A woven shelter

Kylie Giblin
Master of Architecture
Unitec Institute of Technology
October 2009
To the brilliant minds who encouraged and inspired me along this journey and for all those who kept me smiling....
Illustrations

Figure 1  D72 building (1996)  
Figure 2  Te Puia (2007)  
Figure 3  Whareuku project (2009)  
Figure 4  Whare raupō (2002)  
Figure 5  Mānuka framework used in whare raupō  
Figure 6  Nanati binding technique  
Figure 7  Tribal affiliations  
Figure 8  Omaio Bay  
Figure 9  The site  
Figure 10  Existing dwellings  
Figure 11  Site plan  
Figure 12  Wind diagram  
Figure 13  Makaweroa, Tangimoe Clay (2008)  
Figure 14  The tallest kete in the world, Tangimoe Clay (2005)  
Figure 15  Exploration of kete using harakeke and muka  
Figure 16  Material exploration of kete  
Figure 17  Response to Semper  
Figure 18  Paper models  
Figure 19  Preliminary sketches  
Figure 20  Woven bendy plywood  
Figure 21  Woven plastic strapping  
Figure 22  Woven venetian blinds

Figure 23  Woven seatbelts  
Figure 24  Woven fabric  
Figure 25  Woven harakeke  
Figure 26  Joinery exploration  
Figure 27  Plaster, concrete and resin  
Figure 28  Weathering  
Figure 29  Māori and Pacific Island weaves  
Figure 30  The panel  
Figure 31  Corner weaving technique 1  
Figure 32  Corner weaving technique 2  
Figure 33  The corner  
Figure 34  Detail of harakeke and muka  
Figure 35  Attaching technique  
Figure 36  Edge technique  
Figure 37  Paper example  
Figure 38  Diagrams of canopy system  
Figure 39  Three sites  
Figure 40  Perspectives of canopy  
Figure 41  Site plan  
Figure 42  Sectional diagram a:a  
Figure 43  Sectional diagram b:b  
Figure 44  Sectional diagram c:c
Abstract

The existence of a distinguishably ‘New Zealand’ architecture is a continuing obsession of historians and critics. This paper investigates the few built examples that represent Maoridom within our built environment. Research is comprised of precedents that illustrate how Māori craft, mythology, natural resources and indigenous building techniques are currently being employed and developed in Aotearoa (New Zealand).

Traditional Māori building techniques have inspired raranga (weaving) as a craft to be explored through material exploration. Natural resources and recycled materials have been employed to generate kete (baskets). Harakeke (flax), muka (flax fibre), rope, paper, plastic tubing, seaweed and seatbelts explore the cavities created by controlling the tension of the weave.

This project undertakes research to better understand the East Coast of New Zealand. The chosen site for this proposition is between Omaio Bay and Te Kaha. Te Ehutu trust lease this land to our family on a six monthly basis, which has informed the proposal of a temporary sheltering system.

The shelter weaves harakeke from the site, to construct a transformable canopy. Simple weaving techniques have been employed to encourage ‘group’ participation within the making of the shelter. The design of a corner system allows Mānuka saplings to prop up the canopy whilst being tensioned to the ground by muka guy ropes.
Introduction
This project has eventuated out of a desire to understand site and community within the greater East Coast region. The East Coast of New Zealand is populated by predominantly Māori communities, where Māori lifestyles are intertwined and reliant on the land. The district of Te Kaha is a community where Māori values prevail.

This study of Te Kaha considers land in terms of food and water sources, natural building resources, tribal affiliations, mythology and legend. Site specific studies map existing dwellings, vegetation, contours, and climatic conditions within the site. These investigations set the parameters of the design brief by engaging with aspects of Māori culture and site specific research.

This thesis is part of the discourse around the few architectural examples of indigenous culture within Aotearoa (New Zealand). Particular attention is given to the reconstruction of indigenous whare raupō (sleeping house) by Rau Hoskins and Carin Wilson (2002). The whare raupō project reclaims traditional knowledge and techniques utilising natural resources as an alternative to current New Zealand building solutions. Other precedents such as Te Puia by Harry Street (2007), D72 building by Andrew Patterson (1996), and Whareuku by Kepa Morgan (2009), have influenced the direction of this project. These precedents discuss how indigenous Māori culture and craft are represented in our built environment.

The project employs and develops kete (basket) which are an important concept within Maoridom, being the repository for all knowledge, whilst being able to contain, protect, and store resources. I was taught in 2008, by Kristelle Varney, how to construct a simple two cornered kōnae (basket) woven with 8 aho (weft) and 8 whenu (warp) strands. This technique has been developed through process based exploration, and theoretical and practical research for this woven architectural proposition.

The project explores how a range of different materials can be woven. The use of harakeke (Phormium tenax), muka (internal flax fibre) and other found materials such as seaweed, rope, plastic tubing, plywood and seatbelts have been inspired by contemporary weaver Tangimoe Clay. These materials transform the weave and explore enclosure and scale.

Further maquettes explore Gottfried Semper’s theory, which argues that raw materials fit into one of four groupings (textiles, ceramics, carpentry or masonry) which in turn orchestrate their use (Mallgrave, 2004). Preliminary explorations challenge these categorical divisions, evolving soft fabrications into rigid forms. This response to Semper assisted the development of a shelter woven with harakeke. The canopy system celebrates the malleable, temporal properties of harakeke rather than forcing it to be structural.

This document has developed from a research question reacting to the limited literature and architectural precedents that represent indigenous Māori architecture. Initial research was focused on the following question: In a bi-cultural nation how might Māori craft become a significant aspect of the architecture of Aotearoa? This has evolved through research, discussion and analysis to question:

1 There are three baskets of knowledge which names differ between tribes but are most commonly known as “Te kete tūāuri – knowledge of karakia (ritual chants). Te kete aronui – knowledge of aroha (love), peace and the arts and crafts which benefit the earth and living things. Te kete tūātea – knowledge of evil, including war” (“Three baskets of knowledge”, 2009).
2 There are a small group of academics that have influenced and directed this thesis, each sharing a common interest in Māori architecture. Sarah Treadwell, Mike Linzey, Deidre Brown and Bill McKay from Auckland University, Mike Austin from Unitec, and Amanda Yates from Massey University have published various articles surrounding this topic.
How might communities re-establish connections with natural resources to use indigenous techniques including raranga (weaving)?

The objectives of this research are to:

- Present current projects that recognise the need to represent and develop Māori culture within contemporary architecture.
- Understand the chosen site conventionally through methods of landscape architecture whilst considering (non)western perspectives of whenua (land).
- Learn, develop and apply raranga techniques within the design of a temporary shelter that can be constructed on site, using available materials.

Defining a national architecture

The existence of a distinguishably New Zealand architecture is a continuing obsession of historians and critics. Peter Shaw claims “significant but diverse buildings…reveal that there is no defining style, unique feature or single exemplar of purely New Zealand architecture, however much people wish there to be” (Shaw, 2003, p. 231). Aotearoa today has diverse but Eurocentric architecture. We, as a nation, have in general, dismissed indigenous ways of living and adopted an architecture derived from the settlers’ homeland. Bill McKay argues that “Pakeha (New Zealanders of European descent) culture has not grown a new architecture in a new land, rather it has rebuilt the landscape to suit a largely transplanted architecture” (McKay, 2004, p. 1). This thesis questions what we have left behind in our crusade to replicate British archetypes. It challenges the pre-colonial architecture of Aotearoa to offer and inspire contemporary building practices.

