(Te Papa Tongarewa Museum, 2015)

Digital Documentation for Conservation of Artifacts at the Wellington Te Papa Tongarewa Museum

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TE PAPA
OUR PLACE

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CHAPTER 1. Introduction

Vincent Van Gogh once said, "Great things are done by a series of small things brought together." Museums embody this idea, bringing many small things together to explain and understand the human experience. These institutions provide people the opportunity to uncover their history and appreciate their past. The ability to view tangible records of the great things accomplished in the past provides the individual the opportunity to view their world and their life as a continuation and connection to the lives of others. The Te Papa Tongarewa Museum of Wellington, New Zealand is one such institution that offers the world a place to come and embrace works of art, culture, and history alike in pursuit of the cultural enrichment of human society.

The Te Papa Tongarewa Museum is incredibly unique, possessing thousands of artifacts from across five areas of study: art, history, Pacific culture, Maori culture, and natural environment. It would be extremely difficult for museums like Te Papa to offer their exhibitions to the public, if not for the ability to conserve these artifacts. The process of conservation entails keeping artifacts as intact as possible while taking care not to compromise their integrity. Keeping track of the conservation process is just as important as the conservation itself and requires meticulous written documentation. These documents are an object's condition report. Currently, Te Papa uses paper condition reports, but these hard copy records are becoming more and more laborious to transcribe and are easily lost or misplaced. Given these issues and that technology is advancing more and more each day, the museum has decided it is time to upgrade to a paperless system.

When considering and preparing for this upgrade it is important to focus on two dimensions: the human experience and the museum's technological constraints. Since the conservation staff at Te Papa will be the primary beneficiaries of the system, they should feel comfortable using the new system. Understanding their needs generates an idea of what the new system must accomplish in order to be successful and well-received. In addition, it is equally as important to be conscious of the technological constraints at the museum. This is because the systems proposed need to be able to function at an optimal level. Identifying the parameters defines where the functional limitations of the proposed system need to be, which in turn leads to more educated decisions when choosing the final paperless digital documentation system.

There are many different ways of going paperless. Institutions can use tablets and styluses to hand annotate digital records, access and annotate documents via the cloud, or even take advantage of third party applications that allow users to create and edit documents in real time and later upload the data to their digital asset management system. All options have different key features and different standard operating requirements. This is where research on the museum comes in. Just as all paperless solutions are different so are the people using them. Where some institutions have conservation teams that are digitally fluent, others may not. Since it is clear that each institution has its own unique skill set and needs, it is important to approach this problem by learning the specific characteristics that make Te Papa, Te Papa.

This project assists the Te Papa Tongarewa Museum of Wellington in choosing a digital documentation system to aid in the management of their condition reports that also works with their existing software. By aiding in this transition, the hope is that conservationists at Te Papa and elsewhere can better protect the integrity and identity of their artifacts, and enable people to enjoy the artifacts for centuries to come.

CHAPTER 2. Background

To ensure that no damage occurs to the artifacts in their collections, museums and similar institutions must periodically monitor the condition of their artifacts in a formal report that is easily accessible. As each museum is unique, conservation and documentation best practices vary greatly. As many museums tailor their procedures to the museum's distinct collection, transferring artifacts and their accompanying documentation records between museums is challenging. Utilizing databases and other digital technologies facilitates searching for information on an artifact, eliminating the need to search through several paper copies that can easily become lost.

This chapter provides information about the Te Papa Tongarewa Museum in Wellington, New Zealand and their methods for artifact conservation. The first section provides background on the Te Papa Tongarewa Museum and the current conservation methods and best practices they use. The following section discusses the condition reporting process the museum uses when loaning artifacts. The next section describes the stakeholders involved in Te Papa's conservation process and examines the people and organizations affected by the museum's use of conservation technology and how the process concerns them. The subsequent section is on people-technology integration that discusses the need for user-friendly technology. The following section covers conservation technology used by the Te Papa Tongarewa Museum and other institutions. The next section examines other museums, providing an overview, a description of the collections, and their conservation strategies. The final section goes into further detail of the data collection methods used in the methodology chapter and explains the benefits and drawbacks to each method.

