He Matapihi Mā Mua, Mō Muri: The Ethics, Processes, and Procedures Associated with the Digitization of Indigenous Knowledge—The Pei Jones Collection

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The digital era has transformed how people live their lives and interact with the world and knowledge systems around them. In Aotearoa/New Zealand a range of initiatives incorporating Indigenous knowledge have been implemented to collect, catalog, maintain, and organize digital objects. In this article, we report on the ethics, processes, and procedures associated with the digitization of the manuscripts, works, and collected taonga (treasures) of the late Dr. Pei Te Hurinui Jones—and describe how it was transformed into a digital library. It discusses the decision-making processes

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and the various roles and responsibilities of the researchers, family members, and institute in this process.

KEYWORDS tikanga (cultural protocols), digital libraries, spatial hypermedia, Indigenous knowledge, ethics, processes and procedures

INTRODUCTION

With the convergence of archival and digital material in recent years,[1] ethical issues regarding access, display, cultural rights and ownership, custodial practices, and consultation, poses a critical challenge for individuals and organizations interested in developing and displaying Indigenous knowledge in a digital context.[2] Indigenous peoples have also realized that protection of their own traditional knowledge depends on their own efforts which "has triggered an ongoing international debate that the United Nations, through the World Intellectual Property Organization (WIPO) is spearheading but is also rife in the World Trade Organization (WTO) and the Convention on Biological Diversity (CBD)."[3] This has resulted in a proliferation of Indigenous knowledge being stored by, and disseminated through libraries, museums, archives, and herbariums.[4] In recognizing the potential of assisting with the preservation and access to Indigenous knowledge, the International Federation of Library Associations and Institutions (IFLA) released a 'Statement on Indigenous Traditional Knowledge' that acknowledges "the intrinsic value and importance of Indigenous traditional knowledge and local community knowledge, and the need to consider it holistically in spite of contested conceptual definitions and uses." IFLA also recognizes that "the character of Indigenous traditional knowledge does not lend itself to print, electronic or audiovisual means of recording but, in order to ensure its continuing preservation, access and elaboration," recommends that libraries and archives:[5]

1. Implement programs to collect, preserve and disseminate Indigenous and local traditional knowledge resources.
2. Make available and promote information resources which support research and learning about Indigenous and local traditional knowledge, its importance and use in modern society.
3. Publicize the value, contribution, and importance of Indigenous and local traditional knowledge to both non-Indigenous and Indigenous peoples.
4. Involve Elders and communities in the production of resources and teaching children to understand and appreciate the traditional knowledge background and sense identity that is associated with Indigenous knowledge systems.

5. Urge governments to ensure the exemption from value added taxes of books and other recording media on Indigenous and local traditional knowledge.
6. Encourage the recognition of principles of intellectual property to ensure the proper protection and use of Indigenous traditional knowledge and products derived from it.

Maina notes that a real challenge for Library and Information Science (LIS) lies in the fact that "the oral nature of traditional knowledge is challenging to libraries' key practice of collecting the material that they house. The dominant LIS information management model, which is based on acquiring, organizing and preserving recorded knowledge that is mainly generated by researchers and universities, excludes traditional knowledge that is not formerly codified and is acquired not through research but through, inter alia, inspiration and life experiences."[6] Moreover, he argues that "by using favorable reviews and indexes, libraries use more of the same acquisition tools and, thus, creating a closed system that not only limits the information that is available to library collections developers, but also tends to limit the acquisition of traditional knowledge because most of these tools do not cover Indigenous topics and scholarship. The resultant collections, which shape the research patterns and options for future research, also misrepresent Indigenous Peoples and their histories."[7]

In Aotearoa/New Zealand, the management, conservation, care, and display of *taonga* (treasures and sacred objects), *Mātauranga Māori*, and information in institutions, libraries, archives, and museums has traditionally been associated with the process of colonization.[8] Whaanga and Hedley note, "[t]aonga Māori held by international and national museums, galleries and libraries have been displayed, viewed and appreciated by many for generations ... [but] their cultural and spiritual significance have been largely ignored or, at best, under-valued."[9] This checkered history has left a legacy of disenfranchisement, marginalization, and disempowerment for Māori when negotiating the management and dissemination of information and knowledge and the care and control of their *taonga* in these traditional Western institutions.[10]

An important aspect of the control of resources which remain in public institutions is "the negotiation of arrangements that enable effective participation by Indigenous peoples in ... governance, management and professional practice."[11] As a result, many organizations and *iwi* (tribes) have sought out digital technology to establish, control, manage and disseminate their information and knowledge in non-traditional formats.[12] These initiatives include, for example, geographic information systems to enhance Land Information New Zealand data that support existing Māori land management,[13] the digital repatriation of *taonga* using 3D technology as part of the revalidation and reclaiming of *taonga* that were collected and exchanged during

European voyages to Polynesia,[14] the creation of digital databases of the more than 16,000 taonga held in overseas museums, art galleries and allied institutions,[15] and *iwi* developed digital archives such as "Pūtē Routiriata—The Taranaki Māori Digital Archive" in Taranaki[16] and the Hauraki Digital library in the Hauraki plains area.[17]

In developing a digital library to house the manuscripts, works, and collected *taonga* of the late Pei Jones, a small research team from the University of Waikato, in collaboration with *whānau* (family) members and an advisory group consisting of key stakeholders, applied *tikanga* (cultural protocols) as a guiding principle during the archiving, cataloging, and development of both the physical and digital layouts. In order to provide a background to the *tikanga* and the various processes that were applied at different stages of the digitization project, a brief biographical sketch of Pei Jones and the Pei Jones' collection is provided. There follows a discussion of the various roles and responsibilities of the researchers, *whānau* members and institute, and the types of technological developments that were trialed and implemented as part of this process.

DR. PEI TE HURINUI JONES (JP, DHons, OBE) (1898–1976)

Pei Te Hurinui Jones (see Figure 1) was a notable Ngāti Maniapoto leader, adviser, interpreter, land officer, scholar, writer, translator, genealogist, spokesman for the Kīngitanga (Māori King movement), adviser to King Korokī, and his successor, Te Arikinui Te Atairangikaahu. Born on September 9, 1898 at Harataunga (Kennedys Bay) on the Coromandel Peninsula, Pei was the son of Daniel Lewis, a European storekeeper, and Paretekorae Poutama of Ngāti Maniapoto. Pei was adopted by his mother's grand-uncle, Te Hurinui Te Wano, after his father left New Zealand to serve in the Boer War. Paretekorae then married David Jones and her children took their stepfather's name.[18]

Pei Jones was a respected leader in the revival and retention of the Māori language, cultural knowledge and heritage in the twentieth century. Pei's primary interest and passion was in the recording of Tainui genealogies and tradition, an interest that began in his youth. Pei occupied many pivotal roles during his extremely busy life. He was the first chairman of the Tainui Māori Trust Board (a nominee by Korokī), the President of the New Zealand Māori Council in 1970, the Chairman of the Māori Dictionary Revision Committee for the 7th Edition of Williams' Māori Dictionary, a member of the New Zealand Geographic Board, a member of the Maniapoto District Māori Council, and a member of the Taumarunui Borough Council. He also played leading roles at young Māori leaders' conferences and was awarded an OBE in 1961. In 1968, he was awarded an Honorary Doctorate in Literature from

