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Hangarau me te Māori: Māori and Technology

Te Taka Keegan and Acushla Sciascia

Introduction

A sign of a vibrant, healthy developing nation is the adaptation and uptake of new technologies. Māori have a long, but mostly unrecognised, history of ingenious innovation and adaption of new technologies. This chapter will reveal Māori ingenuity through discussion of historic examples and modern media usages by Māori, and the future implications these have for Māori.

Technology can be defined as tools, devices and machines that have been developed by the application of scientific knowledge. Māori technology, then, is Māori tools, devices and machines that have been developed by the application of Māori scientific knowledge. This chapter discusses some examples of innovative Māori technology and their adoption in both historic and modern times. It includes sections on historic Māori technology, Māori media innovation and Māori adoption of Internet technology. Two sections are further expanded on: Māori in social networking sites and te reo Māori in technology. The chapter concludes with the authors' thoughts on how the adoption of new technologies will shape tikanga Māori and te reo Māori into the future.

Historic Māori Technology

Māori have a history of technological innovation and adoption. Primal examples can be seen in creation myths where Tū-mata-uenga fashioned snares and spears to trap and kill the children of Tāne, and then went on to make canoes and nets to catch the children of Tangaroa.[1] The legendary figure Māui, perhaps Māori's greatest innovator, used his grandmother's jawbone to fashion a weapon and a fish hook, and was also renowned for inventing the strongest ropes which he then used to snare the sun and fish up land.[2]

Pre-encounter Māori made use of technologies and engineering principles that transcended contemporaneous European technology. Examples of this are evident in the technologies used in waka design, as the following three examples show.

The hull of the traditional ocean-faring waka was not levelled smoothly but 'the *toki umarua* (double-shouldered adze) was especially made to *pare-ngarungaru* (make small wave like patterns on the hull on the exterior of the canoe) – *kei piri te wai ki te waka* (to prevent the water from clinging to the canoe, and so impeding its progress)'.[3] This has the effect of producing small rotating eddies that gather kinetic energy and reduce the overall drag on the hull, leading to a quicker waka. The same principle is used in modern golf balls: dimples are placed on the surface of the ball that create small eddies when the ball is travelling in the air, which reduces the drag on the ball and makes it travel further.

The sail that was used in traditional waka was a lateen (triangular-shaped) sail. The lateen sail has a number of advantages over the square-rigged sail used by European sailors at the time. In a comparative analysis of the two sail designs, A. J. G. Papesch lists eight aerodynamic features of the lateen sails used by Māori and subsequently goes on to state: 'Clearly when European made contact with Māori, Polynesian sail design was superior to European sail design.'[4]

A third example of pre-encounter Māori technology in waka design is the hoe (paddle). Papesch states that Māori showed significant appreciation of design physics in the technology of the pre-contact hoe.[5] The long length of the hoe (approximately 1.5 metres) increases its flexibility and allows strain energy to be stored at the beginning of the stroke and kinetic energy to be released as the handle is straightened towards the end of the stroke. The V-shape of the blade creates two counter-rotating vortices over the convex upper surface, which translates to extra thrust when the hoe is used in the water. The 5-degree angle of the blade leads to a greater stroke length and longer time during which

force is applied (as opposed to a 0-degree straight blade). The application of these three physics principles led to a hoe that is more efficient than those used on ceremonial waka that are seen in modern-day waka celebrations.

Aside from waka technology, applications of scientific knowledge in other fields abound. Concepts of solar heating/cooling, insulation, ventilation, hygiene and water-proofing were evident in architectural design.[6] Insightful engineering principles are displayed in fortified pā design.[7] Mechanical concepts such as the wedge, lever, inclined plane and skid were utilised in construction.[8] Aspects of metallurgy intelligence are apparent in heat-tempering processes that were employed in tool and weapon creation.[9] Examples of technology application can also be found in the fishing, hunting and agriculture pursuits, in weaving and clothing manufacture, and in the fields of health and nutrition.

Māori clearly possess an extensive history of creating new technologies based on Māori scientific knowledge and current needs and then utilising this technology in innovative applications.