2.1 Te Papa Tongarewa Museum of Wellington

The Te Papa Tongarewa Museum, located in Wellington, is the national museum and art gallery of New Zealand. The mission of the museum is to be "a forum for the nation to present, explore, and preserve the heritage of its cultures and knowledge of the natural environment in order to better understand and treasure the past, enrich the present, and meet the challenges of the future" (Museum of New Zealand Te Papa Tongarewa, 2015, para. 2). According to

TripAdvisor, the museum is the top attraction in Wellington and won the 2015 Travelers' Choice Award (TripAdvisor, 2015). The museum is free and open to the public, displaying various artifacts spanning five areas: art, history, Pacific culture, Maori culture, and natural environment (Museum of New Zealand Te Papa Tongarewa, 2015). The name, Te Papa Tongarewa, literally means "our container of treasured things and people that spring from Mother Earth here in New Zealand" (Museum of New Zealand Te Papa Tongarewa, 2015). The Te Papa Tongarewa museum wants the public to have more access to artifacts in the museum. Therefore, it is important to monitor the conditions of artifacts both in house and while on loan in order to allow the public to see the artifacts of interest.

2.2 Loan Condition Reports

Museums loan artifacts and collections to other museums and institutions to enable the public to view cultures and history that they would otherwise not have the opportunity to experience (Museums Association, 2015). Extra benefits from loaning artifacts include increased communication between institutions and enhanced training in conservation experience in staff members (Museum of New Zealand Te Papa Tongarewa, 2009). Smaller museums that do not have the resources to bring in a sizeable acquisition of collections have the opportunity to develop broader collections in cooperation with larger museums. For example, the Something Borrowed Program developed in England gives smaller museums access to larger works from the British Museum and the Renaissance East of England (Museums Association, 2015). When museums conduct loan transactions, institutions require communication, giving them the opportunity to develop networks among themselves. From this, staff members gain experience in handling and displaying artifacts.

When museums loan out their artifacts, a conservator fills out a condition report. This condition reports contains all the information associated with the artifact of interest, including any damages that have occurred. For this reason, both the borrowing and lending museums fill out loan condition reports several times during the process. These reports provide a detailed record of the artifact's history (Museum of New Zealand Te Papa Tongarewa, 2010).

The museum completes a condition report when an artifact enters the museum, leaves the museum, or undergoes restoration (Museum of New Zealand Te Papa Tongarewa, 2010). The

conservation staff also complete condition reports of artifacts on display as part of their daily routine. The museum creates these reports in a thoroughly cleaned workspace with sufficient space for the artifact to sit. Staff handle the artifact properly depending on the type of artifact (for example, a picture has different handling guidelines than a piece of furniture). Because pen ink can leave permanent marks on an artifact if an accident occurs, staff members always use pencil to complete condition reports. If the staff member completing the report finds damage, he or she makes note of the damaged location on the artifact and the potential source. When writing the report, it is important for the individual conducting the inspection to be concise in his or her writing so future readers can understand what that individual observed. Reports also contain pictures of the artifact to aid in the description of any particular damage.

2.3 Conservation Process Stakeholders

Although collection management systems such as KE EMu (KE Electronic Museum management system) are good for managing artifact data, it is important to take into account the individuals who have a hand in the loaning process between institutions. In particular, the conservation and Information Technology (IT) employees are major stakeholders because of their direct interactions with both condition reports and the KE EMu software. The conservation staff have the most experience when formulating reports and transferring them to the software. IT staff, on the other hand, interact with the software more often and have a greater understanding of its usability. People of Maori descent are also stakeholders in this process because the Te Papa Tongarewa Museum houses an exhibit dedicated to artifacts donated by Maori tribes, but still remain under Maori proprietorship. Te Papa staff and staff at other museums are also taken into consideration, as they will have to interact with the technology recommended.

When the museum considers loaning Maori artifacts, the museum consults with a Maori liaison to approve or deny the loan. Museum staff and personnel who work in the conservation department, registrar, IT, and borrowing institutions are also stakeholders because they all work with condition reports, directly or indirectly. The following section discusses the different stakeholders in greater detail and explains their roles during the process of collections management and loaning.

2.3.1 Museum Personnel

The Te Papa Museum conservation and IT staff are the two departments of the museum most involved with the museum's documentation system. The conservation staff are responsible for maintaining the system's data and need to be able to effectively use the archiving tools provided. The IT staff, however, are responsible for maintaining the system itself. Others affected include staff from borrowing institutions. These outside staff must fill out a condition report following Te Papa's guidelines. Currently many museums still use pencil and paper to record information before entering the collected data to a digital system. A study in 2009 found that two thirds of museums still record their information by analog means (Green et al., 2009). Many of these personnel are more comfortable with using pencil and paper, and thus may be reluctant to use overly sophisticated or complicated software. Even if willing, many will likely need training to use new technology. When determining an effective system for digitally documenting condition reports, these are some of the factors to consider.