FIGURE 1 Pei Te Hurinui Jones.

the University of Waikato in recognition of his outstanding contribution to New Zealand literature.[19]

Pei Jones was a prolific writer and skilled translator in Māori and English. He edited and translated into English three volumes of *Ngā Mōteatea*,[20] a definitive collection of traditional Māori song. He translated three of Shakespeare's plays (*Huria Hiha* [Julius Caesar], *Owhiro* [Othello], and *Tangata Whai Rawa o Weniti* [The Merchant of Venice]) into Māori as well as Edward Fitzgerald's Rubaiyat of Omar Khayyam.[21] His own writings include King Pōtatau,[22] an account of the life of the first Māori King (King Pōtatau Te Wherowhero), biographical pieces on Mahinarangi[23] and on the poetess Puhiwahine;[24] *Ngā Iwi o Tainui*, a Māori-language version of the history of the Tainui tribes, published posthumously in 1995, consists of 67 chapters of the history, genealogies, songs and chants of the Tainui people;[25] *He Tuhi Marei-kura*, an account of the creation based on priestly lore of the Tainui people,[26] were the outcome of many years of research on Tainui tradition, genealogies and customs. Pei also contributed numerous articles and reviews on a range of topics to *Te Ao Hou*,[27] a bilingual quarterly published by the

Māori Affairs Department from 1952–1976, the *Journal of the Polynesian Society,*[28] various symposia,[29] societies[30] and other publications,[31] in addition to writing many booklets to commemorate the opening of meeting houses in the Tainui and Ngāti Tūwharetoa areas.

Pei Te Hurinui Jones married twice. His first wife was a widow, Hepina Te Miha (formerly Teri) from Ngāti Tūwharetoa, whom he married on October 16, 1943 at Hawera. They had no offspring of their own but legally adopted two genetically related sons, Robert Te Au and Brian Hauāuru Jones, and brought up four others from their extended family. Hepina died in 1956, and in 1958 Pei married a divorcee, Kate Huia Apatari (formerly Rangiheuea) at Palmerston North. She had children from a previous marriage. Pei died at Taumarunui on May 7, 1976, survived by his wife. He is buried beside Te Hurinui Te Wano in the cemetery at Te Tokanga-nui-a-noho marae in Te Kuiti.

THE PEI TE HURINUI JONES' COLLECTIONS: ESTABLISHING *TIKANGA*

During his lifetime, Pei Jones had amassed a significant collection of books, manuscripts, and taonga. There are at current estimates approximately 30–40,000 pages of written material in English and *te reo Māori* (the Māori language), numerous *whakapapa* (genealogy) scrolls, ear pendants that were worn by King Pōtatau Te Wherowhero, King Tāwhiao, Te Heuheu Patatai, and Te Rauparaha, watches and medals, assorted weaponry including a *patu onewa* (stone club), two whale bone *kotiate* (a short weapon with a notch on both edges of the flat blade), and a *taiaha* (a long weapon of hard wood with one end carved), various cloaks including *kākahu*, *karure*, *korowai* and hundreds of books, photos, and maps.

Following his death in 1976, the collection was split into two parts, with about one-third of the collection remaining with his wife Kate Huia Apatari and her family. The remaining two-thirds went to Brian Hauāuru Jones, Pei's son from his marriage to Hepina Te Miha. In 1994, Mr. and Mrs. Carpenter (Pei's stepdaughter from his second wife Kate Huia Apatari), from Plumpton in Australia, transferred to the Alexander Turnbull Library in Wellington the materials that had been in the possession of Pei's second wife, Kate Huia Apatari, and her family. This collection included 142 folders of holographs, manuscripts, typescripts, printed matter, tape recordings, maps, photographs, plans for the Pūkawa Meeting house, a painting of a cottage by Katie Roore, and various newspaper collections.[32]

In 1990, Brian Hauāuru Jones decided to deposit his father's manuscripts with the University of Waikato Library "in the light of the close relationship that his father, the Jones family and the University of Waikato had established

over the years."[33] This collection included 64 boxes of material, which were archived by Salim Baksh, a qualified archivist who was employed by the University of Waikato Library to carry out the work on a short-term contract.[34] Later, in 2002, Brian Jones initiated discussions with the School of Māori and Pacific Development (SMPD) at the University of Waikato to deposit the remainder of his father's collection (including books, photographs, *kākahu*, and other *taonga*) with the University Waikato. A number of *hui* (meetings) were "set-up to discuss the request and to consider the ethical, cultural and financial implications including access to the collection by family members, loaning procedures for specific items, intellectual property rights, copyright, publication issues, access to the collection by other universities and scholars and care and maintenance of the collection once it had been archived."[35]

Once agreement from all parties was established, a small group traveled to Brian Jones' residence in Taupo in 2003 to collect the remaining books, photographs, *kākahu*, and *taonga*. A room on the third floor of *Te Kohikohinga o Aotearoa* (the New Zealand Collection) was selected as an appropriate location to house the collection and a contractual arrangement was developed which was informed by the specific issues identified during the initial discussions. Five general areas were identified and incorporated into the *Whakaaetanga ā- pukapuka mō Te Tiaki i te Takoha o te whakahiatotanga a Pei Te Hurinui* (Deed of Custodial Gift Pei Te Hurinui Collection):[36]

- *Te Takoha me te whakaaetanga* (Gift and Acceptance)
- *Te Tiakitanga* (Custody)
- *Ko te Whai Wāhi Atu* (Access)
- *Tiaki (Care)*
- *Inihua* (Insurance)

Legal advice and input on various issues was sought in the development of the contract. Of importance to the entire collection is the concept of *te takoha* (gift giving). During negotiations Tom Roa, a senior academic from SMPD and a highly respected local elder, elaborated on various interpretations of exchange from a Māori perspective, which he described in term of five general types of exchange:[37]

Koha—where a gift or object is freely given and at some stage a reciprocal exchange of similar formality may occur;

Takoha—where a gift or object is freely given or an immaterial contribution is made. The reciprocity may not be as formal as with koha;

Tuku—where an object is given and no reciprocal exchange is expected;

Riro—where an object is acquired or obtained;

Hoko—where an object is exchanged, bartered, bought or sold.

Following lengthy negotiations, an agreement was reached that the definition of *te takoha* fully encompassed the nature of the gift. Issues relating to *Te Tiakitanga* (Custody) were also addressed and ownership of the material remained with the donor, Brian Hauāuru Jones. *Tiaki* (Care) stipulates that the Library will apply appropriate archival theory and practice to the Collection and *Inihua* (Insurance) ensures that University agrees to provide appropriate and reasonable insurance for the Collection.

