conceptual thinking behind the design response in the form of a large conceptual diagrammatic image board. The design process was described and applied to the various test sites in order to fully explore the hand-knotted textile. The design cycles were documented and include planning, making, observation and written reflection. The design process culminates in textile space-defining elements placed within the test site for intervention. Finally, the chapter offers a short summary on the possibilities and restrictions of hand-knotted textiles.
If the evolution of the interior design discipline from upholsterer to decorator to interior designer contributes to the devalued status of textiles within the interior, the research within this dissertation re-evaluates this position and reclaims this valuable lost territory. The dissertation investigated the construction of hand knotted textiles and their application within interior space. By translating traditional rope knotting techniques into alternative textile fabrication methods the study explored the characteristics and manifestations of textiles within interior space. Further it placed emphasis on the use of textiles as a valuable interior design material.

The dissertation employs a hybrid research strategy. The combination of the Practice-based Research method and the Action research method allows for the independent exploration of the textile and its potentials while still providing the framework for rigorous documentation, allowing for a dissertation where research is conducted through the act of making.

This final section of the dissertation brings together the various themes as discussed within the preceding chapters and can be seen as a final reflection. The section briefly reflects on the final outcomes of the exploration of textile-space-defining elements and the hybrid research method. Whereafter it lists the research contributions. The section concludes with recommendations for further study.

“

The studio is a laboratory, not a factory. An exhibition is the result of your experiments, but the process is never-ending. So an exhibition is not a conclusion.

-Chris Ofili

Final Reflections

CHAPTER 6
6.1. PERSONAL REFLECTION

As stated in Chapter 2: Methodology, reflection plays an important role in the Hybrid research strategy. This section acts as the final reflection of the dissertation ‘Knowing through making’. The reflection is written from a personal viewpoint and consolidates thoughts and ideas about the process and experiences throughout the year. The essay does not cover all the parts of the process but highlights some important lessons I have learnt, suggests things that could be done differently and gives an overall picture of the design journey.

The initial dissertation topic was focused towards ideas of decoration and the issues that the discipline of interior design has with the act of decorating. The topic of decoration is a controversial one and a source of many discussions between my fellow interior design students and I. I had considered early on that I wanted to experiment, build and ‘make’ using textiles as part of my dissertation’s study. Consolidating the discussion on decoration and the exploration into ‘making’ with textiles proved to be a struggle.

With assistance from the examiners and my study leaders, the topic was narrowed and focused on a specific area within the discipline, broadly related to concepts of decoration, but directed more to the use of textiles. It was also decided that a very specific research method would be needed to address the topic. At this point in the process I decided to combine the Action Research method and the Practice-based Research method. These two methods have many aspects in common but each have strengths of their own that play toward the concepts that I wanted to approach through my research. The PBR method allowed me the freedom to make and experiment and due to its cyclical nature, the AR method assisted in the process of iteration and documentation.

The speed at which the dissertation evolved from the beginning of the year up until the June exam proved radical. Due to the initial doubts about the research topic, the research strategy was implemented later in the year than is ideal. This contributed to the lack of ‘made’ knowledge early in the design process resulting in initial responses largely based on ‘collected’ knowledge. I suggest that any students that focus on Research through making should start the process of ‘making’ much earlier on within the year to avoid this. However, this would mean that the student would need to decide whether they wanted to research in a traditional way (collected knowledge) or in an alternative manner (made knowledge). Once the decision about the specific research method was made and fully understood, the process evolved more naturally. It became clear that the project was one where research was done through making, and the selected research methods were well geared toward this aspect.

Conducting continuous rigorous research, through the act of making, proved more difficult than originally anticipated. I continuously searched for inspiration and ideas, whether through discussion with students and lecturers, old books on the topics of textiles and decoration found in the library or image boards made from photos collected from the internet. These conventional research techniques assisted me in the act of making. But, ultimately I discovered that in order to continue making, I had to simply continue making. ‘Playing’ with the material took up a lot of my time and initially this was a cause of concern to me. When I compared my progress and completed tasks to students with more conventional projects, it seemed as if I was much further behind than I should have been. It was only during the June exam that the progress I had made became evident. The rigorous manner in which the documentation was done and the continual observation and reflection added significantly to the design development.

