



ASA

The Architectural Science Association (ANZAScA)

The 54th International Conference of the Architectural Science Association
26 & 27 November 2020

Imaginable Futures: Design Thinking, and the Scientific Method

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Published by:

The Architectural Science Association (ANZAScA)

Hosted by:

School of Future Environments, Built Environment Engineering, Auckland University of technology, Auckland, NewZealand

Printed in Auckland, New Zealand

Example of how to cite a paper from these proceedings:

Lastname, A. (2020) Example Title of ASA 2020, in A. Ghaffarianhoseini, A. Ghaffarianhoseini and N. Nasmith (eds), *Imaginable Futures: Design Thinking, and the Scientific Method*, 54th International Conference of the Architectural Science Association 2020, 26-27 November 2020, Auckland University of Technology, Auckland, New Zealand, pp. 1-10.

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ISBN 978-0-9923835-7-2



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Embedding Digital Technology into Contemporary Māori and Pasifika Architectural Practise.

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Abstract: The research paper will review how designers and architects can utilise digital technology to produce culturally respectful Māori and Pasifika architectural outputs within a contemporary landscape. The purpose of the research is to determine how digital fabrication technology can embody the same mana found within traditional design thinking and making process. The research will firstly aim to understand what social customs must be retained to ensure the design outcome are culturally appropriate. The second aim of the research is to determine what traditional building and artisan crafts must be employed in the fabrication process. The method will predominantly a review of various forms of literature, recorded interviews and case studies where possible. Three generations of Māori and Pasifika architectural practise having been selected for this review to ensure a large and diverse cultural representation are analysed. The research findings have indicated there are a large number of approaches to producing contemporary digital architecture. While some approaches ensure traditional craftsman are involved throughout the design and fabrication process, other designers opt to engage with modern craftsman with the blessing of the community. The value of this research is important, as it will serve as a mechanism to understand the conflicts between tradition and technological progress. Although it is essential to preserve cultural skill, expertise and craft, it is equally crucial to innovate technologically. The research goal is to enable digital architecture that can spiritually resonate mana and respect to ancestors of Māori and Pasifika culture.

Keywords: indigenous architecture; digital technologies; culture.

Imaginable Futures: Design Thinking, and the Scientific Method. 54th International Conference of the Architectural Science Association 2020, Ali Ghaffarianhoseini, et al (eds), pp. 442–450. © 2020 and published by the Architectural Science Association (ANZAScA).

1. Introduction

The research presented within this paper will review how architects utilise digital technology to produce culturally respectful Māori and Pasifika architectural outputs within a contemporary landscape. Today, the architectural profession acknowledge the indigenous people of New Zealand by seeking to work with local Māori when formulating designs for community infrastructure (cultural, civic and landscape architecture) and public art. Embedding digital technology into contemporary Māori and Pasifika architectural practices requires practitioners to incorporate modern methods of fabrication (whether sculptural, ornamental or structural) into a culturally driven environment that needs to respect Māori and Pasifika traditions and heritage. The technology that will be investigated are;

- ❏ Building Information Model (BIM) software,
- ❏ Automated Fabrication systems such as CNC cutters, Robotics, and 3D printers to simulate traditional hand carving,
- ❏ Other traditional artesian crafts that may be achieved by digital methods

The purpose of this paper sets to determine how digital fabrication technology can embody the same mana found within traditional design thinking and making process. According to Māori Dictionary the word 'Mana' can be described as "prestige, authority, control, power, influence, status, spiritual power, charisma", it is a supernatural force within a person, community, place or object (Moorfield, 2020). The paper will be focussing on aspects that relate to spiritual power, prestige and influence within the production of architecture. The cultural practices of the Pasifika and Māori artesian and craftspeople often draw upon generations of cultivated customs. To quote Karen Stevenson (2002), "Contemporary Pacific Island artists in New Zealand are utilising the cultural knowledge of their homelands in their artistic expression as a means of navigating their urban environment." This ensures they acknowledge the ancestral routes from where they draw their inspiration from.