ARCHIVING, CATALOGING, PHYSICAL LAYOUT AND CONSERVATION: DEVELOPING *TIKANGA*

There are numerous ways in which one can approach the archiving, cataloging, physical layout, and conservation of a collection of the type discussed here. The majority of collections held in libraries and museums are dispersed to allocated areas according to subject headings or cataloging standards established by each institution. These systems are based on Western organization principles and are biased toward Western classification of knowledge.[38] As such, systems such as the Dewey Decimal Classification, *Library of Congress Subject Headings*, the British Catalogue of Music Classification, and the National Library of Medicine (NLM) Classification for medicine, lack the "concepts and subject terms that are particular to Indigenous cultures, languages, and knowledge and that consider an Indigenous worldview and epistemology," which "results in either misrepresentation or lack of representation of alternative knowledge systems and worldviews and consequently, lack of access to alternative knowledge."[39] In discussing the ethics, values, and morality in contemporary library classifications, Mai notes that "to move the foundation of classification work from its prior absolutistic and essentialistic conceptual bases, it was argued that the ontic and epistemic foundation of classification should be found in relativistic and pragmatic philosophies. It [is] now time to take that project one step further and ground libraries and library classification in sound moral philosophies to create just, fair and good libraries and library classifications."[40]

To address the predominant standard of Western classification, the Library & Information Association of New Zealand Aotearoa (LIANZA) has developed *Ngā Ūpoko Tukutuku*/Māori Subject Headings.[41] Ngā Ūpoko Tukutuku is a "thesaurus of searchable subject headings in te reo Māori that is designed to improve access to taonga in libraries and archival repositories. Originally developed to help catalogers and descriptive archivists [to] describe Māori materials, Ngā Ūpoko Tukutuku has been especially created to link students, researchers and communities to taonga using Māori concepts familiar to them."[42] Nicolas, in considering the way Indigenous people

and resources are treated in libraries, argues that although the treatment of Indigenous peoples and resources are improving, there are still a range of issues that need addressing, noting that in the context of the National Library of New Zealand:[43]

> services are offered to Māori persons: you can be informed in the Māori language, specific information on Māori collections is available, the spiritual value of some documents is acknowledged, traditional rituals can take place, partnerships between the libraries and Māori groups are established. As far as collections are concerned, Māori resources benefit from a kind of affirmative action, Indigenous heritage is digitized, attention and funds are devoted to Indigenous resources, and not only to resources about the Māori ... However, there is one aspect of libraries that is much less efficient and innovating from the Indigenous point of view: the catalogs. Admittedly, the highly needed Māori Subject Headings are in preparation. Alas, you would hardly find another example. Today, if you search several versions of the Māori creation myth, you will retrieve some noise (Christian proselytizing and tales for western children) and much silence. Even in New Zealand, catalogs are very ignorant of Indigenous resources, particularly of oral tradition resources, essential to Indigenous culture. And yet, these Indigenous resources exist actually in libraries. But our cataloging rules and tools have not been designed in a way to give them any bibliographic existence. So, how to reform our bibliographic habits and principles so that Indigenous resources and hence, Indigenous patrons, are better treated?

In approaching the archiving, cataloging, physical layout, and conservation of the Pei Jones collection, *tikanga Māori* was applied as an appropriate ethical and procedural practice in relation to the Pei Jones collection. To encapsulate this holistic approach, we "began with Pei te Hurinui Jones himself in order to ensure that his mana (authority, control, influence, prestige and power) is acknowledged and that his work and work habits are fully recognized."[44] We strongly felt that:

> Because the history of appropriation, exchange, purchase and gifting of Māori cultural heritage is fraught with issues associated with access and past grievances . . . it was important to draw on a range of sources in determining appropriate ethical and procedural practices in relation to the Pei te Hurinui Jones collection. These included the experiences of iwi and of institutional and private collections. To provide the most appropriate access for family, researchers and students, to reduce anxiety and to ensure that there was as little room as possible for future complaints about the treatment of taonga and other treasures, we included tikanga (protocols and custom) as one of the guiding principles of ethical practices during the decision-making process.
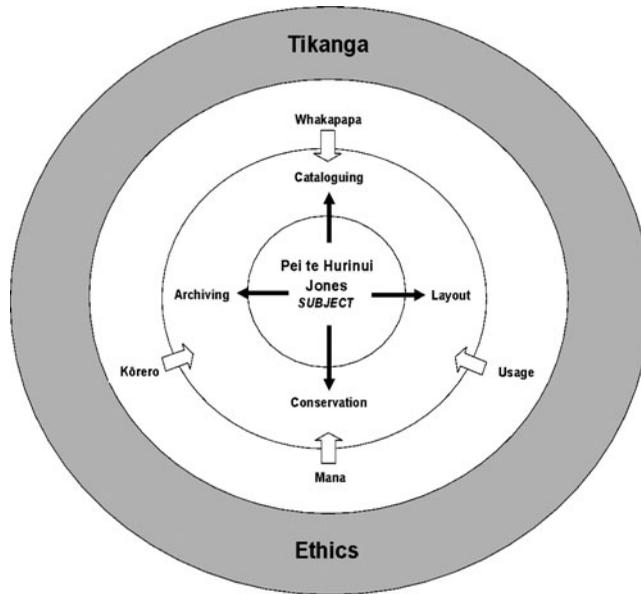
FIGURE 2 Diagrammatical Representation of the Organizational Principles for the Pei Jones Collection.

From this point of view the entire collection and each *taonga* was considered in terms of its cultural values and spiritual connection to Pei Jones. This led to an arrangement of the room according to overarching Māori philosophical values and principles. Thus, the "archiving, cataloging, physical layout and conservation were all considered in relation to mana (authority, control, influence, prestige and power), whakapapa (genealogy), relevant kōrero (history), and usage" (as illustrated in Figure 2).[45]

The cataloging of the book collection was completed by University of Waikato Library staff following the *Library of Congress Classification* System and the cataloging of the photographs, *taonga*, and the unpublished material was completed by the archivist, Rangiiria Hedley from Ngāti Tūwharetoa. The index produced by Salim Baksh was re-edited and updated and a number of inconsistencies in the Māori in the first index were noted and corrected in the revised index.[46] This task was made considerably easier by the "fact that the archivist was already familiar with the whakapapa, history, names and place names included in the 1991 index, [it] was approached meticulously in order to ensure that the integrity of the collection, the whakapapa, history, names and place names that it contains, were preserved."[47]