Māori architecture today is largely appreciated through ornament and decoration, through whakairo rākau (wood carving), tukutuku (woven panels), and kōwhaiwhai (painted pattern on rafters). This research offers the indigenous wharepuni (sleeping house) as an important characteristic of Māori architecture.

Traditionally, Māori gathered resources within close proximity to pā (fortifications), or kāinga (villages) to construct their whare (houses). According to Peter Shaw, toetoe (Cortaderia) and raupō (Typha orientalis) were used as cladding materials, moss (Scleranthus biflorus) was used as an insulator, and clay and timber were walling and structural devices (Shaw, 1991). Rau Hoskins notes that raupō was the common cladding material, but discusses the use of nīkau (Palmae sapida) and wīwī (Juncas kraussii) in warmer climates (R. Hoskins, personal communication, August 13, 2009). Across the motu (country), whare were clad in assorted resources depending on the micro climates of the area.

Wharepuni were part of an assemblage of buildings within the kāinga. According to Hoskins, the Māori way of living was “a Victorian notion of everyone living under the same house, turned inside out, so take the Victorian house, pull it all apart and then you have your cooking area” (R. Hoskins, personal communication, August 13, 2009). Clusters of whare were positioned in an arc around a camp fire in a spatial arrangement determined by tapu (sacred) and noa (profane) spaces.

---

3 “Around the country there were a whole range of different construction typologies employed, different thatching and different wall techniques, but they all seem to me to fit into the notion of a simple sleeping house for probably/normally 2-4 family members” (R. Hoskins, personal communication, June 10, 2008).
4 According to Peter Shaw, “Ethnographic evidence indicates that Maori architecture was extremely diverse, despite the limitations imposed by stone tools and available materials. There were many forms of buildings, including temporary lean-tos, dwellings and sheds both round and rectangular, cooking sheds, and rectangular buildings made of poles and thatch” (Shaw, 1991 p.10).
5 “Maori life was organised in all its aspects through the intricate interplay of two states of being, tapu and noa, which were complementary and of equal importance. In numerous contexts, a person, place or thing would be said to be tapu or noa” (Orbell, 1998, p. 150).
As a consequence of colonisation, indigenous building practices were hybridised with European techniques and materials, which in turn saw changes to the whare in terms of materiality and construction techniques. What has not been lost is the Mauri (life force) of the whare. This is particularly evident in ceremonial proceedings where the whare is addressed as a living entity. Mike Linzey draws attention to this by arguing the, “fundamental understanding that the meeting house is a living presence is richer than any mere simile; it is beyond the idea of a metaphor or a representation in the European sense” (Linzey, 2004, p. 13).

**Within the land of the long white cloud**

This section details a number of precedents that investigate the appropriation of indigenous craft based practices within architecture. The works of Andrew Patterson, Harry Street, Kepa Morgan, Rau Hoskins and Carin Wilson were significant in this respect.

This thesis began in reaction to the woven perforated stainless steel façade of Andrew Patterson’s D72 building (1996). The origin of the weave, however Patterson claims the D72’s woven façade does not derive from Māori culture, but assimilates Pacific Island basket weaving. There is an obvious difference between Māori and Pacific weaving techniques as raranga patterns are at right angles to the floor, rather than parallel. Therefore how can the development and abstraction of raranga techniques be illustrated as a sensitive response to the original craft? Throughout the exploration of the project, where necessary, I have identified when the weave is not identifiable as uniquely Māori.

The D72 building has raised questions of the utilisation of traditional motifs within architecture and how does one assimilate culture without being offensive? Vanya Steiner’s paper *Mis)*appropriation in New Zealand: an incriminating cite, discusses the Non-Māori use of Māori motifs. She argues that, “such usage is considered a sacrilegious impropriety; a stealing, violation and misuse of that regarded as sacred; a site of criminal activity, stolen property and illegitimate access” (Steiner, 1996, p 1). Steiner does not refer to Māori using Māori motifs, but Pākehā appropriating Māori motifs. She argues that, “what is at stake is not accuracy but authority” (Steiner, 1996 p. 2). I am interested in the abstraction and representation of Māori craft within our built environment.

The second architectural project, is the redevelopment of Te Puia (2007). Architect Harry Street represents local īwī (people) in the design which represents Māori mythology with twelve timber columns representing the twelve heavens within Te Arawa (tribal area) cosmology (“Timber design awards,” 2007). Tāhuhu (ridgepole), heke (rafters), pou (centre interior post), and decorative motifs are evident within the architecture of the building (“Timber design awards,” 2007). This study situates Te Puia as an important piece of contemporary architecture that successfully communicates the interface between indigenous knowledge and contemporary use of this knowledge. Tangata whenua (people of the land) and Street collaboratively engage with site specific research to represent the people of Te Arawa. Te Puia recognises the importance of discussion, guidance and support needed to represent Māori mythology within the built environment.

---

6 Deidre Brown references the “economic, social and constructional transition from wharepuni to domestic housing” (Brown, 2009 p. 103-104) in regards to the ‘hybrid’ house. Brown acknowledges the limited research about these buildings which were a combination of weatherboard and raupo cladding (Brown, 2009).

7 The wharenui represents an important ancestor. The kōruru or tekoteko (carved head) above the entrance/porch of the whare represents the head, the tāhuhu (ridgepole) is the backbone and heke (rafters) are the ribs.

8 A. Patterson, personal communication, September 23, 2009.
The third example, (fig. 3), Whareuku (earth house) is currently under construction. Kepa Morgan has developed a technique where flax fibre is added to concrete providing an inexpensive strengthener and insulator. This innovative technology has been developed as a means of providing Māori with the tools and knowledge to construct affordable housing, using the community as builders (Morgan et al., 2008). This example paves the way for Māori housing projects. I am interested in how Morgan utilises natural building resources and promotes the transference of knowledge between generations. This is what Rau Hoskins refers to as ‘Technacy’. According to Hoskins, technacy was the fundamental knowledge of the Māori way of living, of understanding and utilising traditional resources and techniques. Colonisation led to Māori utilising European building practices and materials and subsequently they lost their own knowledge of traditional Māori building (R. Hoskins, personal communication, June 10, 2008).

Te Puia and Whareuku hybridise Māori and European architecture, challenging this comment by Chris Hilliard that “Maori building is presented within histories of New Zealand architecture, but rarely as if it progresses. It is situated outside history – a curious prehistory” (cited in Clark & Walker, 2000, p. 33). This thesis offers examples of current New Zealand architecture that is attempting to rectify this claim.

"Technacy is the ability to understand, skillfully apply and communicate creative and ‘balanced’ technological solutions" ("Technacy", 2009).