The next obstacle that I discovered employing the Hybrid research strategy, was when I had to alternate between the act of ‘making’ and other, more traditional, design techniques (such as sketching on plan and section). The transition seemed forced and the jump seemed to inhibit the use of design intuition. In order to move beyond these hurdles, I completed small design charrettes on intermittent occasions. These charrettes related directly to the issue at hand and were used as a ‘translation’ mechanism. Other more alternative design tools included the development of the range of various testing sites. These sites allowed for a more fluent transition between making and the more traditional design techniques.

During the making process I found that sketches and handwritten notes were more useful and valuable than digital documentation. Similar to the act of making, sketching offers a more tactile experience and changes made to drawings clearly illustrate the iteration process. This iteration process was also very evident while sketching on bumph overlaid onto plans and sections, emphasizing the process of iteration that already exists within the parameters of conventional design methods. I also made sure that all sketches and handwritten notes on pages were always dated. This allowed me to continuously...
refer back to notes, observations and reflections made earlier on in the year. Further documentation included photographs of physical samples as well as spreadsheets which documented the fabrication processes and materials used. This documentation process will allow other students the opportunity to follow the entire process of Research through making from the initial onset to the final results.

The development of the physical design process ran parallel to the development of the theoretical underpinnings of the dissertation. With each completed design cycle I discovered and documented new aspects about the knotted-rope textile. I contemplated associations and perceptions that designers and users have concerning the use of textiles. The learning curve was steep and with each step, observations became more specific and iterations more focussed. The debate about textiles, decoration and the act of making as a research method continued throughout the building. I had many insightful discussions and disagreements with peers and lecturers from the interior and architectural disciplines. These discussions strengthened my opinions and influenced my design decisions. Ultimately these types of interactions made me realise the importance of the studio environment.

True to the requirements of the hybrid research strategy, the majority of decisions were made through various cycles of iteration. Additionally many design and dissertation topic decisions were guided by the various milestone critiques. Large jumps in progress followed each critique, stressing the importance of responding to commentary. With this I learnt the significance of clearly communicating the observation and reflection parts of the hybrid research strategy. This should be done verbally as well as visually.

Due to continual development it is hard to reach final conclusions in the design part of the study. I think here the specific aims and delimitations that are set up at the start of the study creates an important parameter. It allows for precise decision making. Future students should keep in mind that these limitations need to be set up early in the year to ensure the desired end result. Yet, they should also understand that these limitations also adapt and grow as the study continuous throughout the year.

As conclusion to my personal reflection, the findings of the research is listed in section 6.1.1.

6.1.1. FINDINGS

1. The exploration of hand-knotted rope and rope-like materials revealed and illustrated various possibilities and restrictions that textiles present when utilized as space-defining elements. These findings were documented throughout the various design cycles as observations and finally employed in the test site for intervention as a part of the design response.

2. A construction method and a set of fabrication drawings for the manually constructed textile unit (scenario two) was developed and presented as Knotting instruction.

3. This dissertation serves as an example of research carried out by making, within the context of the interior design discipline. All procedures, methods and outcomes were described throughout the process and potentially serve as an informal guide to future projects employing similar research strategies.

4. The Hybrid research strategy employs a combination of the Practice-based Research method and the Action Research method. The Practice-based Research method places emphasis on the creative outcome or interior artefact as well as the process involved in its creation. The Practice-based Research method offers opportunity to carry out research that is focussed on the idea of making and is well suited to the Interior design discipline.
6.2. RESEARCH CONTRIBUTIONS

The dissertation makes the following contributions:

◘ The study contributes to the understanding of how hand-knotted rope and rope-like textiles react and manifest under certain test conditions.
◘ The study contributes an alternative spatial application for hand-knotted rope and rope-like textiles within the interior environment.
◘ The study contributes a new fabrication technique and documentation process as well as new terminology concerning rope and rope-like materials to the discipline of interior design.
◘ The study makes a contribution to the discipline of interior design at the University of Pretoria by applying a hybrid research strategy that includes the Practice-based Research method.
◘ The study makes a contribution to the discipline of interior design as it employs the act of making as a way to do research.
◘ The study and research methods applied, contributes critique on the current manner in which teaching and learning within the Department of Architecture takes place. The discipline of interior design is concerned with interaction between the user and its environment, yet the current design process is far removed from this tactility.
◘ The study contributes to the present discussions regarding the definition of the boundaries of the interior design discipline in relation to the architectural discipline and the architectural profession.