When considering the physical layout of the room, a "number of factors including room design and size, Tainui tikanga, whakapapa, relevant
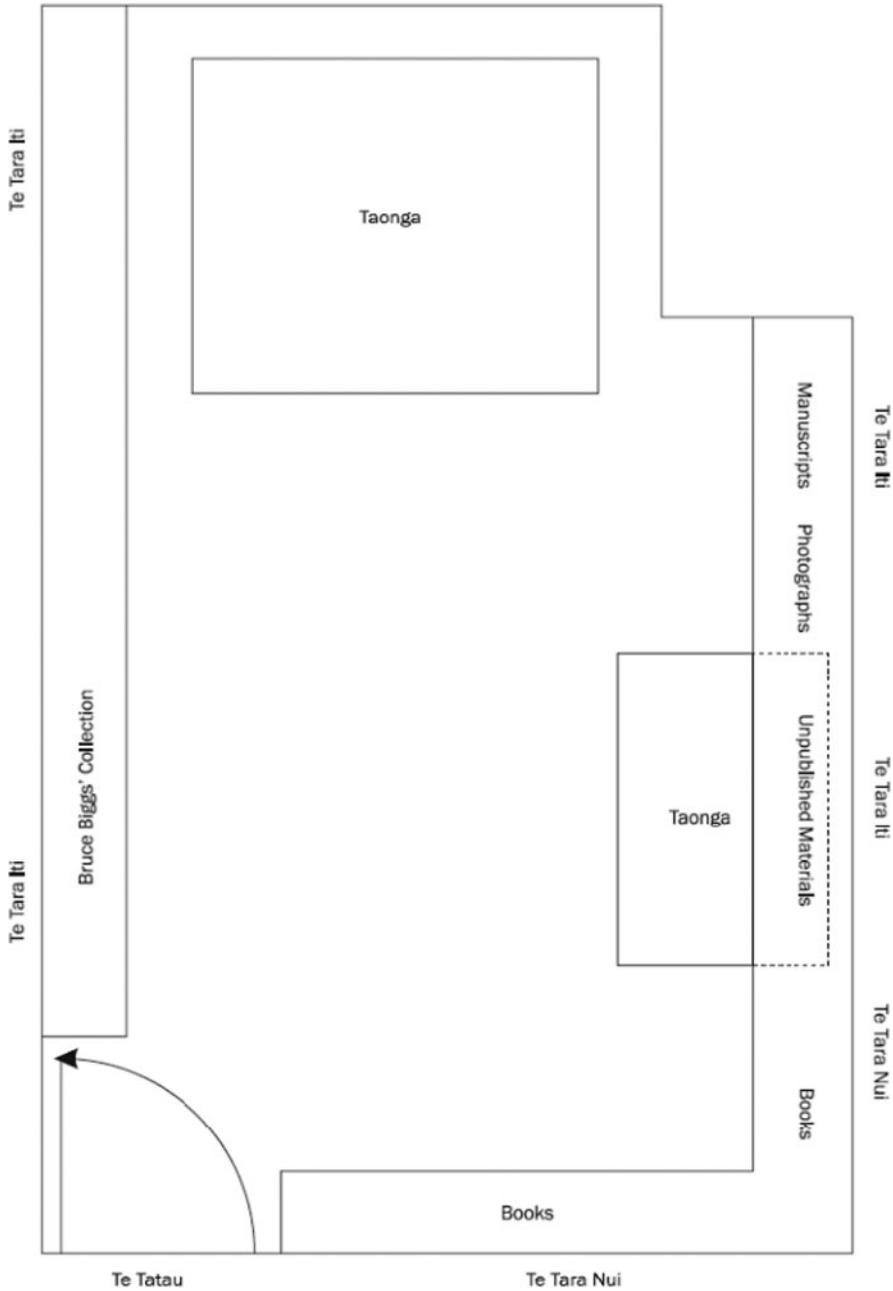
FIGURE 3 Floor Plan Based on the Layout of a *Whare Puni* (an Ancestral Meeting House).

kōrero, and usage [were utilized]. It was decided that the collection would be arranged, so far as the room size and shape would allow, according to the layout of a *whare puni* (an ancestral meeting house)"[48] (Figure 3). This is based on the principle that:[49]

visitors, guests, or, in this case, researchers, students or family members, are called to enter through Te Tatau (the doorway). To the right-hand side is the area designated for manuhiri, called Te Tara Nui. All the publications which Pei used for reference and inspiration in writing and researching his various works are located here. These are available for use in further research ...

To the left-hand side of the Te Tatau is the area designated for tangata whenua (people belonging to any particular place, local people, hosts) called Te Tara Iti ...

Located in the center of the back wall are the taonga. This is the area normally designated for rangatira (chiefs, nobility, aristocracy) and their photographs.

To house the *taonga*, two lockable four-drawer moisture-cured polyurethane pine units were purchased. These are also "organised according to whaka-papa, relevant kōrero and use. The organisation of these taonga depends upon the interpretation of relevant Māori philosophical values, tikanga and the kōrero associated with each object."[50] When significant renovations to the University Library were undertaken in 2008–2012, a new room was proposed to house the collection. The same principles were applied with the new room as the previous one. The only significant changes being the shifting of the Biggs' collection to *Te Tara Nui*, the extension of *Te Tara Nui* to encompass the entire wall and the addition of the work of the late Professor Evelyn Stokes. In June 2012, the collection that was held by Alexander Turnbull Library was returned to the donor and subsequently added to the collection held in the University of Waikato Library (as illustrated in Figure 4).

TRANSFORMING THE PHYSICAL INTO DIGITAL: APPLYING *TIKANGA*

When applied to the digitization process, *tikanga* has the ability to address ethical issues by acknowledging Māori cultural values through a Māori philosophical view. Stevenson and Callaghan[51] highlight three key issues in the digitization of Māori-based material: ownership, control and access, and consultation. After consulting with communities, potential user groups, librarians, the public, and artists, they concluded that the issues of ownership, control and access, and consultation can be addressed using Māori concepts, specifically *rangatiratanga* (ownership) and *kaitiakitanga* (guardianship or preservation); *mana* (control) and *putanga* (access—provision of context, stipulation of terms and conditions of use, access and restriction or suppression); and *kōrerorero whānui* (consultation—the process of proposing, presenting, listening, considering, and deciding). They note that providing access to Māori-based information and material via the Internet may be an
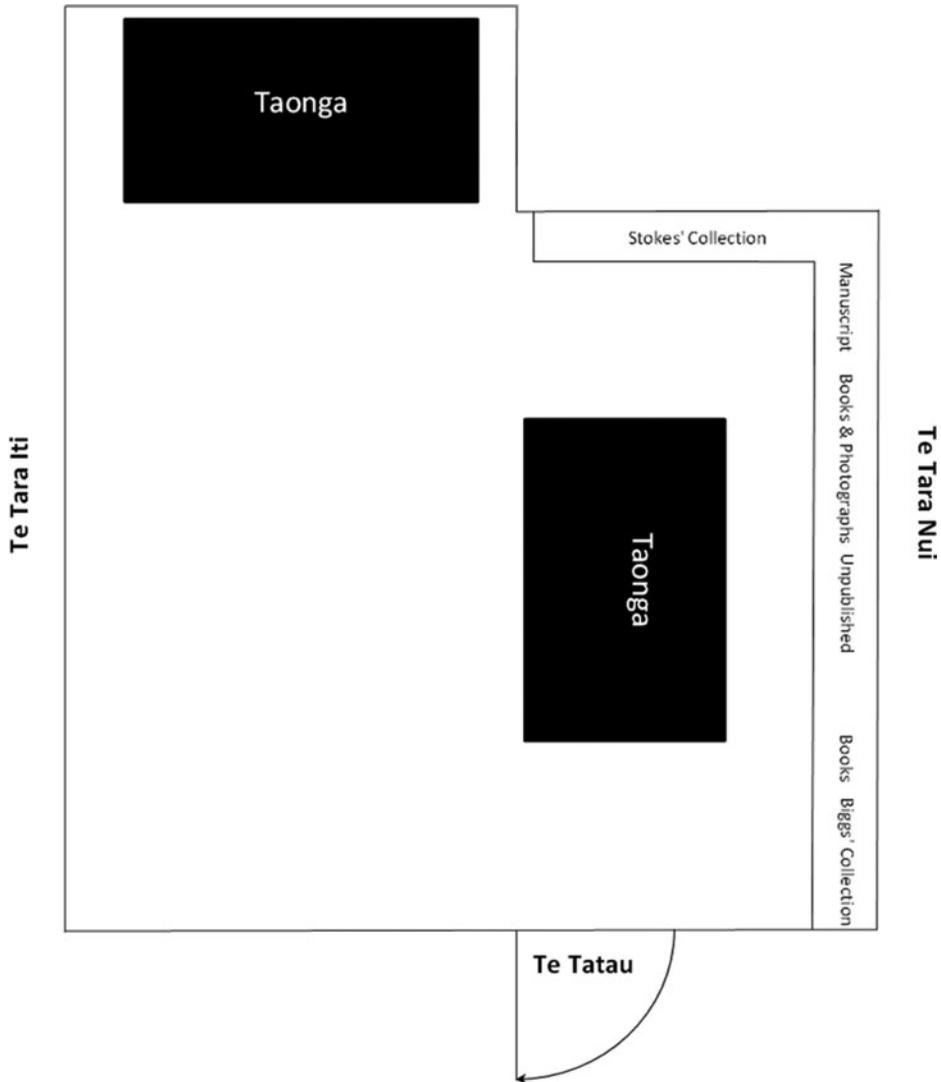
FIGURE 4 New Floor Plan.