9 “Back in the day there was literacy, numeracy and technacy. It’s a word that we don’t use here and we don’t value it. So someone can be literate, numerate, and technate, what Māori have lost is a huge amount of technacy in the last 50 years” (R. Hoskins, personal communication, June 10, 2008).
Whare Raupō

Research has uncovered the need for opportunities within Māori communities to better understand the natural resources available within their district to facilitate low cost housing projects. One example which utilises natural resources is the collaborative build of a whare raupō (sleeping house) at Te Patunga Bay by Rau Hoskins, Carin Wilson and a group of Unitec students in 2002 (fig. 4). They obtained traditional construction knowledge and techniques by speaking with kaumātua (elders) as there is limited documentation of these whare.

Māori are well known as orators. Knowledge is passed Kanohi ki te kanohi (face to face) through generations via discussion and demonstration. This research has been heavily reliant on discussions with our older generations who remember raupō (Typha orientalis) as a building material.12 Kaumātua form the link between traditional Maoridom and current practices.

Raupō reeds were harvested from local wetlands13 and lashed into bundles or panels to form the external waterproof panelling of the whare.14 Mānuka (Leptospermum scorparium) saplings (and later Tōtara) were collected from local ngahere (forests) and bound together with vines to form the structure of the dwelling (fig. 5).

Hoskins and Wilson have reacquired some of the lost binding techniques used in constructing whare. One of these binding techniques they employed lashes seven raupō reeds into one panel (fig. 6). This technique, nanati,15 uses parallel lengths of raupō joined by binding each individual stem to the next in a looping motion (R. Hoskins, personal communication, August 13, 2009). The nanati binding technique has inspired fastening techniques within the design project.

Bundling, lashing, height, size, extension of the eaves and excavation of the interior of the whare differed between īwī and were dependent on available resources.16 Generally these whare had a small door, window and a mahau (porch) which was sheltered by the roof extension (Shaw, 1991). The porch was an important part of the whare, the threshold between interior and exterior space, where eating and social interaction occurred during wet weather.

The whare raupō gradually decreased in numbers as settlers bought with them building materials and techniques to assimilate the architecture of Britain.17 To accommodate the vast number of settlers, 97 percent of swamps were drained, ultimately destroying the raupō resource and subsequently 11 Indigenous whare raupo are extinct. According to Vicky Freeman “in 1842 the Raupo house Ordinance was passed that imposed for regulations and taxes upon these dwellings. This legislation actively encouraged the disuse and abandonment of raupo structures” (Freeman, 2008, p. 10). Hoskins argues the reason whare raupō became extinct was due to dwindling resources as wetlands were filled (R. Hoskins, personal communication, June 10, 2008).

Valma Giblin remembers her father (my great grandfather) thatching the roofs of the shearers quarters. The buildings were waterproof. (V.Giblin, personal communication, June 30, 2009). Hoskins referred to Haare Williams who lived in a raupō whare from the age of 5-14. Only one panel of raupō rotted and needed to be replaced within these 9 years (R. Hoskins, personal communication, June 10, 2008).

Raupō can be found up to 750m above sea level. It is predominant along rivers and lakes around New Zealand and can be found close to the site in Te Kaha.13 According to Hoskins there are two main bunching techniques. The bundle technique is 7 strands lashed together in a cylindrical formation and tied to the frame. The second is a panel technique where 7 panels are bound parallel to one another. Vines, muka or boiled harakeke are all successful binding materials (R. Hoskins, personal communication, June 10, 2008).

Nanati is the binding technique used by Tūhourangi īwī (R. Hoskins, personal communication, September 26, 2009).

The Williams whare raupō had side panels that stood only one metre high (from the exterior). The inside was excavated for greater height within the interior (R. Hoskins, personal communication, August 13, 2009).

Freeman discusses the discontent settlers expressed in her paper Whare Raupo (2008), “after this initial period of settlement and construction, Pakeha attitudes to whare raupō..."
the whare raupō (R. Hoskins, personal communication, August 13, 2009). With colonisation came building legislation and restrictions which did not assist the whare raupō but were not the ultimate cause of their decline.\textsuperscript{18}

This project does not propose to design or restore a whare, but rather, I am interested in the traditional resources and construction methods used in Māori architecture (although Pacific Island examples have also been used).

**Seasonal Whare**

Seasonal whare were an important part of Maoridom\textsuperscript{19} as inland īwī (tribes) would follow food sources and reignite relationships with īwī along the coast (R. Hoskins, personal communication, August 13, 2009). Seasonal whare raupō were constructed in close proximity to the sea with a north, north east orientation. This often left the whare raupō vulnerable to storm winds\textsuperscript{20} and it is likely that seasonal whare needed re-thatching on a frequent basis. Bill McKay and Antonia Walmsley argue that “Maori were familiar with a constant process of seasonal building and rebuilding, a process which also provided the ongoing opportunity to practice and pass on construction skills to the next generation” (McKay and Walmsley, 2005, p. 64). This thesis questions how we might re-engage with this transference of knowledge, reclaiming techniques we have left behind.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure4.png}
\caption{Whare raupō (2002).}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Mānuka framework used in whare raupō.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure6.png}
\caption{Nanati binding technique used to bind panels of raupō.}
\end{figure}

\begin{footnotesize}
\begin{itemize}
\item Hoskins argued that in some rural settlements building legislation was not enforced. Communities did not and some still don’t abide by these. “I know of whanau that were building whare raupō in the 1960’s. Two groups that continued whare raupō - one is the shearing community… and the other group were the hunters” (R. Hoskins, personal communication, June 10, 2008).
\item Īwī would usually have two or three living areas, they would move in summer to either a lake, river, mountain or the coast.
\item Permanent whare were constructed with an understanding of micro-climates. They were positioned in still areas out of the cold winds (R. Hoskins, personal communication, August 13, 2009).
\end{itemize}
\end{footnotesize}
Tangata Whenua (people of the land)

The East Coast of New Zealand is a landscape subdivided into tribal areas by rivers, coastline and mountain ranges (fig. 7). Te-Whānau-a-panui īwī (including Te Kaha) spreads from Maraenui to Tihirau, contained by the ranges separating the east and west coastlines. To the east of the ranges lie Ngāti Porou, Te Aitanga-a-Hauiti and Ngāti Ruapani īwī. The southwest shores of Tōrere are inhabited by Ngāi Tai, and further afield Whakatōhea īwī inhabit Ōpōtiki. To the south, the inland ranges are populated by Tūhoe īwī.

The East Coast,\(^{21}\) from Ōpōtiki to Hicks Bay is characterised by domestic architecture with rusting iron roofs, damaged weatherboards and broken eaves. Further research into economically viable building materials is required to assist these communities. The region has a high unemployment rate and housing is often overcrowded and run down. This project considers site specific research particular to the small township of Te Kaha where Māori make up 85.7% of the community (Statistics New Zealand, 2006).

The Māori community in Te Kaha have lifestyles that are indebted to the surrounding natural resources. They gather seafood and fish from the moana (sea), hunt in the ngahere and bathe in the Haparapara River. Locals are irrevocably intertwined with their land.\(^{22}\)

Summer Holidays

Between Omaio Bay\(^{23}\) and Te Kaha there is a site where our family and friends have spent many summer holidays (fig. 8). In close proximity to the site are natural attributes that encourage sustainable living. Mānuka saplings are predominant in the neighboring ngahere and raupō can be found in the swamps along the Coast between Te Kaha and Waihau Bay (approximately 35 minutes drive from the site). Harakeke grows along the river banks and sides of the cliffs.