6.3. RECOMMENDATIONS

The dissertation makes the following recommendations for further study:

◘ That the three-dimensional textile unit and the spatial manifestations thereof, be further explored and developed.
◘ That the associations and resultant meaning of the hand-knotted textile be analysed and supplemented with empirical data collected through the study in order to determine its meaning within the discipline of interior design.
◘ That the dependency between a material choice, selected construction technique, the resulting form and its eventual spatial application be further explored.
◘ That the potential role of the act of decorating within the interior design discipline be investigated. This includes an investigation and analysis of the types (or scale) of decoration that already manifest within the interior environment and what the meaning of each of these are.
◘ That a greater understanding of the relationship between making and research within the interior design discipline be reached.
◘ That research methods that facilitate the act of making within the interior design discipline be further investigated and developed.
6.4. CONCLUSION

The chapter, and the study, is concluded with a personal reflection essay discussing the various lessons learnt during the development of this dissertation. This essay highlighted times where great development took place as well as areas of difficulty. The personal reflection essay also made suggestions for future improvement. Lastly the research contributions were listed followed by recommendations for further study.
list of references
CHAPTER 7
G


H


I


J


K


L


M


N


P


5.3.1.1. CONSTRUCTION OF THE TESTING FRAME

The testing frame was constructed from two unused pin-boards (referred to as Board A and Board B). See Figure 1: Pin board before alteration. Initially the shape and specific requirements of the testing frame were derived from the characteristics and opportunities offered by rope and rope-like materials.

Board A acts as the backdrop to the testing frame. The OSB was cleaned, sanded by hand and finished with white PVA paint. Holes were drilled into the backboard in order to allow for the fixing of rope and hardware. The 8mm diameter holes are set 200mm (centre to centre) and run on a horizontal and vertical grid. This allows for the shaping of three dimensional textile space.

Board B acts as the main frame onto which hardware and rope can be fixed. The OSB board was removed from the existing frame, the frame was cleaned and holes were drilled into the inner part of the frame. The 8mm diameter holes were spaced 100mm centre to centre. Holes 1-19 were placed at the top and bottom of the horizontal frames and holes A-J were placed vertically down the sides of the frame. The numbering system was incorporated for documentation purposes. Finally Board B was painted white.

To complete the testing frame Board A and Board B were fixed together. The feet of the frames were bolted together using M6 bolts and two pieces of 32x32x600 mm timber batons. The tops of the frames were fixed by spanning two pieces of 2.6x25x25x450mm mild steel equal angles between the two frames and fixing them with self-tapping screws. These materials were left unfinished and unpainted.

The completed testing frame is 2020mm wide, 1670mm high and 435mm deep. See Figure 2: Completed testing frame in use (right). The completed testing frame includes the addition of M6 eye bolts as fixing points. For physical parameters of the testing frame see section 5.3.1. on poster 10 (page 54+55).
5.3.2.1. CONSTRUCTION OF THE TESTING BOX

Where the testing frame acts as quite a rigid test site, the testing box allows for more fluidity and malleability of the textile. This is due to the increased amount of fixing points and the fact that the grid is aligned. Not only does the grid allow for the fixing of eye bolts but the aligned holes also mean that threaded rods can pass through both of the side panels simultaneously.

For physical parameters of the testing box see section 5.3.2. on poster 10 (page 54+55).

The testing box was constructed using 16 mm MDF. The form of the box was designed to be ‘neutral’. Therefore the dimensions of the box was not based on the testing site for intervention, but was built to be an empty rectangle. This was done to ensure maximum flexibility in terms of spatial response.