Māori Literacy and Innovations in Media

The ability of Māori to adopt and shape technology for their own benefit is also apparent in Māori media. Despite substantial difficulties, Māori have made in-roads and developed a significant but unique presence in the media of Aotearoa.

Te reo Māori was an oral language with no discernible written form prior to Pākehā encounter. The early missionaries arrived with an intent to make the scriptures available in te reo Māori and to assist the conversion of Māori to Christianity. Initial efforts by Thomas Kendall were enhanced by collaboration with Samuel Lee and two Māori rangatira, Hongi Hika and Waikato, who created an orthography in 1820 that is the basis of what we use today (see Chapter 9).[10]

Māori subsequently adopted literacy at a rapid pace and later used these skills for letter writing, which was often formal and in te reo Māori.[11] In the late 1800s Māori were in fact more literate in te reo Māori than Pākehā were literate in English.[12] Written letters tended to follow the structure and format of a whaikōrero, with mihimihi and the lyrics of waiata.[13] The content included personal messages of expressed emotion, political statements, excerpts from waiata and passages of oral histories. Such historical letters are now used as material to investigate Māori literacy of the 1800s and offer unique insights

into dialectal differences and orthography.[14] While the intention to make Māori literate was motivated by colonial powers who sought to assimilate Māori through missionaries and the Holy Bible, Māori largely benefited from literacy.

Newspapers

With increasing literacy, Māori newspapers began printing commentaries and opinion pieces on politics and oral histories, formal whaikōrero and Māori activities, international news and accounts.[15] Curnow reports forty such newspapers being published in te reo Māori and in English.[16] Curnow further comments that in the twentieth century, Māori newspapers began to decline, which she postulates could have been due to the decline of native te reo Māori speakers.

Radio

Wiremu Parker was one of the first Māori voices to hit the radio frequencies during the 1940s; his reading of names of the war dead developed into weekly te reo news segments on radio.[17] Radio New Zealand was, under its obligations as a Treaty partner, obliged to allocate resources for television and radio frequencies for use by Māori, although this was achieved with much struggle and political argument along the way.[18] The WAI 11 Waitangi Tribunal report supported the claim that the Māori language be recognised as a taonga under protection of the principles of Te Tiriti o Waitangi, and broadcasting rights were deemed to be one of the pathways through which to revitalise the declining Māori language. Twenty-one radio stations (frequencies and resources) were set aside and allocated for iwi-based promotion of the language, with the first station, Te Upoko o Te Ika FM 1161, being aired in 1988.[19]

Television

The first substantial screening of Māori content on New Zealand television was a six-part documentary entitled 'Tangata Whenua' in 1974 and, as King describes, 'It gave Māori an opportunity to speak for themselves about their lives.'[20] Later, 'Te Karere' became a regular news segment in 1983 as a result of intensive negotiations and pressures on Television New Zealand. The news channel began as a leader in delivering Māori and indigenous-specific news items as well as national and international news in te reo Māori. Similarly, 'Waka Huia' was established in 1987 and developed as a 'means to preserve the reo and mātauranga Māori of our tribal elders'.[21] Also in 1987, te reo Māori was made an official language of Aotearoa New Zealand, but there was a lot of

concern about whether te reo Māori me ōna tikanga would survive the impacts of urbanisation and Māori moving away from their ancestral dwellings.

A further significant success for Māori media and broadcasting was the establishment of a Māori-owned television service, which again was achieved despite huge resistance from the Crown: 'Māori Television emerges from a long struggle to bring about Crown recognition and acceptance of the principles of the Treaty of Waitangi.'[22] The Māori Television Service was launched in 2004 with the aim of promoting te reo and Māori culture.[23] Representations of Māori people and culture through the broadcasting of the Māori Television Service gave positive and encouraging images and messages of Māori and were uniquely conveyed in both te reo Māori and English. The dual languages ensured that Māori Television's target audience was inclusive of non-te reo Māori speakers. Later, in 2008, the Te Reo Channel was launched where programmes using only te reo Māori content were aired.