2. Research Question and Methodology

The research question of this paper seeks to determine if digital fabrication technology can embody the same Mana and cultural meaning that is found in the traditional making process. To understand how New Zealand architects can integrate new fabrication technologies into Māori and Pasifika architecture, this paper documents a variety design and fabrication approach that architects have undertaken. The two main aims that this paper will seek to address are:

- ❏ By researching social customs that pertain to the traditional fabrication involved, there needs to be an understanding what these customs embody in order to keep any foreign fabrication process culturally appropriate and acceptable.

- Through further research of the customs, there must be an understanding of what traditional building techniques and methodologies must be used in the fabrication process in order to keep the same Mana and cultural integrity intact.

The method of the paper will review two types of relevant literature and case studies. The first medium will review relevant theories and design principles that related to Maori and Pasifika architectural practise. The second medium will investigate practice-based case studies that embed Māori and Pasifika values into their digital design and fabrication practice.

3. Literature and Case Studies

3.1. Theories and Design Principles

Architectural commentator with both Māori and Tongan descent, Rameka Alexander-Tuinukuafe (2017), explains the progression of Māori architecture in the past 20 years was largely dependent on practitioners such as Rau Hoskins, Mike Barns, and Peter Maher, late Rewi Thompson. Their contribution has laid the foundation for many architects to express the need for Māori architects to be skilled in both Te Ao Māori (Te Ao Māori meaning Māori worldview), and Te Ao Pākehā (of European descent) (Moorfield, 2020)). He expresses that in order for progression and change, as a starting point the change needs to be led by Māori architects inside established architectural practices. In the near future significant architectural projects will be led by Māori architects and clients, resulting in a place based or iwi specific architectural outcomes that enhance the Whakapapa and Mana of the indigenous people of Aotearoa. Alexander-Tu'inukuafe's reflections, highlight the importance and need for today's New Zealand architects to express an understanding of both the western design principles and the Māori design principles. Digital fabrication represents an argument that there needs to be some sort of conversation between the two principles in ensure traditional crafts and ideas do not become superseded, overshadowed, and overwhelmed by modern technology. It is therefore important to encourage architects, academics and other designers to be exposed to the digitisation of the production of Māori and Pasifika architecture to enable discourse around this topic do take place. Without it, this unique opportunity for local Iwi and other cultural stakeholders to participate on the conversation will be forfeited (Alexander-Tuinukuafe, 2015).

There are concerns that not enough is being done to reclaim the Māori cultural identity of urban landscapes within the city centres. When reflecting upon the Auckland Central Business District, we see very little traces of the of Māori identity and heritage. This problem is being combated with the employment of Phil Wihongi as Māori design leader within the Auckland Design Office (Alexander-Tuinukuafe, 2017). Digital fabrication technology can provide an outlet to allow urban spaces to be reclaimed to provide greater Māori cultural identity to existing western infrastructure.

To influence the urban context, we can review the work of contemporary Māori artist and carver Bernard Makoare on the Māori identity to the cultural landscape of New Zealand. Makoare's influence

and thinking on tikanga Māori and how this can be brought to life in an urban context. The Māori voice is the original voice, the indigenous voice of New Zealand, yet there is not enough representation across Auckland for their voice and presence to be heard and felt. The introduction of Bernard Makoare brings an interesting view of the current Māori artisan perspective as in further research into his works and crafts he brings a new term of “Miharo” when approaching a project with the Mana it deserves (Makoare, 2020). Bernard Makoare personal website describes Miharo as extraordinary or exceptional. In his diagram he breaks it down into creativity and innovation. Makoare first experienced the concept during the Auckland City Art Gallery project where they “began to grapple with an unfamiliar Māori dimension” (Makoare, 2020). This is a significant development, as it promotes the innovation and creativity that is needed to address the ever-evolving environment that modern contemporary Pasifika and Māori artisan are navigating.