acceptable way to widely increase access but it is important to provide context for the material to "reduce the risk of users with little understanding of the material using it in ways which fail to respect its importance."[52]

During the initial stages of the negotiations the donor, Brian Hauāuru Jones, discussed the possibility of providing digital access to the collection for *whānau* members, scholars, and researchers. In honoring this request, staff members of SMPD applied for research funding from Ngā Pae o te Māramatanga at the University of Auckland to undertake research and develop processes and protocols in a digital context. An advisory group

consisting of key stakeholders was established based on his *whakapapa* (genealogy) links, representation from Pei's whānau, his close association with Kīngitanga, Tainui, Ngāti Tūwharetoa and the University of Waikato, representation from Māori academics at the institution that the collection was gifted to, and representation of the University of Waikato Library who administer and care for the collection.[53] Three broad themes were identified from the general discussion with the advisory group:

- kaitiakitanga;
- contextualization of information; and
- content development and control and developing multilayered access points.[54]

Kaitiakitanga was considered an extremely important aspect of the digitization process. In particular, it was noted that the integrity of the collection was based on the experience of *mauri* (life principle, vital essence), *mana*, *tika* (be correct, right, just, fair), *tapu* (be sacred, prohibited, restricted), and *noa* (be free from the extensions of *tapu*, ordinary, unrestricted) of the collection and *kaitiakitanga*. The Advisory Group highlighted the fact that a digital medium created a different level of connection. Furthermore, they identified that the digital collection would have a different *wairua* (spirit, feel). It was felt that the meaning of *wairua* needed to be further discussed and interpreted. In addition, the use of *te reo Māori* as part of translating and representing the collection would also emphasize the *wairua* of the collection. As large portions of the collection are based on *whānau*, *hapū* (subtribe), and *iwi* knowledge, provenance was strongly emphasized by all participants as a very important component in the maintenance of integrity of the collection. As current guardians of the material, the Advisory Group suggested establishing a working guide of *kaitiaki* values that would provide guidance on representation, provenance, context, and the digitization of the collection.

Contextualization of information was also considered an extremely important aspect of the digitization process. The group strongly agreed that in order to maintain the integrity of the collection that required an appropriate context from which to work. A number of possible strategies were suggested including timeline diagrams, templates based on Pei's cosmology charts, diagrams, and themes within the collection that could be used to symbolize the content of the collection.

The final theme to emerge was the development and control of content and the development of multilayered access points. The development of the digital library is currently one of a number of access points being developed for the collection (others include the room itself and a touch screen facility that will also be located in the room). It was noted that enabling users to access information electronically, rather than physically, ensures the

authenticity of the originals. Possible strategies were suggested in relation to content development including the development of a method based on the crowd-sourcing of the information. The purpose of this particular approach would enable users (including *whānau*, *hapū* and *iwi*) to enter the site and assist with aspects of the development and control of content. For example, it would allow *whānau*, *hapū*, and *iwi* to assist with the development of the content (e.g., the editing, proofing, and checking of the content), be part of the control and management of content (e.g., identifying important information and content that may need to be embargoed), and provide an opportunity to connect with Pei's work. Thus, it was noted that the ultimate goal for *whānau, hapū, iwi* in this process is to provide the procedures in which they can control their own knowledge and information and are full participants in the decision-making process.[55]

In conceptualizing a model of digitization, eight of the twenty projects identified by Linda Tuhiwai Smith[56] were considered as guiding principles to formulate a possible model of digitization: claiming, remembering, revitalizing, connecting, representing, returning, protecting, and sharing:[57]

- *Claiming*—For *Māori* claiming has been a dynamic process where methodologies on claiming and reclaiming have been developed.[58] Reclaiming that original knowledge source for *Māori* enables *Māori* to uphold that integrity.
- *Remembering*—*Māori* have a natural connection to remember the past, whether painful or not. Digitizing certain stories enables *Māori* to remember what events occurred in the past and remember them for future purposes and generations.
- *Revitalizing*—Revitalization as a project has established initiatives in language programs, education, broadcasting, publishing, and community-based programs.[59] The digital medium creates a new initiative for *Māori* knowledge to be revitalized digitally. Revitalizing *Te reo Māori* and *Māori taonga*.
- *Connecting*—Connecting *Māori* information and knowledge creates a relationship through the digital medium. It provides a link to certain *kōrero* no matter where the user is located. It creates an opportunity to connect to the past and connect to knowledge that others did not know existed.
- *Representing*—The digital medium creates a whole new element of learning and interacting. The representation of *Māori* material through digitization will enable it to be represented through a *Māori* perspective, acknowledging the integrity of the material to be first priority.
- *Returning*—Returning involves the returning of land, rivers, mountains to their Indigenous owners.[60] It also involves the returning and repatriation of *Māori* knowledge and *taonga*, such as artifacts, remains and other cultural materials claimed by the hands of non-*Māori* whether appropriate or not. The digitization of *Māori* knowledge will create awareness and a

relationship between *Māori* and non-Māori to consult with *Māori* and the wider communities and incorporate *Māori* as part of the governance of their *Māori* materials.