2.3.2 The Maori Community

The Maori of New Zealand are descendants of a Polynesian population from south-east Asia (Wilson, 2015). Although the exact date of settlement is unknown, historians suggest that the Maori came to the islands of New Zealand around the 13th century. Their first encounter with Europeans was when Dutch explorer Abel Tasman landed in New Zealand around 140 years before Captain Cook made landfall in 1769 (Lysnar, 1915).

Since then, the Maori have continued to inhabit the islands of New Zealand. As of 2013, there are approximately 598,605 Maori residing in the country (Ihaka, 2013). Their collection is a special part of the Te Papa Tongarewa Museum. Iwi (tribal groups) loan out the artifacts to the museum and help Te Papa organize the exhibits properly, as part of the Iwi Exhibition Programme (Museum of New Zealand Te Papa Tongarewa, 2015). Whenever there is an exhibition, kaumātua (elders) from the iwi stay at the museum and perform necessary ceremonial duties and other roles at the Marae, Te Papa's communal meeting place, located in the museum. Any artifacts considered for loan or restoration require a Maori representative to assist in making

decisions that are best for Maori and the museum. The Iwi Exhibition Programme is a vital part of the museum and "an important expression of mana taonga - the role of communities in the understanding and care of the collections" (Museum of New Zealand Te Papa Tongarewa, 2015).

The Maori consider "all art objects produced by their ancestors [as] tribal treasures, with…tribal proprietary rights [as] an important issue…" (Hanson, 1989, pg. 896). It is important to note that there were previous instances when this cultural belief came into play as a key factor in an attempt to display Maori artifacts. One instance of this was during the creation of the "Te Maori: Maori Art from New Zealand Collections" exhibit (Hanson, 1989). During the beginning stages of the exhibition a "distinction was made between the legal ownership of the artifacts, vested in the museums that [held] them, and the cultural ownership, which remained with the tribes" (Hanson, 1989, pg. 896). In addition to the distinction, the head organizer of the project, Sidney Mead, brought Maori elders from New Zealand to perform a dawn ceremony that lifted the tapu ("taboo") from the artifacts displayed as they moved from location to location (Hanson, 1989). This consideration that the museum recognizes all Maori artifacts as sacred and deemed cultural property of the Maori is one to keep in mind when interacting with and managing any of their artifacts. The presence of tapu and mana (Maori words for taboo and power) in artifacts is common in Maori culture (Ministry of Justice, 2011). The Maori have a broad spectrum of artifacts that they consider sacred (Crelinsten, 1999, pg. 27). Thus, curators with large Maori collections must be extremely aware of the cultural meanings of the artifacts and acceptable artifact handling procedures. The notion of cultural significance is a common thread among many conservators involved with Maori artifacts. Vicki Heikell, a Maori paper conservator, considers the definition of "culturally significant" to mean that which has cultural significance by the Maori (Heikell, 1995). She states that not only are the oldest pieces of Maori heritage important, but that contemporary works as important as well. Consequently, any institution should take these cultural significances into consideration when choosing to display or loan out any artifacts donated by Maori regardless of the artifact's age.

The International Council on Monuments and Sites (ICOMOS) New Zealand Charter for the Conservation of Places of Cultural Heritage Value is a document that exists to outline handling procedures for all artifacts deemed culturally significant. The document briefly outlines the purpose of conservation, conservation principles, and best practices for the conservation, restoration, and documentation of the artifacts. It is vital to duly consider any and

all handling procedures when dealing with sacred artifacts because this becomes a direct reflection of the conservators respect for the culture (ICOMOS, 2010).

2.4 People-Technology Integration

Although computer based technologies are more available for people to use, many still lack the knowledge to use this technology to its full potential (Resnik, 2001). The conservation staff at Te Papa are likely to be at varying levels of technological comfort and thus it is important to take their perspectives into consideration when generating recommendations that include digital systems integration.

In "Closing the Fluency Gap," Mitchel Resnik introduces the idea of fluency within the space of technology and its utilization (Resnik, 2001). From Resnik's perspective "Fluency means not just accessing information on the Web, but creating your own Web pages. Not just downloading MP3 music files, but creating your own digital-music compositions. Not just playing SimCity, but creating your own simulated worlds." (Resnik 2001, pg. 1). This definition brings an important idea to the forefront, that fluency means not only being able to use the technology but also understanding how it works.

