Theme 2.

Iwi, institutes, societies & community led initiatives

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General introduction

With the rapid evolution, innovation and incredible growth of ICT, the avenues to exchange, access, manage, create, disseminate, display and research Indigenous data and Mātauranga Māori have increased at astounding rates. This generation, often referred to as 'digital natives', 'homo zappiëns', 'Net generation', 'millennials', 'i-generation' (see, for example Akçayır, Dündar, & Akçayır, 2016; Kirschner & De Bruyckere, 2017; Prensky, 2001; Yong & Gates, 2014), have been raised, immersed and exposed to a myriad of digital technologies, video games, computers, digital music players and cellular phones during their brief lifetimes. Technologies have dramatically transformed how each generation access, communicate, share knowledge, distribute and view information. Social networks like Facebook, YouTube, Instagram, Twitter, Reddit, Pinterest, Tumblr and social networking apps such as Messenger, WhatsApp, WeChat, QQ Chat, QZone, Viber, LINE, and Snapchat, with billons of active users per month, are as familiar to this generation as was the radio, television and landline telephones to the Baby Boomers who grew up with pre-cellphone mobile technology.

During this decade, "the amount of digital information created and replicated in the world will grow to an almost inconceivable 35 trillion gigabytes as all major forms of media – voice, TV, radio, print – complete the journey from analog to digital" (Gantz & Reinsel, 2010, ¶1). A paper on forecasting global IP traffic suggests that by 2012 the annual global IP traffic would reach at least 3.3 Zettabyte, an astounding 127- fold increase from 2005 (CISCO, 2017, ¶1). Current estimates from The World Bank on ICT access and use suggest that there are:

> more than 7.3 billion mobile-cellular subscriptions worldwide ... 3.5 billion people [are] using the Internet, of which 2.5 billion were from developing countries. Mobile-broadband subscriptions have risen constantly to reach 3.6 billion, while the number of fixed-broadband subscriptions reached more than 884 million during the same period. (The World Bank, 2017, p. v)

In an Aotearoa context, the World Bank estimated that out of every 100 people there were 121.8 mobile-cellular telephone subscriptions; 40.2 had fixed-telephone subscriptions; and 31.5 fixed-broadband subscriptions. 82.3% of households had a computer with 82.8% of households having Internet access at home (The World Bank, 2017, p. 159). All of these figures highlight the scope and impact of ICT and digital technologies into our daily lives.

In the past 20 years many iwi, institutes, societies, communities and language

activists have sought out digital technology as a pathway to linguistic, cultural, social revitalisation and economic sustainability. Numerous individuals, hapū, iwi, academic institutes, innovators, communities, industry leaders, computer scientists, programmers, historians, geographers, translators, linguists, te reo experts and tohunga have engaged in and lead the creation of software, web resources and Māori content as another mechanism to connect Māori to their reo, whakapapa, whānau, culture and identity. A number of these key developments for te reo Māori and Māori content in ICT were outlined by Keegan and Cunliffe (2014, pp. 388-391). These highlights include:

- 1993 – the Computer Science Department at the University of Waikato teach a computer science paper 'Ngā Tautono Rorohiko' in te reo Māori. Many of the computer terms developed in this paper later form the basis of many te reo Māori interface translations.
- 1995 – Greg Ford of Reddfish produces 'Te Kete Pūmanawa', the first interface produced that is solely in te reo Māori comprising four tools (a system clock that displayed dates in te reo Māori, an interactive story called 'Te Mahi Hangarau Ahi', a counting exercise called 'Te Tatau' and a board game called 'Mū Tōrere').
- 1998 – 'Te Reo Tupu', a comprehensive Māori-English-Māori CD-ROM dictionary is released by Wordstream. It enabled full-text searching of the Williams, Ngata and Te Matatiki dictionaries.
- 1998 – 'Toi Te Kupu', a database of published Māori-language teaching and learning materials is released online by Te Pūtahi-a-Toi, the School of Māori Studies at Massey University.
- 2000 – 'Niupepa: Māori Newspapers collection' of 17,000 pages of Māori content is released by the Computer Science Department at the University of Waikato.
- 2003 – Microsoft release a keyboard definition to type macron characters without having to resort to non-standard fonts.
- 2004-2011 – Learning Management System (LMS) Moodle is translated to te reo Māori by the Waikato Institute of Technology in 2004 and further revised editions are done by the University of Waikato in 2006 and 2011.
- 2004 – PLACE LMS is translated by the University of Waikato.
- 2005 – eWānanga LMS is translated into te reo Māori by Te Whare Wānanga o Awanuiārangi.
- 2005 – Microsoft fund te reo Māori translation of Windows XP and Office2003.
- 2008 – Google Web Search interface is made available in te reo Māori.
- 2009 – Microsoft fund te reo Māori translation of Windows Vista and Office2007.
- 2009 – Google translator toolkit is made available for translators of te reo Māori.
- 2011 – Microsoft fund te reo Māori translation of Windows 7 and Office2010.
- 2013 – Microsoft fund te reo Māori translation of Windows 8 and regional language support for mobile phones running Windows 8.

To this list we can add other language resources such as the 'He Pātaka Kupu' mono-lingual dictionary, Ngata's English-Māori dictionary, 'Te Wakareo' (the online version of 'Te Reo Tupu'), and 'He Pātaka Kupu Ture / Legal Māori Archive' from The Legal Māori Archive New Zealand Electronic Text Centre (see www.nzetc.org). In the research paradigm we have projects like 'Te Ataakura' the digital repatriation, revalidation and reclamation of taonga held overseas back to Te Aitanga a Hauiti (Lythberg, Hogsden, & Ngata, 2017; Ngata, Ngata-Gibson, & Salmond, 2012), Te Papa's digital databases of approximately 16,000 Māori treasures held in overseas museums, art galleries and allied institutions (Hakiwai, 2012), and the 'Donald McLean letters' (Colquhoun, Jones, & Young, 2008-2009), leading the way in reconnecting Māori to a broad genre of mātauranga, taonga and history.

A quick glance of the scope and nature of projects funded through the Puni Kōkiri's and the Ministry of Business, Innovation and Employment's contestable 'Ka Hao: Māori Digital Technology Development Fund', we can see a plethora of amazing ICT initiatives for rangatahi, whānau and communities. Here is a $30 million Government initiative spread over six years, up to 2021, that has been established to support Māori economic development, participation in the ICT sector, and access to te reo Māori content and culture through ICT (Te Puni Kōkiri, 2017). These include projects on:

- Digital apprenticeships (Ariki Creative);
- Coding book camps (Online Education Ltd t/a Code Avengers);
- Gaming ecosystems and STEM related programmes (Digital Natives Academy);
- Digital cartoon content in te reo Māori (Nige, Dreamweaver. Ltd);
- Academic scholarships for web developers and entrepreneurs (Enspiral Academy Ltd);
- Māori Internet of Things using Weightless (First Tree Growing Ltd);
- An iOS focused app development accelerator programme (Kia Ata Mai Educational Trust);
- Parent and child technology workshops (Kidscoin Ltd);
- Development of a multi-platform action-adventure stealth video game (Koi Digital Ltd);
- Development of Tākaro an online gaming experience to teach rangatahi spatial awareness skills and strategies to build confidence in STEM (Metia Interactive Ltd);
- Establishment of an ICT Computer Club in Wairoa and Napier (Ngāti Pahauwera Development Trust);
- Facilitation of a young animators workshops for rangatahi in 12 rural schools (Nikora Ngaropo Motion & Design Ltd);
- STEAM workshops and resources for rangatahi and tamariki (Pam Fergusson Charitable Trust t/a OMGTech!);
- 3D scanning and point cloud visualisations of taonga tūturu and marae/wharenui of iwi and hapū throughout the country (PointCloud Visualisation Ltd);
- Trialling of the University of California's C-Stem programme in five South

Auckland primary and secondary schools (Smart Fish Partnership);

- The development of speech recognition and natural language processing of te reo Māori (Te Reo Irirangi O Te Hiku O Te Ika);
- The creation of a human-centred Internet of Things for asset management (Tuia Group Ltd);
- Development of visualisations and analyses of cultural and environmental data relating to freshwater quality (Waiora Pacific Ltd);
- Establishment of a Digital Natives Academy in Ōpōtiki (Whakatōhea Māori Trust Board); and
- The building of whare sensors that measure temperature and humidity (Whare Hauora).