Māori Adoption of Internet-based Technology

The Internet became a rapidly adopted technology by Māori for multiple reasons. These reasons included increased access to information and learning opportunities, the ability to create an authentic Māori voice, collaboration with other indigenous communities, language revitalisation and the sharing of specialised knowledge within groups: 'In its beginnings it [the Internet] was seen by many as a technology with great potential for empowerment and self-representation of marginalized groups.'[24] A. Smith and R. Sullivan discuss the positives of the Internet for both Māori and non-Māori whereby specific information could easily be accessed regarding Māori culture.[25] Keegan also points out that the Internet provides a space of whanaungatanga and aroha, where sharing and dissemination of information occurs: 'I believe the single greatest factor in the explosion of the Internet was and is people's ability to share.'[26] Keegan notes that the Internet enables Māori to interact, engage and socialise in another space, thus empowering Māori to maintain ties and relationships and therefore continuing to uphold the value of kanohi ki te kanohi (face-to-face) in virtual spaces.

Pewhairangi comments on the ways in which the Internet has positively promoted Māori culture and values as well as being the medium through which various expressions of art forms have been highlighted through early websites.[27] Further and importantly, she says that the Internet has empowered Māori to

have a voice which they might not have had in mainstream media (such as newspapers, television and radio), and to participate in global indigenous issues.

Māori and Social Networking Sites

Throughout history, new media and communications technologies have provided Māori with alternative tools and methods to undertake cultural practices without the participants necessarily having to be face-to-face. At their own pace and for their own purposes, Māori have adopted, adapted and entrenched the use of these tools. The emergence of social networking sites has seen a similar rapid uptake by Māori.

Research shows that 86 per cent of Māori are using the Internet.[28] With increased access to broadband and fibre optic connections in remote areas, Internet in the home is becoming almost commonplace and mobile (smart) phones continue to extend Internet use.[29] Wifi hotspots across parts of major cities, cafés, eating places, learning institutions and libraries all provide Māori with greater access to the Internet. The Internet has become a useful medium to promote Māori culture and identity and, in some instances, provide spaces for Māori cultural preservation and learning. Social networking sites have taken Internet technology to a more interactive level whereby Māori communities have the ability to connect, engage and communicate in meaningful ways.

Recent research has investigated ways in which Māori are using these spaces, whether for personal, professional, and/or cultural reasons and uses. A range of findings[30] indicates that many different people, groups and institutions including rangatahi (youth), kaumātua, marae, hapū, iwi and members of the Māori diaspora are using these spaces, and contributing to discussion and debate over related issues connected to identity, cultural concepts, tikanga and the marae.

Relationships

Relationships in social networking sites have been discussed as being as important as offline relationships. Many rangatahi pour time and effort into navigating and negotiating their various relationships online in an effort to ensure that they meet the expectations of friends, family, work colleagues and others.[31] In the research, social networking sites are discussed as facilitating whānau connections and communication and, therefore, increasing whānau ties and relationships. Participants spoke of an obligation that often involved the establishment of an online relationship with family members, and regular

contact and interaction, particularly with those who were not regularly seen in person. The strong family connections that rangatahi felt when they used social networking sites strongly relate to whanaungatanga as a value and practice for Māori.

The idea of virtual whanaungatanga[32] conceptualises how notions of whanaungatanga and its underpinning values are practised and applied in social networking sites. Virtual whanaungatanga offers a framework and process made up of values, which enables relationships to be formed, strengthened and maintained in culturally recognisable ways. Relationships are cared for and nurtured through the processes of whanaungatanga and without it the myriad social interactions that constitute community life would suffer. One way of thinking about virtual whanaungatanga is as a stage of the process where maintenance and management occur in preparation for kanohi ki te kanohi engagements. When face-to-face engagements take place, the relationship is intact because it has been maintained and managed through alternate tools and methods, despite time lapse or distance. Such modes of whanaungatanga are discussed as being key to Māori health and wellbeing, particularly for relationships across vast distances.