- *Protecting*—Protecting is concerned with the protecting of languages, customs, peoples, communities, beliefs, art, ideas, natural resources, and other things that Indigenous peoples produce.[61] The protection of *Māori* material through the digital medium can be best protected with the involvement of *Māori* within organizations who prepare to digitize information. Recognizing what is best for that knowledge source and gaining consent from *Māori* and the wider community is essential to the whole process.
- *Sharing*—"Sharing is about sharing knowledge between Indigenous peoples, around networks and across the world of Indigenous peoples."[62] The potential to digitize *Māori* material will create wider networks and connect people to knowledge that relates to them. It also includes a shared responsibility between *Māori* to share knowledge that is in the best interest of wider *Māori* communities.

Operating within a *Kaupapa Māori* framework,[63] involved a process that considered *Kaupapa Māori* ethics and the seven Māori cultural values of *aroha ki te tangata* (respect for people), *he kanohi kitea* (the seen face, present yourself to people face to face), *titiro, whakarongo…kōrero* (look, listen…speak), *manaaki ki te tangata* (share and host people, be generous), *kia tūpato* (be cautious), *kaua e takahia te mana o te tangata* (do not trample over the mana of people), and *kia mahaki* (do not flaunt your knowledge).[64] These values have been a key feature of developing a process of ethics of digitizing *Mātauranga Māori*. For example, *Kanohi kitea* has been used as a consultation process on obtaining specific information from an identified set group (i.e., The Advisory Group). Thus, *Kaupapa Māori* provides a conceptual space to develop ethical processes, consider possible solutions and shape a set of guidelines for the digitization of *Mātauranga Māori*.

In conceptualizing this space, a model based on *Kaupapa Māori* framework and *tikanga* is worthy of further investigation. The example provided by the Advisory Group of Tāwhaki's ascent to the highest heaven to collect the baskets of knowledge is one possible model of representation based on these principles.[65] Similar to Tāwhaki's ascent to collect the baskets of knowledge, the development of digitization processes is a process of trial and error. At times there will be successes in terms of the ethical and technical challenges and at other times a reformulation of the task is required in order to advance (it involves Smith's processes of claiming, connecting, and returning). The consolidation of that knowledge base is an essential part of the journey. For example, on arriving to the highest heaven, Tāwhaki collected the baskets of knowledge and the stones of consolidation (both formal and informal), and on his return he consolidated these forms of knowledge

as *mauri* (Smith's processes of remembering, revitalizing, protecting and sharing). The concepts of *kaitiakitanga* (Smith's processes of representing, protecting and sharing), contextualization of information (Smith's process of remembering, revitalizing, representing, protecting and sharing), and content development and control (Smith's processes of protecting, sharing and revitalizing) are critical elements within this process.[66]

DIGITAL USER INTERFACES

In implementing a digital counterpart to the physical collection we have striven to find ways that the developed user interfaces encapsulate the key underlying principles of the collections as much as possible—how it has been assembled and disseminated, and in particular the application of *tikanga*—whilst maintaining as many as possible of the advantages digital form can have over physical form. The key software elements utilized in the process were:

- A Māori language macronizer.
- A spatial hypermedia browser and editor.
- A Digital Library toolkit.

In brief: the Māori language macronizer allowed us to quickly transform text produced by OCR on scanned documents of typed correspondence in the collection, and have macrons added automatically to the resulting text; the spatial hypermedia editor allowed us to represent, in a natural way, many of the spatial relationships that exist between artifacts in the collection; and the digital library software provided a framework in which to manage the digital versions of these assets. Further, the spatial hypermedia software provides for an in-room digital experience of the collection through a purpose built touch screen interface. The digital library allows for access of the collection by remote users. We now discuss these items in more detail.

A MĀORI LANGUAGE MACRONIZER

Ratonga Whakaora Tohutō Māori (The Māori Macron Restoration Service) is a website for the automatic restoration of macrons to Māori documents that we have developed through the course of this project (http://www.green stone.org/macron-restoration-service/jsp/en/main.jsp). Originally it was intended solely to assist converting the text that had gone through OCR in the Pei Jones collection: a software process that did not capture the use of macrons in the generated output files. Seeing the potential for such a service

beyond the scope of this project, we have since gone on and made the service publically available for others to use.[67]

Through this website a user can input plain text (cut and paste into a text box) or else upload complete files (Microsoft Word, Open Office documents, and text files are supported file formats) and have the text updated to make use of macrons at the click of a button. The approach taken is based on a machine learning technique (a naïve Bayes classifiers) that analyzes text at the word level. After training on a suitable corpus of marked-up Māori texts, we have found the system achieves a level of accuracy that exceeds 99%; anecdotally, we have found that the mark-up generated (over a period of time) to be more consistent than that produced manually by a trained scholar.[68]

DIGITAL LIBRARY FRAMEWORK

To manage the assets in the collection being digitized, combined with library catalog information that was already available from our university library, we chose the open source digital library software Greenstone.[69] This is an open source digital library software system developed at our university (with a pedigree of over 15 years, and in use around the world). It was explicitly chosen for this project due to our detailed understanding of its implementation because, for this project, we wanted to significantly extend—unencumbered by unforeseen technical limitations, due to unfamiliarity with the software—the functionality of the software in line with the requirements of the ethics and procedures of the project.

A key element to the approach taken was dispensing with the Greenstone Librarian Interface (GLI), a Java-based desktop application, in favor of one more closely integrated into the web browser, which in turn was then aligned with the spatial hypermedia editor used (described in the next section). Within this remit, a detailed consideration of the user requirements[70] led to the following functionality being added to Greenstone code-base, accessed through the web browser by an authenticated user (where the editing role has been assigned to the user account):

1. *Activated ingest* (the process of ingesting documents using the web-browser interface and enables the authorized user to have full control of the documents. Changes, enhancements and corrections to individual documents can be made quickly);
2. *Born-digital document creation* (the process of creating and managing direct-to-digital content with a systematic method of maintaining this information. The increasing use of paperless content requires continuous

digital preservation, storage, and archiving of this content and visibility of this information by searching and viewing from different platforms);

3. *Document delete* (ability to remove a document in a collection directly from the web interface. This would enable the management of the collection from a unified front-end. For example, incorrect or older versions of a document have to be removed from the collection to keep it up-to-date);

4. *Document merge* (flexibility in managing the collection by allowing the users to merge different sections and sub-sections of the document, allowing the content to be organized in a seamless manner. This feature will enable the assembly of documents in a structured manner and enable changes to this structure using a web interface. The merge action can be performed using drag and drop mouse actions);

5. *Document metadata editing* (enhances the system by providing the ability to edit metadata. The system should also automatically populate the metadata for selected fields. For example, any inconsistencies in the collection can be easily identified by viewing the metadata elements grouped together from the web browser);

6. *Document structure editing* (provides additional functionality to the system by enabling the structure of the document to be edited from the web browser. For example, viewing and manipulating the structure of the document in a controlled manner provides a simplified process of editing the structure while maintaining the rules defined by the collection); and

7. *Workflow control of document creation and editing* (provides a system workflow based on a shared concept to actively contribute to the content and provide a mechanism for actioning on these requests. This framework would enable the creation, storage and distribution of collective data by implementing workflow control).