Geographic Information Systems (GIS) have largely been used as a tool to 'map' Indigenous lands and territories for settlement, occupation, survey and ownership. To this end it has been utilised as part of the colonial project. Early cartographic maps were "tools were indispensable for the sea passage itself and for any colonizing that was to follow" (Probasco, 2014, p. 245). Cadastral boundaries are still utilised to demarcate and allocate land use, rules and policies that continue to impact Māori relationships to place and involvement in decision making (Simmonds, Kukutai & Ryks, 2016).

Calls to decolonise GIS, cartography and geography have been sustained over many decades. In 1987 Evelyn Stokes put Māori geographies on the map, calling for geography to open its borders and consider Māori relationships to place and space (Stokes 1987). Indigenous and Māori geographers, cartographers, planners and GIS practitioners have taken up this call and are engaged in critical and diverse projects that serve to resist colonial representations of Indigenous places (see the recent publication *Kanaka Hawai'i Cartography - Hula, Navigation, and Oratory* by Renee Pualani Louis (2017) as a particularly powerful example).

Further, Indigenous peoples have been 'mapping' their lands and landscapes in diverse and nuanced ways for generations. Johnson (2012, p. 1) argue that "Our landscapes are the storied histories, cosmogonies, philosophies and sciences of those Indigenous knowledges". The chapters in this section demonstrate the old and new ways that GIS technologies are being utilised to both resist and reclaim 'mapping' that position Indigenous representations of place and space at the centre. There is a political imperative in doing so, "tangata whenua are here to stay and have intergenerational responsibilities as mana whenua and kaitiaki" (Simmonds et.al., 2016, p.104) the use of spatial technologies, when utilised in a critical way and keeping tikanga and mātauranga at the fore, can provide important mechanisms to protecting, maintaining and sustaining these relationships to place.

In the 10 chapters that follow, we bring together a broad group of innovators, scholars, industry and technology leaders who share a passion for ICT. The authors in this section share a range of personal experiences, as well as technical and cultural challenges

they encountered during their ICT journey.

The first paper (*"He Matapihi ki te Mana Raraunga" - Conceptualising Big Data through a Māori lens*) by Māui Hudson, Tiriana Anderson, Te Kuru Dewes, Pou Temara, Hēmi Whaanga and Tom Roa conceptualises Big Data through a Māori cultural lens. This area of growing significance and concern for many iwi, institutes, societies, communities, hapū and whānau, encapsulates the growing discourse on Indigenous Data Sovereignty, digital ethics, cultural and intellectual property rights, as well as issues of the governance, assessment, use and management of Indigenous data. This paper presents 'Te Mana o te Raraunga Framework', a framework that incorporates core Māori concepts to assess data, its use, and potential users of the data.

The second paper (*He mahi māreikura: Reflections on the digitising the Pei Jones' collection*) by Hēmi Whaanga is a personal reflection on the digital journey of the works and collected taonga of one of Māoridom's prominent scholars, the late Dr. Pei Te Hurinui Jones. It discusses the ongoing transformation of this collection from its current physical location to its digital manifestation.

The third paper (*Māori domains*) by Karaitiana Taiuru discusses how Māori domains have not only created a mechanism for Māori representation on the Internet, but also as a catalyst for other Indigenous Peoples to ensure representation in their countries. He notes that it was the work of a small group of passionate Māori individuals from the Internet community who were responsible for this significant change to occur in Aotearoa.

This paper is followed by *FamilySearch: Māori, Mormon & whakapapa* a paper by Michael W. Taiapa. In this compelling paper on whakapapa, Michael describes FamilySearch (FS), a whakapapa programme developed by the LDS Church, and some of the current issues associated with the current framework for general users and its impact on Māori members of the LDS Church.