Initially the dimensions of the bottom panel of the box was based on the dimensions of an A2 sheet of paper (420mm x 594mm). It was altered to 400mm x 580mm to use the available MDF sheet in the most efficient way. The side panels simply matched these parameters with a height proportionally to the size of the bottom panel. Therefore the side panels were designed to be 300mm high.

The three side panels and bottom panel were drawn out onto the available MDF sheet with pencil. The panels were cut whereafter the sides of the panels were sanded lightly to remove any rough edges. The panels were then glued to each other. Wood screws were used to secure the panels to each other. Initially it was determined that the box would need to be strong enough to resist pulling, tugging and tension from ropes and strings. Later however it became clear that the nature of the type of testing to take place within the box would change. See Table 5.2.

After the wood dried a grid was marked out onto the exterior of the box. This grid was then used to drill 6mm holes into the box. After drilling the box was sanded inside and outside to get rid of any pencil lines and excess glue.

M6 eye bolts and later 6mm threaded rod was placed through the holes within the box.

See Figure 3: Testing box in use (right).
# Appendix B

## Data collection and synthesis

<table>
<thead>
<tr>
<th>TEST NR</th>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>PHOTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Fix three ropes to upper frame (loop through eye bolt)</td>
<td><img src="image1.jpg" alt="Photo of step 1" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One primary cord centred (10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two filler cords (A and B) either side of the primary cord (9, 11)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Select FC-A and make an overhand loop knot towards the PC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place PC through the eye of loop FC-A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pull the running end of FC-A to dress the knot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Repeat step 2 using FC-B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Push knot from FC-B up against FC-A to ensure a snug fit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Hang one AC over left V and one AC over right V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure that ends meet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Select FC-A and make an overhand loop knot towards the AC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place AC through the eye of loop FC-A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dress knot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Repeat step 5 using FC-B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Repeat steps 2-5 until end of rope is reached</td>
<td><img src="image2.jpg" alt="Photo of step 2" /></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Fix five PC (14,16) to the upper frame</td>
<td><img src="image3.jpg" alt="Photo of step 3" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fix four FC (13,15,15,17) to the upper frame</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Select the first FC and make a simple noose not toward the second PC (angling the FC-A toward the right to reach the second PC). Place running end of first PC through the eye of loop FC-A. Pull the running end of FC-A to dress the knot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Repeat step 2 using the second FC and the second PC . Push knot from FC-B up against FC-A to ensure a snug fit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Select the FC-C and make a simple noose not toward the fourth PC (angling the FC-A toward the left to reach the fourth PC). Place running end of first PC through the eye of loop FC-C. Pull the running end of FC-C to dress the knot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Repeat step 4 using the fourth FC and the fourth PC . Push knot from FC-D up against FC-C to ensure a snug fit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Repeat steps 2-4, angling each of the FC to the PC opposite the existing knot criss crossing down the PC one row at a time. Repeat the steps until the remaining PC is covered completely with FC.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor</td>
<td><img src="image4.jpg" alt="Photo of step 4" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Insert four evenly spaced holes in two rectangular sections of board material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Tie an overhand knot about 400mm down the front two rope ends and feed the rope ends through the two front holes of the board. Tie two more overhand knots below the board to secure the board between the two sets of knots</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Repeat this step using the two back ropes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>There should now be two boards secured horizontally between hanging rope ends</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>When pulling on the front top rope loop (Between the two widely spaced eye-bolts) the horizontal boards should tip to a diagonal position</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Insert four evenly spaced holes in two rectangular sections of board material and feed the ends of the rope through the board material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Add and extra loose piece of rope to tie the first half of the Double Fisherman's Knot above the board and the second half of the knot below the board. Slide the knots toward each other to secure the board snuggly between the two knots</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Feed each of the four main rope ends through the four holes in the second board</td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td>Add a third loose piece of additional rope through the bottom tier board</td>
<td></td>
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<tr>
<td></td>
<td>7</td>
<td>Repeat step 4</td>
<td><img src="image5.jpg" alt="Photo of step 5" /></td>
</tr>
<tr>
<td>TEST NR</td>
<td>STEP</td>
<td>DESCRIPTION</td>
<td></td>
</tr>
<tr>
<td>---------</td>
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<td>-------------</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Insert four evenly spaced holes in two rectangular sections of board material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Push running ends of the two front ropes through the front holes in the board material, stick each of the two running ends through a washer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Loop each of the two running ends in order to stick them back through the washer and through the holes in the board material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Take the two running ends that are now at the top of the board material and tie a fisherman's stopper knot to hold them in place.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Place two individual loose pieces of rope through each of the loops that are at the bottom of the board product.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Pull the ropes toward the board to create a snug fit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insert four evenly spaced holes in two rectangular sections of board material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Place the two front ropes side by side through a washer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Split the two ropes and place through the two front holes in the board material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Once ropes are through the holes bring them together again and place through a large washer (repeat step 3 and 4).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Repeat steps 3, 4 and 5.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>One at a time, fix the four loose loop ends from Sample 1 to each of the free running ends of the rope by means of an overhand loop.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Ensure that all loose rope ends are secured.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Dress the knots.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>There should now be a textile secured horizontally between hanging rope ends where the board product was placed initially.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>When pulling on the front top rope loop (between the two widely spaced eye-bolts) the horizontal textile sample should tip to diagonally.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Fix two rope loops through four eye bolts so that each of the four running ends hang towards the floor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>One at a time, fix the four loose loop ends from Sample 2 to each of the free running ends of the rope by means of an overhand loop.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Ensure that all loose rope ends are secured.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Dress the knots.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>There should now be a textile secured horizontally between hanging rope ends where the board product was placed initially.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>When pulling on the front top rope loop (between the two widely spaced eye-bolts) the horizontal textile sample should tip to diagonally.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Fix primary cord to main frame with eye bolt and carabiner by means of larks head knot.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suspend dowel and fix with double stranded clove hitch knot.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Separated two strands from each other and and tie two separate clove hitch knots.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>See poster for more images.</td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX B