\(^{21}\) The East Coast district in the 2006 census reported 59.3% of the local population as Māori (Statistics New Zealand. 2006).

\(^{22}\) Māori legend and mythology has investigated the affiliation between land and people. Margaret Orbell expands on the alternative beliefs between Māori and Western cultures by saying, “since humans and other life forms are bound by the indissoluble ties of kinship, Maori did not see their existence as something separate and opposed to the world around them. Birds, fish and plants, along with natural phenomena such as the moon, mist, wind and rocks, were felt to possess a life essentially similar to that of human beings. There was not the sharp distinction between nature and culture that occurs in Western thought” (Orbell, 1998, p. 5).

\(^{23}\) Local whenua tell the legend of the Māori princess Hinerangi who was taken by waka from her home in Omaio Bay by members of the Ngā Puhi tribe. The waka traveled south under the rocky cliffs, along the shoreline. Outsmarting her captors, she convinced them she needed to go ashore to go to the toilet. The waka stopped at the whaling caves of Whitianga Bay. The princess ascended through the interior of the cave and told her people of her capture. Te Whānau-a-panui avenged their princess and so began the rivalry between Apanui and Ngā Puhi (R. Gage, personal communication, January 2, 2008). The East Coast wars between Te Whānau-a-Apanui and Ngā Puhi are also discussed in Witi Ihimaera’s novel The Matriarch (1986).
The gravel driveway follows the kiwifruit orchard to a fork in the drive which splits into two properties (fig. 9). Between these two properties Pōhutukawa trees (*Metrosideros excelsa*) outline the beach below, (fig. 10), and at low tide a channel of water runs directly out to the Pacific Ocean. At high tide water spills over the sides of the channel and creates a pond immediately beneath the site. During storms the bay is awash with white waves.

The dwelling sits metres from the cliff edge amongst native Pōhutukawa trees which cling to sheer cliff faces. The trees obscure lines of sight and offer a slight wind barrier. Thick Pōhutukawa roots infiltrate the brittle rock, forming natural, step-like crevices down the slope to the sea. Indigenous Flax plants, harakeke (*Phormium tenax*) and wharariki (*Phormium cookianum*) are common under the towering Pōhutukawa along the coast. Agapanthus plants (*Agapanthus africanus*) also occupy the site. The vegetation around the site grows without human interference. Flora dominates the site while the disintegrating dwelling, clad in recycled corrugated iron, looks obsolete. Its blue paint finish, once crisp, is now rusting while sea salt erosion increasingly forms cracks and crevices in its no-frills corrugated covering (fig. 12).

The Bach

The dwelling was built in 1954 to house the local health nurse. It was later used to house forestry workers. Over the last twenty years, the dwelling has been used a bach. At the bach, entertainment continues without televisions or telephones. Activities occur (during low tides) through swimming, diving, snorkeling and fishing. At high tide, sporting duels are often instigated and the lawn area becomes a transformable stage to accommodate tents, a game of cricket or act as a canvas to show a catch of seafood.

Early baches were low budget dwellings, cheaply constructed using found or recycled materials, which were, more often than not, the leftovers from renovations. Quickly erected, the unembellished bach was often a "pragmatic approach to creating enclosure with the least amount of effort" (Cheshire, 2008, p 11). Building restrictions, council bylaws, and the cost of prime coastal real estate have deterred this once popular building typology.

The site we occupy is owned by Te Ehutu Trust and the lease is revised at six monthly intervals. This has meant the little dwelling we occupy over summer has gradually degraded over time. Second-hand, recycled or found materials are gathered to fix problem areas as expansive renovations have never been considered due to the limitations of a short-term lease. This resistance to renovate the dwelling has prompted the design of temporary extensions (to the dwelling). These extensions will use local and sustainable resources encouraging an economically viable proposition that inspires communities to use and regenerate the landscape.

The prevailing southwest winds affect the front façade of the bach (fig. 11). The exposed cliff is affected by north, north west and westerly wind directions. The hills that run to the east of the bach provide a sanctuary from south, south east, and easterly weather conditions. The area between the bach and the shed is protected from the wind and is where we habitually erect a plastic canopy to provide a sheltered exterior space to spend the evenings. In the Summer of 2008/09, the shelter was repositioned on the western edge of the cliff, so we could watch the rising swell. The evening bought with it winds that picked up the shelter (and the chairs) and they ended up in the sea directly below.

This has suggested the need for a new shelter system at the bach.

---

24 Local residents to this day know the bach as ‘the old nurses cottage’.
25 According to Susan Yoffe, “bach communities, once prevalent throughout the country, have now been replaced by the ‘holiday home’ or engulfed by suburbia” (Yoffe, 1998, p. 69).
Figure 8: Omaio Bay.
Figure 9: The site.
Figure 10: Existing dwellings.
Figure 11: Site plan (opposite).
Figure 12: Wind diagram (opposite).
Uhengaparaoa
The exhibition Uhengaparaoa (2008) at Objectspace, by weaver Tangimoe Clay (based in Opotiki) displayed traditional kete and contemporary woven pieces (fig’s. 13&14). Clay uses harakeke, pīngao (*Desmoschoenus spiralis*) and kiekie (*Freycinetia banksii*) to create both traditional basketry and sculptural objects such as Makaweroa – Long hair (2008). Clay explored multiple scales through the exhibition. The tallest kete in the world (2005) was exhibited next to a series of brooches that explored the intricateness and crafting of the kete. Alternative materials such as venetian blinds, wire, plastics, introduced and invasive species of plants and vines are also woven into her practice.

Uhengaparaoa solidified the intentions of this project. I am interested in the physical crafting of a woven space, applying raranga techniques to different materials, to enliven the existing bach using materials from the site.

Exploring raranga
As noted previously, indigenous cladding and binding techniques often used woven resources. I am interested in the application of raranga within a sheltering system. This photographic series, (fig. 15), explores enclosure and openness through the tension and manipulation applied to the harakeke. Experimenting with length, width and the surplus strands has opened up spatial possibilities. There is the potential to generate elongated or compressed forms, a dense weave or porous cavities.

Seaweeds, driftwood, textured surfaces and vegetation offer alternative outcomes to weaving with flax (fig. 16). Seaweed provided an elastic, ductile resource when wet, and when dry it is brittle, but beautiful when held up to light. Harakeke, and kōuka, commonly known as Cabbage tree (*Cordyline australis*) and various grasses were woven to explore their different properties. Harakeke and kōuka leaves are relatively similar in terms of pliability but harakeke is superior in strength. I am interested in how harakeke over time, has the potential to change from a densely woven fabrication to a porous, open weave.
Flotsam and jetsam found on the rocks provided a medium to explore raranga in these initial design maquettes. Plastic strapping (thermastrap) is pliable, bendable and easily manipulated. Fabric, wool and muka have supple, tubular strands that are easily molded and tensioned to create minimal cavities. To create a kete, the number of strands needed with these thin strands increases considerably. On the other hand, the thickness of tubing and the rigidity of wire reduce the number of strands required. Paper, card and cork are adaptable and flexible, depending on the width of the strands and the thickness of the material.