Pasifika researcher and academic, Karen Stevenson (2002) draws upon the mnemonic traits that are carried through the use of patterns and motifs of the Pacific. The intertwining of one’s craft with culture is ultimately a natural evolution of the encapsulating generational experiences within Pasifika society. The language that imbues from the art speaks through metaphors and the stories of the land. The transition of artistry from the old to the new with the contemporary artists using this knowledge of their homeland as a navigational tool to set their own path in their urban environment. Stevenson continues to address this change from traditional methods as a ‘migration’ tracing it back to the navigational history of the Oceanic people. This important detail illustrates that there is an understanding of foreignness and the need to adapt. The contemporary response to this migration can be attributed to two main elements: environment and generation. The environmental aspect of the adaption can be traced to the migration from the homelands, to this new setting where cultures collide and offer varied views on similar standpoints. For instance, Stevenson brings to light that, “the utilisation of these patterns provides sustenance to the culture. As times change, materials may change, metaphors may change, but the cultural essence remains” (Stevenson, 2002, p17).

Professor Deidre Brown, from University of Auckland explains, the Māori perspective of these changing times. Brown (2020) states, “the Mana of movements shifted through the passing-on of symbols and architectural forms” and “the appropriation of Western-European design elements was not a sign of assimilation but a strengthening of culture against colonisation.” It is suggested that the development of the traditional artform does not move away from customs but rather fights the colonisation of the culture using their own tools. For the practice of digital fabrication, it can mean that its introduction to the artform does not take away from the culture but rather enhances it. Digital fabrication then becomes a tool for innovation that is symbolic of culturally strengthening the bonds between an adaptive world and the steadfastness of culture.

3.2. Architectural Practise

As the largest and arguably the most prolific architectural practise in New Zealand, Jasmx is setting the stage for the further development and cultivation of mixing and bringing the old and new age. Jasmx is careful with their approach to making the Koauau (a musical instrument) into a symbolic gift that both

embraces its Māori concepts of Whanau (belonging to a family) and the use of digital technology (Jasmax, 2019). It is seemingly culturally aware in its symbolism and purpose which has been developed in the form of a brand that is unique to Jasmax whilst acknowledging Aotearoa's indigenous heritage and connection to place. As Oceanic people we emphasise the connections we have and the principles that are developed along with them. Being able to know these connections is what also gives the mana its presence. In contemporary Pasifika art the outputs may not be traditional in medium or in material, but the acknowledgement of the connections and essence must be present for the mana to truly be felt (Harvey, 2015).

According to architectural journalist and author Justine Harvey (2019), in order to walk the talk they need to incorporate the Māori values into built environments that recognises Aotearoa as a collective. The Te Aranga Māori design principles are a means of helping both Māori and non-Māori architects engage the cultural landscape and create environments for Māori to grow and thrive. Non-Māori can still engage meaningfully with culturally sensitive environments. Their involvement can help the sharing of knowledge and support which creates culturally equipped teams, that then expand and grow the collective knowledge. It is interesting that there is now a number of Pākehā architects who are learning Te Reo Māori with genuine interest, through working with Māori clients and wanting to understand the culture. This can help the non-Māori perspective understand and appreciate the cultural landscape that they inhabit from day-to-day.

Lyonel Grant has been a driving force in the Māori architecture scene with his work on the Unitec Marae being a culmination of both traditional carving techniques with western sculptural materials and techniques. In the article by Carly Tawhiao, Hare Paniora elaborates on the thinking of Grant, "He didn't just want to decorate a box. The carvings of the house are also its structure," (Tawhiao, 2009). As the Wharenui was traditionally designed and built time and money came into consideration. An interesting factor in this build however is the centre pillar or "Pou" as it is constructed of bronze and represents everything up to 1840. This is not a traditional material and therefore requires a non-traditional approach to crafting it. This shows how the cultural norms are adapting and recognising how the world is changing. They do this by using an important feature in their cultural archetype, the Pou or central heart Pou, as a way of giving recognition to the treaty (Austin, 2014).

Multi-media artist, lecturer, *Tavakefai'ana* Semisi Potauanie (2019) has been a very vocal and relevant artist in the field of architecture and Pasifika art and design. In his recent commission in Christchurch, he was asked by SCAPE public art to design a public piece to be installed in the city centre. Named Vaka a Hina translated to Vessel of Hina, this sculpture is the reimagining of the Tongan or Pacific folktale of the Tongan goddess Hina's vessel (vaka), in which she uses to travels between vava (outer space) and maama (earth). In partnership with John Jones Steel, Potauanie's design was brought to life with steel structure and fabrication. The involvement of Potauanie in the process has ensured that that this folk tale is still communicated accordingly. The sculpture represents a beacon, a meeting point and way finder to connect the community and celebrate cultural differences (Scape Public Art, 2019).