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<table>
<thead>
<tr>
<th>TEST NR</th>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>PHOTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>Fix primary cord to main frame with eye bolt and carabiner by means of larks head knot.</td>
<td><img src="image1.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Suspend dowel and fix with double stranded clove hitch knot</td>
<td><img src="image2.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Separate two strands from each other and tie two separate clove hitch knots</td>
<td><img src="image3.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Add two additional anchor points (eye bolt with carabiner) onto the back board of the main frame</td>
<td><img src="image4.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Position dowel securely by fixing the additional ropes to the dowel by means of clove hitch knots See poster for more images</td>
<td><img src="image5.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Use rope fixing structure as created in test 10</td>
<td><img src="image6.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Remove knot at the end of the dowel and shift textile sample 2 over the end onto the dowel (Use the filler cord as fixing point)</td>
<td><img src="image7.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Add a secondary dowel in the bottom end of the sample, in the loops of the filler cord</td>
<td><img src="image8.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Use rope fixing structure as created in test 10</td>
<td><img src="image9.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Remove knot at the end of the dowel and shift textile sample 2 over the end onto the dowel (Use the structural cord as fixing point)</td>
<td><img src="image10.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Add a secondary dowel in the bottom end of the sample, in the loops of the filler cord</td>
<td><img src="image11.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Fix five Primary Cord’s to the upper frame</td>
<td><img src="image12.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Fix three Filler Cords consecutively in between each of the PCs</td>
<td><img src="image13.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Select FC-A and make a Simple noose knot towards the first PC. Place the running end of the second PC through the eye of loop FC-A. Pull the running end of FC-A to dress the knot</td>
<td><img src="image14.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Repeat step 3 using FC-B and the second PC. Ensure that FC-B is ontop of FC-A in the diagonal cross formed by the two filler cords.</td>
<td><img src="image15.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Repeat steps 3 and 4 with the remaining FC’s and PC’s. Ensure that the FC joining from the left always crosses over the FC joining from the right.</td>
<td><img src="image16.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Repeat steps 3-5 until end of rope is reached</td>
<td><img src="image17.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Fix sample one to testing frame as when constructed</td>
<td><img src="image18.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Firmly secure bottom end of the sample to the testing frame using structural cords</td>
<td><img src="image19.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Pull on left and right hand sides of the sample holding on to the structural cord</td>
<td><img src="image20.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Fix sample one to testing frame as when constructed</td>
<td><img src="image21.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Firmly secure bottom end of the sample to the testing frame using structural cords</td>
<td><img src="image22.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Grip structural cord in the middle of the sample and pull towards self</td>
<td><img src="image23.jpg" alt="Photo" /></td>
</tr>
</tbody>
</table>
The process is similar to the construction process followed to construct sample 13. Here the spacing between filler cord and structural cord is double.