When moving from paper to digital, being fluent becomes a necessity. Implementing a new system takes an ample amount of time and energy and it is best if the users are sufficiently fluent with the working parts to minimize time spent training and executing. One paper heavily emphasizes listening to the opinions and views of all participants, especially the stakeholders who are most involved with the technology, before making any technology decisions (Larson et al., 2009). While this paper talks specifically about digital technology integration in respect to educational staff, the same principle applies to our project. The cohort of Te Papa conservationists work together under Te Papa's management, and decide on the systems that get implemented. The ability to translate the conservationist's concerns, needs, and abilities into educated recommendations that is useful to the management are key to accomplishing the goals set in this project.

2.5 Modern Conservation Technology

Museums need to ensure that an artifact is in good condition in order to be on display for the public. Hence, it is necessary for the conservation department of a museum to create and manage condition reports so that information is easily accessible. While an artifact has static data, such as the location and date of origin, it also has associated dynamic data, such as the handling of the artifact and any damages accumulated over time. To keep track of such data, museums develop and fill out condition reports when they loan out an artifact to another institution. These reports, while important, generate large amounts of information that need storage and management. Currently there are many forms of technology used to digitally manage and organize documents and other data. Institutions and organizations looking to store large amounts of data have many software products available to them at various prices. Many of these services, however, accommodate a vast variety of customers, and thus do not cater to particular documentation needs. The Te Papa Tongarewa Museum uses the KE EMu software for this purpose; but other software such as The Museum System and Mimsy XG offer similar services as KE EMu. As technology evolves, more techniques to efficiently document data arise that may not be easily incorporated into existing software. While many of these services allow for sorting of data, they do not necessarily provide efficient means for accessing data. To enter data into storage systems such as KE EMu, the museum must gather the data themselves, which is currently done with paper and pencil.

2.5.1 Conservation Best Practices

When an artifact enters a museum, a conservator first documents who provided the artifact, what the artifact is, and its current location. The artifact then undergoes its first condition report including photo documentation so there is a clear idea of the current state of the artifact. Afterwards, staff regularly monitor the condition of the artifact, keeping track of not only its condition but also of its location within the museum. The procedure for when an artifact goes on loan varies between institutions. Commonly, the loaning process begins with a condition check by a conservator to record any damages before the artifact leaves. Those who take the artifact on loan are responsible for maintaining the condition of the artifact as well as

developing reports that record any damages that occur. These reports also include the locations and the environmental conditions of the artifact's display, and the time spent on loan. Upon return, the conservator inspects the artifact before admitting it, recording the information from the outside condition reports.

The job of the conservator is to maintain the condition of the artifact while minimizing outside factors. This ensures that the artifact retains its integrity. In the event that the artifact suffers damages, a conservator will attempt to ensure the quality of the artifact is still intact. A preservationist, on the other hand, tries to restore the state of the artifact to when it was first manufactured and attempts to reverse any damage.

The conservation methods practiced at museums differ from institution to institution because of the variation in museum size, the types of artifacts and exhibits held, and the resources available to document and manage condition reports. According to the American Alliance of Museums, these institutions take their unique elements into account in order to "demonstrate the effectiveness of its collections stewardship policies, procedures and practices, and assess them in light of varying factors" (American Alliance of Museums, 2013, para. 7). Conservation best practices vary depending on the types of artifacts held in a museum or institution. For example, a museum that specializes in art galleries and paintings may have different conservation practices when compared with a natural history museum. There are standards that museums follow in order to properly manage the documentation generated, ensure the safety of the environment in the artifact's display, and provide procedures for when an artifact goes on loan to another institution. These standards ensure that a museum has "a system of documentation," "an appropriate method for identifying needs and determining priorities for conservation/care," and "collections care policies and procedures for collections on exhibition, in storage, on loan and during travel" (American Alliance of Museums, 2013, para. 8).

In terms of converting to a digital documentation system and using a database to manage condition reports, museums and institutions need to make sure that the database best suits the desired needs for proper documentation (Moore, 2001). A museum must first consider whether condition forms are valid and filled out correctly. It is clear that variation in conservation methods is not limited to hand-written reports. A museum's ideal database depends on the information the museum needs to store, which is reliant on the type of artifacts held in the museum.