Semisi's prior work, *Manuesina* the white angel displayed in Waiheke island displayed the same vigour. His rich cultural environmental influence has allowed him to make socially appropriate decisions. Working in multi-media disciplines, allows him to undertake a variety of meaningful projects, with different fabrication technologies and innovative materials (Potauaine, 2019). For Semisi's Waiheke sculpture, '*Manuesina*' the incorporated the bird as a symbol for global spirit. The design inspiration came from intricate Tongan highly symmetrical patterns called '*Kupesī*' which is inherently strong in mana. The sculpture was constructed using an environmentally friendly engineered polymer (Ali 2016). Both the Christchurch and Waiheke projects are geometrical form and required the use of digital fabrication technology to be built. The use of 3D printed model were employed to test design iterations. The use of CNC laser cutters creates components and Robotic arms assembler the structure. The end product did not take away from Semisi's cultural visions and beliefs as his involvement acted as a compass that kept the narrative true to its course. For Semisi, digital technology is another tool available for us to use. It allows us to continue our dealing with reality, aiding us in the transforming time-space (ta-va) to line-space (kohi-va). These folklores of antiquity now take on new medium. Just like metaphor, their meaning remains intact.

Tennant Brown Architects and Makers of Architecture teamed up with Māori artist, Derek Lardelli, to create spaces of cultural dialogue that are pushing boundaries while staying grounded in their Whakapapa. Tennant Brown brings together the traditional carving patterns and the contemporary techniques to form the CNC cut '*Tāhuhu*' Ridgebeam at Gisborne Airport. The *Tāhuhu* being the ridge beam and an essential part of the structure of the Whareniui, this use of western techniques seems to become a statement to the growth of the culture's artform. This culmination of western and Māori techniques brings the development of the whare into the spotlight and informs a possible outcome of the technological advancements of today (Ashton, 2019).

The Kākano's pod within Ngā Purapura Sports Facility is parametrically designed geodesic dome that was also CNC cut out of plywood also designed by Tennant Brown Architects. This project can be seen as a big development in the melding of the Māori narrative into the building style of prefabrication. The Kākano is seen as a reflective teaching space that is a mnemonic device of Whakapapa (Tennant & Brown, 2019). The process of building and designing was incredibly efficient and timely due to the ease of the digital fabrication process (Timoteo, 2019). This blend of technologically designed space, and their culturally intertwined meanings, brings to light a conversation between techniques that speak to the potentials of fabrication. Archaeologist Peter Wood of Victoria University brings a perspective that sheds light on the Pakeha's engagement with contemporary Māori architecture. In particular, the Kākano pod within the Ngā Purapura Sports Facility brings an inspirational encounter where he understands the meaning and the purpose of Kākano (Wood, 2012). This is an example of the meaning and purpose of the design is felt regardless of the level of understanding of Mana.

The National Library of Wellington houses a permanent exhibition named '*He Tohu*'. This exhibition houses the most iconic constitutional documents of New Zealand, one of which is the 1840 Te Tiriti o Waitangi (Treaty of Waitangi). The room is an adaptation of a '*Waka Huia*' or a timber treasure box, this sense of a treasure box speaks to the level of sacredness or Mana that it holds. With the importance of

the documents that the exhibition houses, there are technical requirements that need to be met in order for preservation of said treasures. Due to the limitations of the project the designers looked to the use of parametric modelling to generate physical exploratory models and CNC routing. Although Studio Pacific Architecture took a digital approach, they still acquired the cultural expertise of Bernard Makoare to contribute to the design and fabrication of the exhibit. Makoare's involvement and the use of New Zealand's native timber Rimu, for the interior and exterior cladding shows the consideration for connection to Whakapapa and Whenua within the project. This makes the exhibition a prime example of the melding of digital fabrication with traditional taonga (Timoteo, 2019).