A Spiritual narrative

There are multiple aspects involved in the craft of weaving. They include cultivation, preparation, craft and tikanga (customs) which are embedded in the spiritual narrative of Maoridom. Witi Ihimaera defines this cultural dimension in the novel *The Matriarch* (1986):

“The confederation is a world within a world within another world… the spiritual and the physical are one and the same… and when you walk the land you are in the company of gods… a world where gods and men commune, where timelessness begins and there is no separation of past and present” (Ihimaera, 1986, p. 293).

Although I am aware of basic cultivation, preparation and tikanga practices, this project prioritises the act of weaving. I am interested in understanding and acknowledging the importance of mythology, legend, spirit, gods and people within the Maori world view and the unbreakable bond between people and the land. Amanda Yates discusses this in her paper *On Whenua, Landscape and Monumental Interiors* (2006):

“The perception of the relationship between human and land in Polynesian culture is radically different… The term ‘whenua’ describes both placenta and land. These meanings overlay and profoundly intersperse, the term signifies the inseparable interaction and contiguity of the natural environment of ‘nature’ and humanity” (Yates, 2006, p 105).

These examples personify the connection between land and people, the bond which stems from the creation story of Ranginui and Papatūānuku. Yates refers to this as “a sense of (placental) connection rather than separation, a nature/culture continuum” (Yates, 2006, p. 105). So one is left with the challenge to represent and acknowledge this ground — human relationship. I have addressed this alliance primarily within the material choices described in the latter part of this document, where the eternal life cycle within Māori culture is considered by using a regenerative and compostable material source.

---

26 Māori mythology directly relates back to Papatūānuku (earth mother) and Ranginui (sky father). Papatūānuku and Ranginui bore many children, each a god of a natural element. Harakeke is an uri (descendant) of Tāne Māhuta (god of the forest). It was Tāne who created women, molding Hine ahuone from the earthen red clay of Papatūānuku.
Ceramic Textiles
The previous material explorations encouraged a response to Nineteenth century architect and historian Gottfried Sempers’ four motive theory. His theory proposes that, in architecture, raw materials fit into one of four categories; textiles, ceramic, carpentry or masonry (Mallgrave, 2004). He argues that these materials are characterised by the human industries of walling with textiles, hearth making with ceramics, roof making with scaffolding, or carpentry and mounding with the development of masonry (Mallgrave, 2004).

Semper argues that these classifications can share common alliances, for example “with lattices, tectonics provides the material and textiles give it shape” (Mallgrave, 2004, p 110). Within these ‘raw’ categories, multiple materials are included. For example textiles include cotton, wool, silk, leather, rubber, and other natural pliable materials.

Semper discusses the role of textiles within architecture, giving particular importance to textile wall coverings, describing them as being the ‘true’ architecture (Mallgrave, 2004). The structure of the wall is therefore secondary to the covering, “even where solid walls became necessary they remain only the inner and unseen structure for the true and legitimate representatives of the spatial idea namely, the more or less artificially woven and seamed together textile wall” (as cited in Crowe, 2005). The textile category encompasses materials whose attributes are; flexible, resilient and tensile (Mallgrave, 2004).

This theory informs the amalgamation of textiles and ceramics through the use of wool (textiles) and clay slip (ceramics). These design investigations, (fig. 17), explore a series of woven woollen kete. Each textile kete is submerged into a mixture of clay slip, and kiln fired. This process burnt away the wool, leaving the ceramic exterior shell of the kete.

The soft fabrication is no longer a flexible textile but it becomes a hard shell that retains the woven surface condition. Through this process I have merged together two of the four categories of raw materials with the ceramic taking the shape of the textile (similar to the lattice example mentioned earlier). The textile (ceramic kete) is no longer a soft, malleable fabrication but a solid structure, it is both textile and ceramic, and neither walling nor hearth. It is giving the ‘textile wall’ the opportunity to be structural.

Through these ceramic kete, I have challenged the principal roles of fibrous material as secondary to structure, evolving a soft, malleable textile into a rigid, strong form. This response to one aspect of Semper’s four motive theory reinforced the initial design intentions to explore sensory experiences controlled by raranga techniques.

Figure 17: Response to Semper (Opposite page).
Paper maquettes
Following the wool and ceramic kete, a series of paper and cardboard models were created. The strands differed in length, width and elasticity. These different attributes were further manipulated by the tension applied to the weave, which created multiple generations of similar forms. These photographs, (fig. 18), explore multiple sequences that use the corner weave employed in the construction of kete. Instead of weaving four corners inwards to create an enclosure, I have alternated the corner weave to create multiple ‘corners’.

The corners of a kete are the fundamental, beginning stages of a basket. It is here that the pattern is set, and the base and sides of the kete come together into an enclosed form. I am interested in how spatial possibilities may be generated through the manipulation of this corner technique. How might multiple enclosures be generated through the transformation of the corner?

These investigations, (fig. 19), were developed into a preliminary design proposition. The proposition explored the notion of an exterior space derived from raranga techniques. As objects these paper maquettes are intricate, alluring and elegant but these qualities are lost when considered within the site. No longer are the models captivating forms, but systems that require engineering, heavy duty materials and a specialist build team.

This proposition clarified that my intentions were not to design a system that relied on professionals, but a shelter system that can be built and erected by our family for the summer months at the bach. This pragmatic design approach has been influenced by indigenous building practices, in terms of utilising natural resources and practice based learning. This process facilitates the transference of knowledge between whānau (family) by building a shelter as a group exercise.

Figure 18: Paper models (opposite page).
Figure 19: Preliminary sketches that explore the woven models within the site.

Material Exploration
Comments from critics encouraged the exploration of raranga at a larger scale. These explorations further develop the corner technique used in the paper maquettes. They offer a point of departure from traditional uses of kete. I am interested in the notion of enclosure and how it differentiates through weaving assorted materials.

These maquettes offer insight into temporary shelter for human habitation, offering alternative materials to current sheltering systems such as fabric canopies or tarpaulins. The following explorations weave different products to investigate the limitations of the material and its ability to assimilate the corner weave.
Bendy Plywood
This first exploration, (fig. 20), examines bendy plywood as a material. The weaving techniques I have adapted employ multi directional bends. The plywood cannot bend in multiple directions, which restricts the corner technique, producing an enclosure, similar to the basket form. This form requires further structural support as the delicate corner joins cannot support the weight of the top surface. In this test the weight of the top panel is suspended from above to create an interior space.

The restraints of the plywood form cavities at the corner joins. This creates an interesting parallel between the tight horizontal weave and the spread of the verticals. The open and closed spaces within the timber structure allow environmental factors such as wind and light to contribute to the interior space. This creates a dynamic, unpredictable environment that does not eradicate natural elements within the space but minimises the harshness of the sea breeze. It acts as a barrier, forcing some of the wind around and over the shelter.