Identity

Social networking sites aid and assist some Māori users to access more information about their whakapapa, language, performing arts, marae, hapū and iwi, and also about te ao Māori, contributing to their knowledge and articulation of their Māori cultural identity. For Māori who are living away from their tribal areas, social networking sites have become an important tool to connect them to their culture and heritage. There is the potential for Māori who are using social networking sites in this way to use these connections and understandings of their culture to return home in a virtual state of kanohi ki te kanohi, in the same way that physical interactions could be made with marae, hapū and iwi members.[33] Despite some participants in the research commenting that they continue to engage in their marae via social networking sites, there remains a growing concern amongst communities who tend to the marae and who live within the tūrangawaewae that some Māori whānau are leaving their tribal lands and not necessarily returning.

Representations of Rangatahi

Through social networking sites, rangatahi Māori are shaping and moulding online representations of the self, in which they present diverse online

personalities that stand alongside offline versions of themselves. Societal expectations and pressures in the offline world are instantly transferred to the online world (and potentially more so where popular and mainstream media are more readily accessible and visible) in which individuals become obsessed with manufacturing their desirable image. Such online representations of these rangatahi depict romanticised and industrialised versions of the self, which bring to the fore the ideals of beauty, fashion, socio-economic status and wealth that actually distort their lived realities. The online identities of these rangatahi Māori are scrutinised by diverse audiences (families, schools, employers, marketers) where judgements are made, and for some of these young people, such personas have social, ethical and future implications.

Issues of Privacy and Cyber-bullying

O'Carroll suggests that there is a general lack of understanding amongst rangatahi Māori regarding privacy in online social media spaces attached to their online personalities.[34] The majority of participants in her study did not know how to change their privacy settings on Facebook, which raises serious concerns over who can access their personal information and posts, and the possible implications for relationships with family, friends and employers. Furthermore, the fact that many of the rangatahi interviewed had very little idea about their privacy raises concerns for their personal safety and understanding of social practices and etiquette in social networking sites. The implications of their actions and decisions can have undesirable effects on employment, acceptance into educational institutions, family relationships and friendships.

Recent research points to the dangers of cyber-bullying where many rangatahi are being targeted by peers both within their own offline and online communities.

Tikanga

With as many as one in five Māori now living abroad, Māori are faced with rethinking and refining how cultural practices are acted on and maintained. In the context of new technologies, such as social networking sites, these spaces are providing Māori with opportunities to play out some of these practices. Current research suggests that rituals associated with tangihanga are shared on Facebook, including notifications of deaths, details of the tangihanga, as well as images and video of the tūpāpaku.[35] Participants expressly discussed their concern about such media being shared in these spaces and felt some of the shared material was insensitive and disrespectful to grieving families. Kaumātua involved in the research questioned the application of tapu being applied to

virtual spaces and had some concern over how this could be done appropriately and under the guidance of suitable experts and elders on such sites. Furthermore, kaumātua expressed their concern about the potential impact of virtualising tikanga and how this might affect the marae and the frequency with which descendants would return to their marae if customs and rituals of the culture were being accessed only virtually. Participants were concerned this might create a disincentive for descendants to return physically to their marae.

Instances where Skype was used to access tangihanga remotely caused participants to question the idea of whether or not it is possible to connect with the wairua of the deceased via this medium. Mead states that 'tapu is every-where in our world. It is present in people, in places, in buildings, in things, words, and in all tikanga. Tapu is inseparable from man, from our identity as Māori and from our cultural practices.'[36] If this is accurate, could applications of tapu to virtual spaces merely be an extension of cultural practices and articulations of identity?

Diaspora

Those who are part of the Māori diaspora are actively seeking virtual ways to make and maintain strong connections with their homes, despite being physically dislocated. Furthermore, participants are expressing their ahi kā in diverse ways, including financial or skills contributions to the hau kāinga, keeping in communication and updated on events and meetings, and being part of decision-making at hapū and/or marae level. While such virtual asser-tions of ahi kā fulfill some areas of responsibility and participation, for others, kanohi ki te kanohi is irreplaceable and social networking sites cannot facilitate connections that ahi kā requires or to the extent that some people seek (physi-cality and physical presence, in particular).[37]

Te Reo Māori and Technology

In adopting technology Māori have always sought avenues to use this tech-nology in te reo Māori. Previous sections have mentioned media that has printed and broadcast in te reo Māori. Māori language adoption in technology has also been apparent in software.