Matthew McIntyre Wilson's architectural CNC milled architectural 'He Raukura' fins adorn's Waitohi Johnsonville Library and Community Hub design by architectural firm Athfield Architects. The work manufactured also manufactured by Makers of Architecture investigates the possibilities of what CNC fabrication has the offer the Māori artform and style. In this piece Wilson's artistry is translated into a series of elegant long fins that were made to reflect the Māori heritage of the area (Southcombe, 2020).

5. Findings

When looking at the social customs of Māori and Pasifika artesian works must be retained the acknowledgement of Whakapapa or heritage seems to be an underlying theme throughout. Knowing and expressing the original ideas and or art style that has been developed and cultivated ensures that Mana can be upheld.

This brings into question what fabrication methods can be used. The traditional methods have not changed and are the same as they have been for hundreds of years. To ensure that strategies and meanings are retained when traditional methods are not viable, consultations with local Māori experts and or tufunga can ensure that the meanings and connections are still being maintained and representative of whakapapa and heritage. By ensuring involvement of the traditional craftsman throughout the process, the design path is steered in the right direction and can manage any misinterpretation of any or all culturally sensitive craft and art (Love, 2016)

By gaining blessings from the community and or indigenous people of the area while using modern craftsman, there is an acknowledgement of the heritage and the community that the project stems from. The connections that are attached to the craft and the cultivation of the artform is the grounding factor. Crafts people are experienced in their field of arts and craft they have the knowledge and understanding of their specific cultural connection. Crafts people are willing and able to adapt while knowing their artform enough to keep their Mana and cultural integrity alive and felt. Community Blessings bring an approach that is respectful to the cultural landscape that is being drawn from. It is an acknowledgement of the environment that is culturally present and respective.

6. Conclusions and Future Research

The value of this research is important as it can help New Zealand's architectural firms, big or small investigate how technology and culturally sensitive design to Māori and Pasifika can be embedded within their practice. This Research can also serve as a mechanism to understand the conflicts between tradition and technological progress. Although it is essential to preserve cultural skill, expertise and craft, it is equally crucial to innovate technologically. The research goal ultimately is to enable digitally produced architecture that can spirituality resonate mana and respect to both the ancestors and the living.

The main point of conflict that is found throughout the research is in the change of mediums. There is a culturally embedded notion that the method of fabrication is just as important as the meaning and can be an essential process for the meaning to be delivered in the end product. We see through contemporary artists the challenging of these cultural norms with their prioritising of the Mana or cultural essence of their product. When it comes to the meanings and the narratives that are represented there is no doubt that they are made to stay true to those origins and to the Whakapapa of those indigenous groups who are involved.

Tangata is of Mana. When Tangata arrived in the new land, Mana must find new medium as a way of integration. In this, we must not rule out that "traditional" started off as "contemporary." We will rest more assured if we think at Mana this way. (Tavakefai`ana Semisi 2020)

The Taonga of Innovations seen through the use of digital fabrication technology have made cultural intent the underlying factor that the making process stems from. Through the research, the use of digital fabrication technology in the manufacturing process has been a turning point for some designs. By giving the artists the freedom that they normally have with the efficiency of the programming, the artists intent and meaning can still be translated into the process and to the product. The Mana is then a product of the artists involved and their input sees the respect is maintained. To quote Rameka Alexander-Tuinukuafe, "Mana does not have to be understood to be felt but can be felt when understood" (Alexander-Tuinukuafe, 2017).

The next steps of the research is to produce an architectural outcome within academia. The authors intend to work with QUE Haven Community and Management Trust – a Non for profit organisation restoring farmland to native forest to design and develop culturally appropriate lookout pavilion. To ensure that the product of this research is not a culturally appropriate, the involvement of artists and or local iwi or communities ensures the product is representative of their whakapapa. Their participation also ensures the connections of the project stay true to their meanings.