The lengths of the plywood allow large openings within the spacing of the weave. This lets pools of light into the interior space, creating dramatic shadows and patterns within. The cavities also provide interesting lighting conditions when lit internally at night. From outside the shelter, the woven canopy is aglow.

Further development of this model could occur by altering the number of warp and weft strands, or using variable widths instead of uniform strips. The plywood has the ability to be joined together (or to other material) to generate a larger spatial enclosure. These testings suggest various opportunities of weaving with bendy plywood.

Figure 20: Woven bendy plywood.
Plastic Strapping
Plastic strapping (thermastrap) is a recyclable product that offers interesting potentials using the corner technique. It is easily manipulated, offering many spatial possibilities.

These explorations, (fig. 21), investigate the rigidity of the material. Like plywood, thermastrap needs a secondary support system for it to exist as a canopy; in this case the maquette is suspended from above. It creates undulating spaces with the plastic strapping as the flexibility of the product allows the maker to manipulate the intricate woven spaces. The composition of these shapes is indeterminate and infinite.

Venetian Blinds
My initial assumption was that the slats from readymade venetian blinds would offer the most potential as their elasticity falls in between the rigid plywood and the flexible thermastrap (fig. 22). Unfortunately this was not the case. The slats have the ability to be densely woven together as long as they are not folded back on themselves which causes breakages.

Figure 21: Woven plastic strapping.

Figure 22: Woven venetian blinds.
Seatbelts
Seatbelts successfully performed the corner technique (fig. 23). The lengths of belt can be attached to other strands, allowing infinite possibilities to be generated from this technique. This material combined with a secondary structural material offers numerous possibilities as a shelter.

The aesthetic appearance of this product must be considered. The shades of grey are woven to create a harmonious undulating fabrication. As a surface, woven seatbelts are an innovative product with exceptional strength and durability.

Fabric
Polyester/spandex stretch fabric is the most flexible material I have employed (fig. 24). My prediction was that the double curve technique would be achieved but the maquette would become drapery, this was not the case. This pliable fabric was rolled into lengths and woven to create a dense hybrid of undulating surfaces. The material was easily gathered to minimise the cavities of the weave. The elasticity of the fabric allowed a continuous woven fabrication, but was not rigid enough to stand vertically, requiring extra support.

These tests show numerous materials that allow the corner technique to be utilised to create enclosures. The following explorations reestablish connections to indigenous building techniques by using harakeke. Harakeke as a medium for creating shelter reinvents past precedents. It was not employed as a cladding material, but muka and boiled harakeke was used as a binding agent in indigenous architecture.

Figure 23: Woven seatbelts. Figure 24: Woven fabric.

27 Warrick Harris claims that one hundred year old flax reduces in strength by half that of fresh fibre, giving it relatively strong tensile properties (Harris, 2000).
Harakeke
My initial hypothesis concerning harakeke was that harakeke would be easily manipulated, flexible and have the ability to be tightly woven. This prediction was correct when using single strands, however when applying multiple curves to the weave a joinery attachment is required. The rigidity of the harakeke, particularly along the rib of the leaf reduces its ability to employ the corner (unless as a small model). The wider the strand the more difficult it is to fold.

These examples, (fig. 25), use the corner weave and explore different ways to secure the edge of the harakeke (fig. 26). The maquettes reject the notion of synthetic or manufactured joining devices. They opt to investigate the tactile nature of the harakeke by binding, tying, twisting, stripping, folding, scouring and overlapping. The most successful technique as a join (and an aesthetic finish) was folding, similar to forming the edge of a kete, weaving the harakeke back on itself. This technique had the least amount of give as drying occurred. This exploration gives importance to the surplus strands of harakeke. Rather than cutting the leftovers, a fastening technique is achieved by overlapping lengths. The joining techniques employed in this series are a hybridisation of indigenous binding techniques and finishing techniques used in raranga.

There are variables to the success of this technique. The thickness of the strand is the major contributor to this technique not working. The second is the particular way to fold it. The dark green side should always be on the outside of the fold.
The module
The design problem was concerned with working within the limitations of the harakeke. A small, woven module which employed the corner technique was developed and modules were connected via binding techniques to construct a woven shelter.

The woven modules had solidifying agents such as, plaster, concrete and resin applied to them (fig. 27). Each product affected the harakeke differently. The plaster and concrete required multiple coats and gradually became a dense mass of product, overriding the weave. When dry, the product was weak where the weave was exposed. Resin allowed the harakeke to retain its woven form. It acted as a joining device, allowing panels to be joined to other panels or stacked onto one another and then solidified. This technique was strong at first however over a period of months, the thin layer of resin has begun to aerate and the harakeke and resin have split apart in places.

There are a number of reasons why these techniques have not been employed further. I have come to the realisation that it is not necessary for the flax to be both fabrication and structure, which I was trying to do in this series, and similarly in the response to Semper. I am interested in the sensory experiences of touch, smell, sound and sight which transform during this drying process, so by applying a veneer, I am undermining the natural weathering attributes harakeke has to offer.
Weathering
The following exploration, (fig. 28), examines how harakeke weathers in an exterior environment open to natural climatic conditions. The testing took place during winter months, which may be different when exposed to the summer sun. Variables may include extreme hot to cold temperatures, direct sunlight and sea salt, which might affect the outcomes. However these findings prove harakeke is able to sustain at least three months outside in weather conditions without severe disintegration occurring.

The first two weeks offer the greatest visible change as the colour altered from dark green to light green. The tightly butted weave began to separate, creating slight openings within the fabrication, allowing small strands of light to enter the interior space. These two weeks had been exposed to constant rain so the drying process had not yet occurred. The leaves were still supple and flexible.

Over the following two weeks the harakeke was exposed to dry weather conditions. This aeration caused the harakeke to rigidify. The green gradually disappeared exposing the light brown coloration. Once the harakeke has dried and hardened, the cavities are at their widest. This allows the performance of shadows within the interior space, as the canopy moves with the breeze.

Figure 28: Monitoring the drying of woven harakeke.

29 The same test was also undertaken with kāuka. Within an equivalent time frame similar effects occurred. The cavities increased, the strands rigidified and the green leaves transformed to light brown edges with a dark brown rib line. Harakeke has superior strength.

30 Judy Hohaia gave harakeke a life expectancy of approximately two months (J. Hohaia, personal communication, October 1, 2009).
Design proposition
The design proposition combines research and design processes. It integrates raranga techniques and site investigation whilst acknowledging traditional Māori architecture. It successfully integrates into the site a temporal sheltering system that encourages and enlivens our current exterior living at the bach.

The proposition is of multiple panels of woven harakeke, attached to one another to create a canopy. I have tested a single panel and generations of small scale models to see how they are integrated into the landscape and how they interact with one another. The panel has simplified to the most basic of weaving patterns, which enables those with limited weaving skills to be involved in its construction. Although Māori influence is still evident in the corner join, (fig. 31), the panel is more aligned with Pacific Island weaving (fig. 29).