The interactive user management system was evaluated by expert users including staff from SMPD, the University of Waikato Library, and the Department of Computer Science. This evaluation was aimed at assessing the functionality, users experience and identifying any problems with the system. The group analyzed the entire system from different perspectives and identified opportunities for improvement in the user interface and the inclusion of additional functionality. The evaluation also aimed to understand the system in its entirety and identify any potential bottlenecks and inconsistencies, leading to further refinements of the system.[71]

SPATIAL HYPERMEDIA EDITOR

To capture, as much as possible, the spatial aspects to the presentation of the *taonga* in the physical collection, we decided to utilize a spatial hypermedia system as the primary graphical display. Moreover we decided to utilize a

FIGURE 5 Photograph of One of the Drawers in the Physical Collection—In this Case Containing Pendants and Related Artifacts.

spatial hypermedia editor as opposed to browser, as a way of providing an environment that more naturally supports spatial decisions associated with the management of the collection. While the latter approach (browser) displays the information, the former approach (editor) does all this *and* allows for information, layout, and presentation details to be altered.

The spatial hypermedia editor chosen was Expeditee (https://www.openhub.net/p/expeditee), an open source reimplementation of the venerable KMS: Knowledge Management System.[72] Below we present some examples to convey a sense of the interaction experience with Expeditee taken from the frame-set[73] developed for the Pei Jones digital collection, which also made use of Expeditee's scripting facilities to provide functionally specific to our requirements. We then go on to detail how we reconciled the management and editorial roles of Expeditee with asset management capabilities of the Greenstone digital library software component.

Figure 5 shows a photograph of one of the drawers in the physical Pei Jones collection. In the center of the drawer we have placed a *kapea* which was owned by Hepina (Pei's first wife). To its right is a pendant belonging to King Pōtatau. To the far left-hand side at the top of the drawer are two of King Tāwhiao's (the second Māori King) ear pendants. Slightly below the two pendants of Tāwhiao is placed Te Heuheu Patatai's bone ear pendant. Te Heuheu Patatai was a Ngāti Tūwharetoa leader and carver who was later to become Te Heuheu Tukino IV, Horonuku. Next to Te Heuheu Patatai's bone ear pendant is Te Rauparaha's ear pendant. Te Rauparaha was highly regarded as a tribal leader and warrior for Ngāti Toa. Central to the organization of these taonga are Māori philosophical values, *tikanga* and the *kōrero* associated with each object. For example, all of the pendants are arranged either slightly higher or lower according to their *whakapapa*
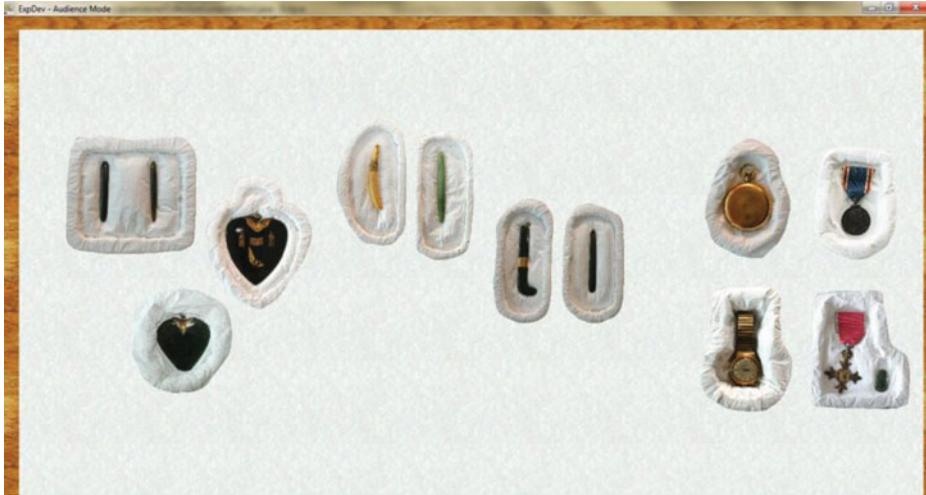
FIGURE 6 Screen Snapshot of an Expeditee Frame—In this Case the Digital Equivalent to the Drawer Shown in Figure 5.

connections. We have also separated pendants because of their historical context (e.g., the pendants of King Pōtatau and Te Rauparaha were separated because of the numerous incursions and incidents between them).

Figure 6 shows the equivalent display in the digital version of the collection, and in Figure 7 the result of touching (or clicking) on the screen the right-most and lowest positioned of the pendants in the top left-hand group (the right pendant above the heart shaped pendant). This brings up a new screen that shows a selection on the library catalog information held on this item. If our users were to then touch/click on the new photo that appears
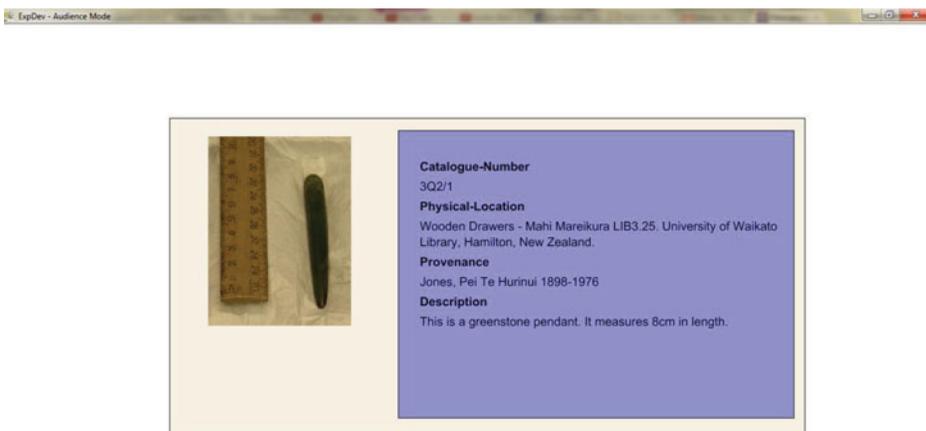

FIGURE 7 Viewing One of the Pendants (the One Immediately to the Left of the Topmost Heart-Shaped Pendant) Shown in Figure 6.
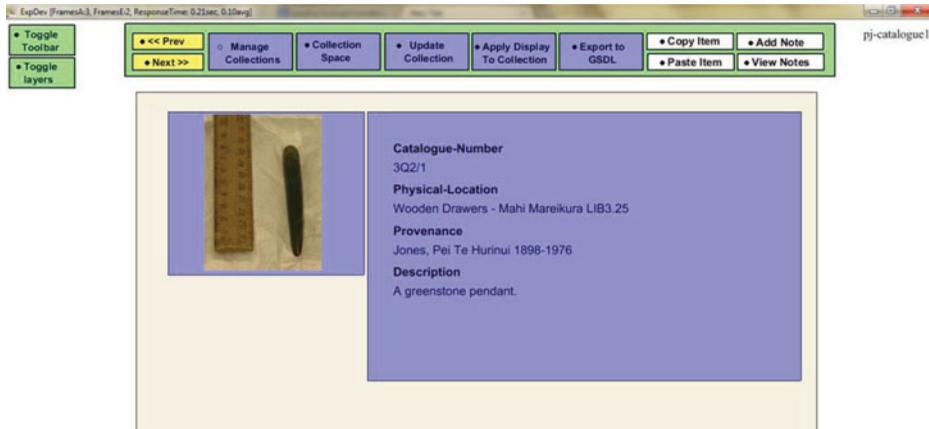
FIGURE 8 Screenshot of an Expeditee Frame as Access by the Curator—in This Case the Same Items as Shown in Figure 7.

in this screen (which includes a ruler for scale), this would then produce a high resolution version of the image for them to view.