1. Fix three Primary Cord’s to the upper frame.
2. Fix three Filler Cords consecutively in between each of the PC’s.
3. Select FC-A and make a Simple noose knot towards the first PC. Place the running end of the second PC through the eye of loop FC-A. Pull the running end of FC-A to dress the knot.
4. Repeat step 3 using FC-B and the second PC. Ensure that FC-B is on top of FC-A in the diagonal cross formed by the two filler cords.
5. Repeat steps 3 and 4 with the remaining FC’s and PC’s. Ensure that the FC joining from the left always crosses over the FC joining from the right.
6. Repeat steps 3-5 until end of rope is reached.

Firmly secure bottom end of sample 16 to the testing frame using structural cords.
1. Pull on left and right hand sides of the sample holding on to the structural cord.

Firmly secure bottom end of the sample to the testing frame using structural cords.
1. Grip structural cord in the middle of the sample and pull towards self.

Fix sample one to testing frame as when constructed.
1. Firmly secure bottom end of the sample to the testing frame using structural cords.
2. Take hold of all four corners of textile sample two and pull away from each anchor point.

Fix five Primary Cords to carabiner within upper frame. Fix to carabiner using Cow hitch knot.
1. Fix five Filler Cords to side of frame. Select the uppermost FC and make a Simple noose knot towards the first PC. Feed the PC through the eye of loop of the FC. Pull the running end of FC to dress the knot.
2. Repeat step 2 with the same FC and remaining PC’s.
3. Repeat step 2 and 3 with the remaining FC’s and PC’s.
4. Dress the knots.

Firmly secure bottom end of sample 16 to the testing frame using structural cords.
1. Grip structural cord in the middle of the sample and pull towards self.

TERMS:

CORD TYPE SET: Any collection of cords within one sample that are of the same material.
PRIMARY CORD: The main carrying cord in any cord type set.
SECONDARY CORD: The cord secondary to the primary cord in any cord type set.
STRUCTURAL CORD: Any cords forming the structure or carrying the weight of any filler cord, cord type set.
FILLER CORD: Any cords forming the infill or body of a sample and is fixed by means of knotting to any structural cord, cord type set. The filler cord does not carry the weight of the sample unit.
ANCHOR POINT: Any point or fixing place to which a textile can be fixed using various configurations of rigging hardware.
FACING SIDE: Facing side is the side of the sample unit that you see while knotting.
BACKING SIDE: Backing side is the side of the sample unit that faces away from you while knotting.
APPENDIX C

Observations:
- The spider web-like structure forms around the central point, resembling a spider web.
- The structure's symmetry is disrupted by irregularities, giving it an organic, natural appearance.
- The web-like form suggests a network of connections, possibly indicating a biological or ecological system.

Overall Observations:
- The web-like structure provides a framework for constructing a network of connections.
- The structure's flexibility allows for easy expansion and contraction, resembling the adaptability of spider silk.
- The web-like form can be used as a metaphor for communication networks, biological systems, or even architectural designs.

Sample Web

Sample Web

PREVIOUS PAGE

Next Page

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APPENDIX C

To make ramp, use:

- Overhang length cut for
  thick textile sample

- One segment can be
  regarded to perform simple
  width + height = sample
  (drawn & dimensions).

- Preparation:
  - Remaining edge of lam.
    need to be trimmed into
    various lengths
  - When long pieces of lamps
    need to be made, process
    will be explained in the heroic
    making end pieces to 40
    and then "loop of stirrup"
    DRP part
  - Final cut length to be
    determined before making
    parts, filler, or melting
  - Braided onto "the end"
    with:
  - Textile could support
  - become very heavy
  - Textile still very "flat"
  - Heavy "weight" textile mainly.