Following are four papers on mapping and Indigenous mapping. The first by O. Ripeka Mercier, Bruce McFadgen and Arama Rata (*Keep teaching this! Engaging Māori Studies students with digital cultural mapping tools*), outlines a Te Kawa a Māui Atlas project at the Victoria University of Wellington to incorporate mapping assignments and activities into their Māori Studies courses. Here an overview of the project is provided, alongside student responses and the variety of mapping strategies and software that students have used in their courses. The second paper from Victoria University of Wellington by Vini Olsen-Reeder (*Mapping linguistic landscapes: Where geo-tagging meets geo-linguistics*), describes linguistic landscaping and its relevance to their Indigenous Language Planning and Policy paper. An intriguing account shows the potential for geo-tagging tools and cultural mapping tools to aid in language reclamation and revitalisation. There follows a paper by Hauiti Hakopa, Anne-Marie Jackson, Ngahuia Mita and Chelsea Cunningham on the *Te Koronga: Mapping case studies.* Three mapping case studies are presented in this paper. The first case study, by Dr Hauiti Hakopa, details his research and practice as a surveyor working for his iwi of Ngāti Tūwharetoa. The second by Chelsea Cunningham discusses the research she undertook as a Ngā Pae summer intern, which she later used

as a pre-cursor to her doctoral studies with her whānau of Ngāti Kahungunu. The third case study is drawn from Dr Anne-Marie Jackson who led the National Science Challenge Sustainable Seas research, in collaboration with Ms Ngahuia Mita and Dr Hauiti Hakopa, focussing on one example of how to utilise mapping for engaging in Mātauranga. The final paper on mapping is by Moka Apiti on *The Indigenous Mapping Waananga 2017*, held in Hamilton from 15-18 May. This paper describes an initiative that sought to engage iwi and Indigenous communities with GIS and 'new' state of the art geospatial tools through the form of wānanga.

The final two papers in this section are on Māori astronomy by Liliana Clarke and Pauline Harris (*Maramataka*), and Pauline Harris (*Portable planetariums in the teaching of Māori astronomy*). The first paper describes how technology has enabled an enhanced experience within the maramataka research and education space. This chapter outlines the various digital technologies including GIS, Google Maps API, Heliacal Star Rising and Moon Phase Calculator and Stellarium that have been used to research the maramataka. The second paper highlights the work of the Society for Māori Astronomy Research and Traditions (SMART) who is at the forefront of revitalising Māori astronomical knowledge. In this paper Harris discusses some of the technology, avenues and projects that SMART have used to transfer this knowledge back to our communities.

Conclusion

This brief introduction has highlighted the scope and power of ICT for Māori. However, it must be noted that ICT not only has the power to make changes in Māori communities it also has the power to reinforce social disparities as Māori continue to be overly represented in the 'digital divide'. Māori continue to suffer from a lack of internet access in their homes, make-up less than 2.5% of the ICT workforce, are more likely to be employed in the lower skilled ICT occupations, and are underrepresent in training for computer-related subjects (less than 1% of Māori are studying towards an ICT qualification) (Figuracion & MBIE, 2015; Sylvester, Toland & Parore, 2017; Whaanga & Wehi, 2015). The ongoing challenges of representation of Indigenous peoples through new ICT platforms remain as they are still operating within ongoing colonial contexts. Therefore issues of power, control, definition and representation remain pertinent to ensuring new technologies do not perpetuate marginalising discourses. Notwithstanding these challenges, the opportunities for this technologically savvy generation to lead and engage in the development of future technologies like machine learning, deep learning and artificial intelligence, edge computing and shared and mixed reality environments, to inform, enhance, reclaim and revitalise linguistic, cultural, social and economic futures is enormous. It would be advisable for these future leaders to draw from the personal experiences and ICT journeys shared by each of the contributors of the following chapters, many of whom are the ICT innovators, scholars, industry and technology leaders of this generation. In this way, the traditional tuakana/teina relationship is sure to be maintained for future generations.

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