One of the earliest pieces of software that was written for the Māori language was Te Kete Pūmanawa. This was a suite of software that included a clock (Te Karaka), an interactive story (Te Mahi Hangarau Ahi), an arithmetic

challenge (Te Tatau), a take on the game of hangman (Kei Oho te Taniwha) and a traditional game (Mū Tōrere). It was produced by a company called Reddfish in 1987 and, with support from Te Puni Kōkiri, was sent out free to every Kōhanga Reo, Kura Kaupapa, primary school and secondary school in New Zealand.

In 1986 the Kōhanga Reo National Trust developed its own in-house Māori language training system. The system had two modes: a learning mode where users could hear and review over 150 sentences spoken in Māori, and an authoring mode where users could create their own sentences in Māori that could then be used in the learning mode. The system could operate in a Māori, English or bilingual mode. Twelve complete systems were built and distributed throughout the country, but disappointingly they became obsolete and fell out of use after only three years.[38]

An electronic bulletin board called Te Wahapū was set up in 1990 by Te Wāhanga Kaupapa Māori of the New Zealand Council for Educational Research. Its aim was to allow the exchange of students' writings in Māori; discuss issues relating to Māori education, in particular, the teaching and development of te reo Māori; and provide a database of new and technical Māori vocabulary. What was unique about this system was that all the menu items, system prompts and messages were in te reo Māori. While this system was successful in its original aims and intentions over a ten-year period, it was superseded by web technology.[39]

Toi te Kupu is primarily a database of Māori language teaching and learning resources. As such it is an invaluable resource for both learners and teachers of te reo Māori. It was established in 1995 by Te Pūtahi-a-Toi, the School of Māori Studies at Massey University. The website administrators state its aim is threefold: to catalogue Māori language resources, to assist teachers' and learners' access to these resources, and to provide ideas on how better to use these resources. Significantly, the website interface is available in monolingual Māori, and there is also a bilingual Māori/English option.

In 2001 the Māori Niupepa website was launched. The site was made available by the Computer Science Department at the University of Waikato that digitised the Māori newspaper pages that had been collated and microfilmed by the Alexander Turnbull Library. Not only were the pages digitised but they were converted to readable text files, which meant the 17,000-page primary Māori language content was full-text searchable, making available perhaps the most significant amount of Māori language material through a bilingual interface.

Support for the use of te reo Māori in technology has also been forthcoming from some major international computer companies. Microsoft Windows XP and Microsoft Office 2003 were translated into te reo Māori in 2005. This was a substantial translation task involving over 900,000 words in over 180,000 separate strings (character sequences) in a new, technical and complex genre. The translation work has continued in subsequent versions of MS Windows and MS Office: Windows Vista, Windows 7 and Windows 8, and Office 2008, Office 2011 and Office 2013.

Google has also released translation tools that support te reo Māori. The Google Web Search interface was available in te reo Māori in 2008, the Google Translator Toolkit for te reo Māori was released in 2009 and Google Translate began supporting (being available in) te reo Māori in 2013.

While the motives for te reo Māori support from these large international companies may appear extrinsic, the reality is that very little revenue and very little recognition is gained by them. What is apparent, though, is that te reo Māori has the potential to be operated and used in these modern software environments.

There is the ability in Aotearoa to use Automated Teller Machines (ATMs) in te reo Māori. The Bank of New Zealand first made available multilingual interfaces, including te reo Māori, on their ATMs in 2007. Historical statistical data on language usage shows that the ATMS are used primarily in English (96 per cent) followed by German and Chinese, with usage in Māori being less than 1 per cent. In 2014 the Aotearoa Credit Union also launched a Māori language ATM in Kirikiriroa (Hamilton), stating incorrectly at the time that it was the first in Aotearoa.

The company, Two Degrees, launched a smartphone in 2011 that had a Māori language interface. However, no data are available about how many of these were sold or are still being used in te reo Māori.