A panel is made up of approximately 20 aho (weft) and 20 whenu (warp) to create an 800mm square unit, (fig. 30). This equal number of strands dictates the square shape of each individual module. One strand is one harakeke leaf, split along its length. The thick ends of two strands of harakeke are butted together to make one aho or whenu. This overlapping increases the strength of the flat area.
The corner
The following series demonstrates how the canopy is woven and where possible I have labeled strands to document the process. As noted above, I have appropriated from initial weaving explorations an angled weaving pattern which distinguishes Māori weaving from other cultures, this is evidenced in the corners of the panels. The adaptation of the nanati binding technique is also evidenced here, as an attachment between panels, and as the device to join the guy rope to the canopy.

(fig. 32). The first four strands on either side of the corner are woven like the start of a kete (but with the glossy, dark green side of the harakeke facing upwards). Strand A is folded around strand B, and slid back under strand C. Strand B is then folded back around strand A and slid under strand D to secure the edge of the corner. The strands labeled C and D are folded between strands A and B to retain the woven pattern. The internal panels are all constructed this way, with four corner pockets. The outer edge of the canopy however differs from this. At the four corners of the canopy (plus at points along the edge) the corner join becomes the attachment to the taura (rope/cord). Here, (fig. 33), strands C and D are folded directly back onto themselves to accommodate the guy ropes, made of muka. The muka is interlaced through these layers of harakeke to create a tensioning device between canopy and ground via a series of wire tent pegs at the base of the canopy.

---

Figure 31: Corner weaving technique 1.
Figure 32: Corner weaving technique 2.
Figure 33: The corner.
The attachment
This image, (fig. 35), depicts the securing technique I have employed which requires approximately 250mm of surplus harakeke to attach panels together. Strand H represents the four edge strands of each panel. Strand E represents the strand folded over strand H to secure the weave in place. Here strand F has two possibilities. Firstly strand F becomes the attachment to another panel. It is woven into strand F of the next panel, interlocking two panels. These panels are further secured by thin muka strands at the corners, binding the units into place (fig. 34). Along the outer edge of the entire canopy strand F differentiates from the internal connections (fig. 36). Strand G is added under strand C, on top of strand E. Strand F here is folded over strand G and C to secure the outer perimeter of the canopy. These joins are similar versions of the finishing techniques used in traditional raranga. Like the kete this canopy is woven in a way that requires no synthetic attachments.

Figure 35: Attaching technique.

Figure 36: Edge technique.

Figure 37: Paper example of edge technique.
The transformable canopy
The interior corners become a pocket system to house Mānuka saplings which prop up the canopy (fig. 32). The design utilises up to seven Mānuka posts per woven canopy. The seven posts reference the seven migratory waka of the great fleet from Hawaiki to Aotearoa. These posts offer vertical support for the canopy whilst the guy ropes tension and ground the canopy. Utilising this support system allows the posts to be set at different angles, in turn altering the spatial possibilities of the canopy. The canopy is transformable, movable and adjustable depending on the needs of the occupier(s). It can be used to accommodate many people, such as during meals. Or the system allows a side or corner to be lowered to create a more enclosed space for one or two occupants (fig. 38).

Figure 38. Diagrams showing transformability of canopy system.
Site analysis
Analysis of the site has uncovered our restricted use of the landscape at the bach. We primarily occupy the most sheltered area of the site, between the bach and the garage. Documenting current use and potential usage of the areas around the site that provide sea views and shelter has suggested the locations for three moveable shelters (fig. 39). There are three areas where the canopies will be assembled to increase occupation around the exterior of the bach. Throughout the day as the tide changes different compositions can be achieved to accomodate the occupants needs.

(fig. 40). Site A is currently where we erect our plastic canopy . It is sheltered from the sea breeze, but gets limited morning and evening sun. This area is near the outdoor fireplace and transforms between meals to accommodate our activities. Although this space does not have an intimate connection with the landscape, it offers a sheltered space between the dwellings. These surrounding buildings dictate the square composition of the canopy, aiming to maximise the sheltered space within this area. This canopy is made up of twenty five panels, which cover the majority of the distance between the dwellings. The occupation within this area I predict will be similar to its current use as a sheltered area that is used throughout the day to eat and socialise out of the wind and sun.

Site B is the most affected by the sea breeze, and occupation only occurs here during minimal winds. During these occasions we eat breakfast on the timber bench seat, with our backs to the morning sun. The gap in the Pōhutukawa trees provides undisturbed views onto the rocks below, across the sea and out to Whakaari (White Island). This space is the best place to watch the sun recede in the evening. I have positioned the canopy, which is comprised of 20 panels, between the towering Pōhutukawa trees. The rectangular shelter is designed to allow a corner to be lowered during winds to shelter oneself from the sea breeze. It is the perfect spot to sit during the day and watch the activities on the rocks, to read a book or watch the sunset.

Site C is exposed to northern winds as it opens to the expansive kiwifruit orchard and has views across the bay. This area is under Pōhutukawa trees which shelter from the summer sun and the sea breeze. Here the canopy is made up of 18 panels and is directed by the surrounding vegetation and the existing dwelling. The canopy covers the stairway to the rocks below where I have accommodated a seating area at the front of the bach by extending the first three existing stairs. This cuts into existing vegetation but opens up the minimal space of the front façade. This excavation is the maximum cut that could be made before the cliff becomes too steep, however it allows a small flat grass area that connects site B and C.

These three canopies offer alternative spaces to accommodate outdoor activities. Each has unique attributes during different times of the day and in different wind directions. The canopy system offers a transformable, manipulatable space that encourages seasonal occupation within the landscape. It is of a simple form so that as a family we can construct this temporal sheltering device. I have developed a system whereby no synthetic materials are needed to construct this shelter as the weave is secured by folding and joining harakeke. Guy ropes are made from muka and the props are Mānuka from the neighboring ngahere. The final proposition reiterates the initial intentions of the research project to use natural and local resources to construct a sheltering system.

The shelters allow us to appreciate the surrounding landscape of the bach. There are two options for the construction of the shelter. One option is to use boiled harakeke. This will shrink the strands to their dry stage, allowing the weave to be tight. The coloration will also assume the colour of the dried harakeke. The second option is to use, fresh, (un)boiled harakeke. This luminous green hue, with tightly woven strands will gradually become a light brown colour, with increased cavities. The purpose is not to design a waterproof canopy as I am excited by the diverse changes that occur using fresh harakeke.
Using natural resources enlivens the sensory experience within the site. It encourages the natural changes of the material. The smell of fresh or drying harakeke will be present throughout the duration of the shelter’s existence. As the shelter dries, the sound of the panels moving will alter. The hush of soft, delicate, fresh harakeke changes to a rustle of dry leaves rubbing together. Dry harakeke is less supple and malleable however it still retains the smooth feel of fresh harakeke. Within the interior of the canopy the dark green leaves, tightly woven together will gradually become porous, allowing water, light and wind to enter through these cavities.

As the harakeke weathers, it is a sign that summer is retreating. As we leave the bach for the majority of the year, we will bury the harakeke canopy, giving it back to Papatūānuku. Here Erenora Puketapu-Hetet acknowledges the tikanga associated with weaving, “it is used until it can no longer serve the purpose for which it was created. It is then deemed to have died a natural death and is allowed to go back to where it first began – back to Papatuanuku to begin a new life cycle” (Puketapu-Hetet, 2000).