References

- Ali, M (2016, 20 July). The Titirangi artist's concept selected for Waiheke Headland Sculpture of on the Island. Available from: Stuff <<https://www.stuff.co.nz/auckland/local-news/western-leader/82202156/titirangi-artists-concept-selected-for-waiheke-headlands-sculpture-on-the-island>> (accessed 19 August, 2020).
- Alexander-Tuinukuafe, R. (2015). Opinions: Rameka Alexander-Tu'inukuafe on..."A Ngā Tamatoa perspective on Māori architecture". *Architecture NZ*, 6(Nov/Dec Issue), 27-28

- Alexander-Tuinukuafe, R. (2017, November 08). Building culture: why good urban design requires a better understanding of Tikanga Maori. Available from: Idealog <<https://idealog.co.nz/urban/2017/11/building-culture-why-good-urban-design-requires-better-understanding-tikanga-maori>> (accessed 02 August 2020)
- Ashton, A. (2019, November 20). New look for Gisborne Airport. Available from: Gisborne Herald <<http://www.gisborneherald.co.nz/local-news/20191120/new-look-for-gisborne-airport/>> (accessed 02 August 2020)
- Austin, M (2014). Turning (Back) to Linguistics” C. Schnoor (eds), Translation; The Society of Architectural Historians, Australia and New Zealand, (SAHANZ), pp 205-211
- Brown Professor Deidre Brown, D. (2020, January 03). Open your eyes to the future of Māori architecture. Available from: Newsroom <<https://www.newsroom.co.nz/@ideasroom/2020/01/03/965328/open-your-eyes-to-the-future-of-maori-architecture>> (accessed 02 August 2020)
- Harvey, J (2015). Jasmx Maori Cultural Advisory. Architecture NZ, (Nov/Dec Issue), 27-28
- Harvey, J (2019). New Architecture of the South Pacific: How the Maori Worldview is Changing New Zealand’s Built Environment. Architecture Design, 89, 94-97; Wiley
- Jasmx (2019, November 14). Jasmx announces a new design direction. Available from Architecture Now: <<https://architecturenow.co.nz/articles/jasmx-announces-a-new-design-direction/>> (accessed 18 August 2020)
- Love, J. (2016, November 07). Kōrero Mai, Kōrero Atu: On making an exhibition from colonial spoils. Pantograph Punch. Available from: <<https://www.pantograph-punch.com/posts/korero-mai-korero-atu>> (accessed 18 August 2020)
- Makoare, B. (2020). Bernard Makoare: Carver, artist & designer. Available Bernard Makoare from <<https://bernardmakoare.com/>> (accessed 18 August 2020)
- Stevenson, K. (2002). Lalava-ology: A Pacific Aesthetic. In F. Tohi & S. Rees (eds.), Filipe Tohi: Genealogy of lines Hohoko ē Tohitohi, New Plymouth, Bovett-Brewster Art Gallery, 17-19
- Southcombe, M. (2020). Going beyond the brief. Architecture NZ, (May/June Issue), 32-39
- Scape Public Art. (2010, March 28). Icon for East Frame. Available from: Scoop Media <<https://www.scoop.co.nz/stories/CU1903/S00357/icon-for-east-frame.htm>> (accessed 18 August 2020)
- Tawhiao, C (2009, April 02). Unitec Whareniui Opens. Auckland City Harbour News. Available from: Stuff <<http://www.stuff.co.nz/auckland/local-news/auckland-city-harbour-news/2255652/Unitec-whareniui-opens>> (accessed 18 August 2020)
- Tennent, H., & Brown, E. (n.d.). Ngā Purapura. Available from: The Designers Institute of New Zealand <<https://designersinstitute.nz/case-study/nga-purapura/>> (accessed 03 August 2020)
- Timoteo, E. (2019). He Tohum, Document Room. In E. Timoteo, P. Bell & G. Marriage (eds.), How to Prefab: A series of New Zealand offsite construction case studies. Wellington, Prefab NZ, 09-10.
- Timoteo, E. (2019). *Ngā Purapura, Sports Facility*. Available from: Prefab NZ Database <<http://www.prefabnz.com/Downloads/Assets/Download/13509/1/Nga%20Purapura,%20Sports%20Facility%20.pdf>> (accessed 03 August 2020)
- Wood, P. (2012). Nga Purapura, Te Wananga o Raukawa. *Architecture NZ*, (July/August Issue), 58-64
- Moorfield, J.C (2020.). Available from: Māori Dictionary <<https://maoridictionary.co.nz/word/3424>> (accessed 01 August 2020).

ASA
2020

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Architectural Science Association (ANZAScA), Australia
ISBN 978-0-9923835-7-2