- Before used for:
  - Upper textile sample
  - handle we STRETCH, filling
  - manipulation, or the "loose
count in a enough suggestion for the
  same method being that can be used along.
APPENDIX C

TEST FB

1. Fill up 30 ft. PARAFFIN & 24 ft. PARAFFIN.
2. PARAFFIN (REITERATIVE).

OBSERVATIONS:
- Note: No damage on PC (Figure 2).
- The fillings are a numbered series (Figure 2).
- Fill up (1) PARAFFIN with PARAFFIN & 24 ft.
- PARAFFIN (REITERATIVE).

TEST FB

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- Note: No damage on PC (Figure 2).
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- PARAFFIN (REITERATIVE).

NOTE 2

FILLER WITH PARAFFIN
PARAFFIN NEEDS TO BE WARMED
AND COVERED.

TEST FB

1. Fill up 30 ft. PARAFFIN & 24 ft. PARAFFIN.
2. PARAFFIN (REITERATIVE).

OBSERVATIONS:
- Note: No damage on PC (Figure 2).
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- Fill up (1) PARAFFIN with PARAFFIN & 24 ft.
- PARAFFIN (REITERATIVE).

NOTE 2

FILLER WITH PARAFFIN
PARAFFIN NEEDS TO BE WARMED
AND COVERED.
TEXTILE SPACE MAKING AND THE ISSUE OF DECORATION: A DIGITAL PRESENTATION LOUNGE FOR BOHJONDE

THEORETICAL ISSUE

With the advancement of interior design and the notion of creating a space that is not only functional but also aesthetically pleasing, the role of textile space making in the design process becomes increasingly important. In the current context, the design of the digital presentation lounge for Bojhonde involves not only the physical space but also the digital realm, where textile elements play a crucial role in creating an immersive and engaging environment.

REAL WORLD ISSUE

The integration of traditional textile techniques with modern digital technologies presents new opportunities for designers. The challenge lies in creating a space that is not only visually appealing but also functional and sustainable. In the case of Bojhonde, the design must cater to the needs of users while also promoting cultural heritage and sustainability.

PROPOSED INTERVENTION

The design concept for the digital presentation lounge involves the use of textile elements to enhance the user experience. The proposed intervention consists of a series of textile components that create a dynamic and interactive space. These components include

1. Textile screens
2. Interactive surfaces
3. Hanging installations
4. Textile furniture

This approach not only adds visual interest but also creates a sense of engagement and interaction among users.

CONCEPTUAL APPROACH

The design concept takes inspiration from traditional textile practices, such as the use of fabric in traditional architecture. However, it also incorporates modern digital technologies to create a seamless blend of the physical and digital realms.

Traditional

<table>
<thead>
<tr>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decoration in traditional style</td>
</tr>
<tr>
<td>Interactive elements</td>
</tr>
<tr>
<td>Hanging installations</td>
</tr>
<tr>
<td>Textile furniture</td>
</tr>
</tbody>
</table>

SECTION SCALE 1:50

The proposed design concept includes a detailed section that illustrates the integration of textile elements with the digital environment. This section highlights the potential for user interaction and engagement.

PLAN SCALE 1:50

A detailed plan of the digital presentation lounge illustrates the layout and定位 of the various textile components. This plan is crucial for understanding the spatial organization and flow of the design.
APPENDIX E  Design charrette

NOTES:
- Analysis of existing building materials/colour palette.
- Suggestions for painting of columns.
- Permanent/Iconic elements present within building?
- Required lux level for studio?

Existing wall as protection screen

Staircase with large tread to be suggested as seating opportunity

Adjustable

Fixed

Brass cap

Brass batten

New amended aluminium air-con baffle, directed? (painted?)

Timber cladding, permeable shell allows natural light to enter office space (also does not hinder air-con).

Steel + timber mezzanine 'permeability of impermeable', lighting to be included.
“We are the Borg. Lower your shields and surrender your ships. We will add your biological and technological distinctiveness to our own. Your culture will adapt to service us.
Resistance is futile.”

Star trek – First contact (1996)