Figure 39: Three sites.
Figure 40: Perspectives of transformable canopy.
Figure 41: Site plan
Figure 42: Sectional diagram a:a.
Figure 43: Sectional diagram b:b.
Figure 44: Sectional diagram c:c.
Conclusion
The project began with the objective of defining New Zealand architecture. Through trying to distinguish this, it became clear that my interests were in how Māori culture is represented in the architecture of Aotearoa. This development in theoretical framework has directed the scope of the research to examine contemporary architectural precedents that appropriate Māori craft. Further research has investigated indigenous building materials and techniques of the wharepuni and how practitioners are employing these construction methods in contemporary designs. This research has uncovered the need for further development in this area to examine how different ūi utilised different techniques and resources within their built environments across Aotearoa (rather than an overview). This project is a step towards understanding the diverse building practices employed by indigenous Māori.

The design component of this project began with no pre-conceptions of what might eventuate as a design proposition. This has meant the project has explored and developed multifarious design inquiries in reaction to research, and in response to discussion and critique. This has enabled various routes to be considered, but has often lead the project away from the initial intentions. The final proposition integrates research and process in the design of an uncomplicated canopy system which utilises a resource found on site.

The design has evolved by learning and adapting raranga techniques to weave a diverse range of materials. The explorative material testings offer potential for future development, but are not utilised in the final design. The project utilises harakeke as a natural, renewable resource that changes through the drying process.

This project offers a corner mechanism derived from raranga techniques which are activated by the Mānuka props. The canopy contributes to current architectural thinking surrounding temporary architecture that uses natural resources. Further development could integrate and layer two or more materials to investigate a waterproofing system. Although I have employed harakeke as a temporary building material, the design process is heavily focused on the development of woven materials, evidencing that this technique can be achieved using various materials.

This research by design project contributes to the discourse surrounding Māori craft and architecture. It amalgamates theory, and the craft of weaving into the design of a canopy system that utilises and adapts traditional weaving, binding and resources to construct a temporary shelter.

I want to conclude by making reference to the Nga Aho hui (conference) which was held 25-27 September 2009. As I have mentioned previously, this research documents a small collective of academics that are interested in Māori architecture. The collective of practitioners that were present at this hui, are actively involved in sustaining Māori culture for the generations to come, within their different disciplines. It was a realisation that this is what I want to pursue, that this research is just the beginning. I am honored to have been a part of the passion, expertise, cultural, spiritual and intellectual knowledge that was present during this hui.

*He Kākano I ruia mai I Rangiātea*
The seed will not be lost.

---
31 “Nga aho is a national network of Maori design professionals who come together to support each other to better serve the design aspirations of our Maori communities” (Nga Aho, 2009).
References.


<table>
<thead>
<tr>
<th>Glossary</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>aho</td>
<td>weaving strand (weft)</td>
</tr>
<tr>
<td>Aotearoa</td>
<td>Māori name for New Zealand</td>
</tr>
<tr>
<td>aroha</td>
<td>love</td>
</tr>
<tr>
<td>harakeke</td>
<td>New Zealand flax (<em>Phormium tenax</em>)</td>
</tr>
<tr>
<td>heke</td>
<td>rafters</td>
</tr>
<tr>
<td>īwī</td>
<td>tribe</td>
</tr>
<tr>
<td>kāinga</td>
<td>village, home</td>
</tr>
<tr>
<td>kaumātua</td>
<td>elder</td>
</tr>
<tr>
<td>kete</td>
<td>basket</td>
</tr>
<tr>
<td>kiekie</td>
<td>vine (<em>Freycinetia banksii</em>)</td>
</tr>
<tr>
<td>kōnae</td>
<td>simple woven basket</td>
</tr>
<tr>
<td>kōruru</td>
<td>ancestral figure on the gable of the meeting house</td>
</tr>
<tr>
<td>kōwhaiwhai</td>
<td>painted patterns on rafters</td>
</tr>
<tr>
<td>Māori</td>
<td>indigenous people of Aotearoa</td>
</tr>
<tr>
<td>mahu</td>
<td>porch</td>
</tr>
<tr>
<td>mauri</td>
<td>life force</td>
</tr>
<tr>
<td>mānuka</td>
<td>tree (<em>Leptospermum scorparium</em>)</td>
</tr>
<tr>
<td>moana</td>
<td>sea, ocean</td>
</tr>
<tr>
<td>motu</td>
<td>country</td>
</tr>
<tr>
<td>muka</td>
<td>prepared flax fibre</td>
</tr>
<tr>
<td>ngahere</td>
<td>forest</td>
</tr>
<tr>
<td>nikau</td>
<td>palm tree (<em>Palme sapida</em>)</td>
</tr>
<tr>
<td>noa</td>
<td>profane</td>
</tr>
<tr>
<td>Pākehā</td>
<td>New Zealand European</td>
</tr>
<tr>
<td>pā</td>
<td>fortified village</td>
</tr>
<tr>
<td>pōhutukawa</td>
<td>tree (<em>Metrosideros excelsa</em>)</td>
</tr>
<tr>
<td>pīngao</td>
<td>grass (<em>Desmoschoenus spiralis</em>)</td>
</tr>
<tr>
<td>pou</td>
<td>post supporting the ridge pole</td>
</tr>
<tr>
<td>raranga</td>
<td>Māori weaving</td>
</tr>
<tr>
<td>raupō</td>
<td>reed, bullrush (<em>Typha orientalis</em>)</td>
</tr>
<tr>
<td>tāhuhu</td>
<td>ridgepole</td>
</tr>
<tr>
<td>taura</td>
<td>rope, cord</td>
</tr>
<tr>
<td>tapu</td>
<td>sacred</td>
</tr>
<tr>
<td>tohunga</td>
<td>priest, expert</td>
</tr>
<tr>
<td>tikanga</td>
<td>protocols, customs</td>
</tr>
<tr>
<td>toetoe</td>
<td>rushes (<em>Cortaderia</em>)</td>
</tr>
<tr>
<td>tōtara</td>
<td>tree (<em>Podocarpus totara</em>)</td>
</tr>
<tr>
<td>tukutuku</td>
<td>ornamental lattice panels</td>
</tr>
<tr>
<td>waka</td>
<td>canoe</td>
</tr>
<tr>
<td>whānau</td>
<td>family</td>
</tr>
<tr>
<td>whare</td>
<td>house</td>
</tr>
<tr>
<td>whareuku</td>
<td>earth house</td>
</tr>
<tr>
<td>whenua</td>
<td>land</td>
</tr>
<tr>
<td>whenu</td>
<td>weaving strand (warp)</td>
</tr>
<tr>
<td>wharariki</td>
<td>New Zealand flax (<em>Phormium cookianum</em>)</td>
</tr>
<tr>
<td>wharepuni</td>
<td>sleeping house</td>
</tr>
<tr>
<td>whare whakairo</td>
<td>house decorated with carvings</td>
</tr>
<tr>
<td>wīwī</td>
<td>rush (<em>Juncas kraussii</em>)</td>
</tr>
</tbody>
</table>