ROUND-TRIP COMPATIBILITY

Figure 8 shows a representative example of the editing and management side of the Pei Jones digital collection, as is viewed by the curator when they access the digital collection. In this mode the main view to a particular item is present as before. However, now direct manipulation of the items is also supported by way of effecting change: both in terms of editing the text content to a particular item of information (metadata) and altering details concerning presentation, such as font appearance, position, and color. A toolbar along the top controls how these changes affect the collection as a whole. Operations include: Update Collection, Apply Display to Collection, Export to GSDL (Greenstone Digital Library), and Add Note. When the toolbar is not in use, it can be minimized to the side.

In implementing the functionality to this toolbar, a core issue that needed to be resolved was how to reconcile the representation of the collection's content both in the digital library software (Greenstone) and the spatial hypermedia editor (Expeditee). Figure 9 provides an overview of the process. To map from Greenstone to Expeditee, an export service was added to the DL infrastructure that was a combination of:

1. Javascript embedded in the document display and browsing views and

FIGURE 9 Round-Trip Compatibility between Greenstone and Expeditee Over Stored Collection Content.

2. a CGI-script (Common Gateway Interface) written in the Perl programming language that performed the job of writing the exported data to disk as valid Expeditee frames.

The data collated by the Javascript was transmitted to the CGI-script as JavaScript Object Notation (JSON) data using Asynchronous JavaScript and Extensible Markup Language (AJAX) calls.

To map from Expeditee to Greenstone, the spatial hypermedia's in-built scripting agent was used to traverse frames in Expeditee and then write out the necessary syntax for the digital library: a mixture of HTML content and XML files. In combination, the two implementations ensure round-trip compatibility between the representations. Any changes made in the digital library can be "pushed" across to the spatial hypermedia representation, and vice versa with no loss of information. Figure 10 shows the result of this round-trip compatibility when applied to the *taonga* view of the Order of the British Empire (OBE) awarded to Pei Jones. Figure 10a shows the digital library view, and Figure 10b the spatial hypermedia view. Notwithstanding

FIGURE 10 Comparison of the Digital Library View of a Catalog Item: (a) in the Digital Library (Web Browser) and (b) in Expeditee.

some cosmetic differences around the perimeter of the display (relating to navigation) the two views are essentially identical.

FUTURE WORK

The commentaries on content, authorship, provenance, and historical context are progressing steadily but will require further development as new content is checked and incorporated into the digital library. We are currently working on a method based on crowd-sourcing that would enable users (including *whānau*, *hapū* and *iwi*) to enter the site and assist with various aspects of the development and control of content. Once this system is in place, the *whānau*, *hapū* and *iwi* will assist with the development of the content (e.g., the editing, proofing and checking of the content), and be part of the control and management of content (e.g., identifying important information and content that may need to be embargoed). We are also working closely with the *whānau* and the members of the Advisory Group to follow up on the action points that were identified as part of the group discussion (i.e., a condensed biography is being drafted; mock-up versions of the landing page for the digital collection are in development, as is a working guide for the collection that includes a commentary on *kaitiaki* values).

CONCLUSION

The "digital era" has truly transformed how people live their lives, relate to one another, and interact with the world and knowledge systems around them. Of critical importance to the Aotearoa/New Zealand context is the need to develop a set of principles and guidelines for the digitization of *Mātauranga Māori* in institutions, libraries, archives, and museums. These guidelines should be informed by historical contexts, ethics, *Kaupapa Māori* ethics, *tikanga*, and the ethics of Indigenous ownership. These guidelines should address access, display, intellectual and cultural rights, ownership, copyright, custodial practices, policy development, and consultation. Further consultation, consolidation, and sharing among the range of projects using digital initiatives is also required to find more opportunities for Māori to create their own cultural narrative in the digital realm. Among work yet to be conducted are scoping reports and interviews with institutions (e.g., The National Library of New Zealand Te Puna Mātauranga o Aotearoa, The Museum of New Zealand Te Papa Tongarewa, the Auckland Museum), and *iwi* (e.g., Hauraki, Taranaki, Ngāi Tahu), who are currently involved in the digitization of *Mātauranga Māori*.

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63. Norman K. Denzin, Yvonna S. Lincoln, and Linda Tuhiwai Smith, *Handbook of Critical and Indigenous Methodologies* (Los Angeles: Sage, 2008); Kathy Irwin, "Māori Research Methods and Processes: An Exploration," *Sites* 28 (1994): 25–43; Graham Smith, "The Development of Kaupapa Māori Theory

and Praxis" (PhD, School of Education, University of Auckland: Auckland); Linda Smith, *Decolonizing Methodologies: Research and Indigenous Peoples*. 2nd ed. (London; New York: Zed Books: Distributed in the USA exclusively by Palgrave Macmillan), 2012.

64. Smith, *Decolonizing Methodologies,* 120.

65. According to Tainui tradition, Tāwhaki ascended the heavens and received the three baskets of knowledge. In other tribal regions, Tāne the god of forests and birds ascended the heavens to collect the baskets of knowledge.

66. Anderson, "An Exploration of the Ethical Implications of the Digitisation and Dissemination of Mātauranga Māori."

67. The New Zealand Ministry of Justice is one high profile organization using the system, where it is used it to add macrons to court proceedings in Māori. This is a process that used to be done manually, and at a significantly greater cost and amount of time taken.

68. John Cocks, "Diacritic Restoration and the Development of a Part-of-Speech Tagset for the Māori Language" (MSc Thesis, Department of Computer Science, University of Waikato, 2012).

69. Ian Witten, David Bainbridge, and David Nichols, *How to Build a Digital Library.* 2nd ed. (Burlington, MA: Morgan Kaufmann, 2010).

70. Papitha Cader, "An Interactive User Management System for Multilingual Documents: A Case Study of the Pei Jones Collection." Unpublished M.E. (Master of Engineering, University of Waikato, Hamilton, 2012.

71. See ibid. for more details.

72. Robert M. Akscyn, Donald L. McCracken, and Elise A. Yoder, "KMS: A Distributed Hypermedia System for Managing Knowledge in Organizations," *Communications of the ACM* 31, no. 7 (1988): 820–835.

73. In Expeditee a frame-set is comparable to a set of HTML web pages.