Aside from technology in te reo Māori, technology is also being used to teach te reo Māori. There are a number of websites that offer lessons in te reo Māori including Māorilanguage.net, tokureo.maori.nz and tewhanake.maori.nz. Many tertiary institutions that teach te reo Māori offer an online version of their courses. Some use Moodle as their learning management system: Moodle is available with a te reo Māori interface. Māori language courses are now available as apps for tablets and smartphones. Some of the more prominent ones are Kura (for advanced speakers), Puna (for beginners), Te Pūmanawa, Te Whanake, Aki and Hika. Through these examples, it is easy to see how te reo Māori can and is operating in new technological environments.

Conclusion

This chapter has shown, through both historical Māori and modern Māori examples, the innovativeness and rapidity with which Māori have created and adopted new technologies.

The adoption of media by Māori and the ease of its integration into their lives have empowered Māori to exercise, practise and promote their culture. Much of what has been kept from historical accounts of early Māori literacy has provided a plethora of rich material for iwi and hapū schools of knowledge.[40] Similarly, the Māori newspapers gave Māori an alternative way of communicating and debating issues of the time that were often centred on politics and the state of society.[41] Radio and television became viable options for Māori to revitalise and increase the normalisation of te reo Māori, which were achieved through fighting the Crown to honour the principles of te Tiriti o Waitangi. Māori Television's success as an indigenous and Māori broadcaster was a huge step forward for Māori which came at the end of a lengthy and taxing battle against the Crown to recognise Treaty rights and the Māori language as a taonga to protect.

Various technologies, based on sound scientific knowledge, have been applied in new environments for the benefit of Māori. Not only have Māori thought within the square, but many of the innovations have occurred in new and previously unthought-of situations. In te ao hurihuri (the changing world) it is clear that Māori are unafraid to advance new sciences and apply new methodologies in new environments. But how will this rapid adoption of new technologies change Māori as Māori? A response can be postulated in terms of tikanga and te reo.

First, how will the adoption of new technologies shape Māori tikanga? There is concern over the future of the marae and the roles of kaumātua. If tikanga and ahi kā are being practised and maintained away from the marae, the pull to return home to one's marae is not as strong. Balancing social networking sites and kanohi ki te kanohi is the challenge for Māori to ensure they remain connected to one another while upholding the integrity and potency of the culture and its values and practices.

The importance of broadening this idea that kanohi ki te kanohi can be both physical and virtual is a new concept that links well with Keegan's position mentioned earlier in relation to kanohi ki te kanohi being facilitated and nurtured through the Internet.[42] Broadening kanohi ki te kanohi as a values-based practice to include virtual forms could be more inclusive of Māori

living away from their ancestral lands, allowing them to continue to maintain meaningful connections to their hau kāinga. Without these connections, Māori may become removed from their culture and heritage. Equally important is the life and sustainability of the marae as a traditional space for practising Māori culture. The future of the marae can become of significant concern if we as Māori do not consider the challenges and opportunities of virtualising aspects of our culture.

Second, how will the adoption of new technologies shape te reo Māori? At the present time the impact has been minimal because we are yet to see a full adoption of te reo Māori in modern technology. The examples listed earlier have shown that te reo Māori can be and, in the past, has been used as a medium of communication across a wide variety of technologies. But it is not the norm. How many speakers of te reo Māori are using web bilingual interfaces primarily in te reo Māori? How many Māori medium schools have their computer laboratories displaying Microsoft Word in te reo Māori? How many te reo Māori-speaking children are texting or using Facebook in te reo Māori? How many te reo Māori-speaking adults are using library kiosks or Bank of New Zealand ATMs in te reo Māori? Early evidence suggests these numbers are low,[43] which may be attributed to a lack of awareness and unfamiliarity with new words. But as such usages begin to change, and te reo Māori becomes more and more normalised in new technologies, then inevitably te reo Māori will change. It must do so to survive. All living languages change as the people using those languages seek new terminologies and phrases to capture the changing world they exist in. So too will it be for te reo Māori.