2.5.2 Tracking Technologies

App technology is increasingly more popular as a larger percentage of people use it. Many industries, from retail to food delivery, have incorporated smart phones into their organizational routines. Using smart phone applications shows promise in digital archiving as they are easily mobile, almost always have cameras for scanning, and easily connect to the Internet. A 2015 study conducted by Research New Zealand found 70% of New Zealanders use a smartphone, an 11% increase from 2014 (Research New Zealand, 2015). The same study also claimed 50% of smartphone owners preferred their smartphone to other devices.

Standardized codes, such as barcodes and quick response codes (QR codes), uniquely identify artifacts by cell phones and other devices that can scan them. Retail stores as well as transportation services track items using barcodes. A scanned barcode identifies the unique artifact and accesses the necessary information associated with that artifact. Arguably better than barcodes or QR codes are radio-frequency identification (RFID) tags. An RFID is a small microchip placed on or in a product, which holds a unique id number (Borriello, 2005). RFID tags only transmit their data when read by a special RFID reader, which uses radio waves to activate the tag. This means the tags do not need batteries or power in any form. Readers can also write data to RFID tags, such as the location of the reader, making tracking an item with the tag straightforward and convenient.

2.5.3 KE EMu Software

The Te Papa Museum utilizes the KE EMu (KE Electronic Museum management system) software to keep track of their hard copy condition reports. The "KE" in KE EMu represents the background database architecture that houses the electronic museum management system used by over 400 institutions (KE Software, 2015). The purpose of this software is to digitally keep track of the artifact's properties as well as incoming and outgoing loans.

The KE EMu software boasts a variety of features that aid in collection care, research, digital asset management, artifact interpretation, and public engagement that make it one of the most well received management systems in use among larger institutions (KE Software, 2015).

Tools such as condition check documentation and integrated pest management aid in collection care. For assisting in research, the program gives users the ability to input additional information on artifacts for later use or collaboration among other scholars. In terms of digital asset management, the system grants users the permission to upload data from different multimedia platforms to a consolidated record associated with the given artifact. In addition to the aforementioned features, the KE EMu software also gives institutions the ability to create exhibition descriptions, labels, brochures, and web-based synopses of artifacts and exhibits to help visitors gain more insight from their visit both on site and off. To get the information from the system to the web, KE EMu provides the IMu publishing toolkit to its users. This toolkit grants managers access to their collections from their mobile phones, desktops, home computers, and other wireless devices and be able to publish content to their institution's website. The toolkit also offers additional advertisement and attraction to potential visitors browsing their collections online. According to the KE Software website, the Electronic Museum has multiple clients in addition to the Te Papa Tongarewa Museum including (but not limited to) the American Museum of Natural History, the Houston Museum of Natural Science, the Manchester Art Galleries, and the Museum Victoria, making it one of the most used management software in the world (KE Software, 2015).

Users of the software input data into the system manually via XML format. XML is a text format of data that humans and computers can both read (Bos, 2001). Once input is complete the users can choose to create the reports in a multitude of formats including XML, Crystal Report Writer, Microsoft Word, and Microsoft PowerPoint. Institutions also have the ability to exchange data from EMu system to EMu system via exporting into XML from one system and inputting the file directly into the second system. Users are also able to add links to helpful resources directly to their reports for future use.

In general, the software appears to be user friendly. On the KE EMu website, the company offers a "How to use EMu" course that teaches new users how to use the program. The course requires a two-day workshop booked ahead of time and consists of in-depth training on creating, editing, searching, and linking reports. The Andrew W. Mellon Foundation, a non-profit organization dedicated to contributing to the humanities and arts departments in higher education, conducted a survey to determine the progress of digital technologies in museums and institutions around the world (Green et al., 2009). At the time of the survey, only 14 out of 206

respondents were currently using the system, with only one respondent, the National Museum of the American Indian, able to comment in further detail: "Overall, conservators were 'quite' and 'very' satisfied with the system, liking the retrievable reports, images and access to catalog information from other departments." (Green et al., 2009, pg. 35). According to the response received, it is evident this particular museum felt the system worked efficiently.

2.6 Other Museums: Overview and Conservation Strategies

Museums act as stakeholders in the process of creating and managing digital condition reports because they are directly involved in the loaning and borrowing processes for other institutions. When one institution loans an artifact to another, both institutions must agree on the terms of the handling of the artifact and the filling out of the reports that contain the proper information to document its condition. If there is any miscommunication, it is a possibility that information can get lost and the artifact can experience damages that prevent public display. For each museum we provide a brief overview of the museum's collections and its history, followed by the conservation strategies the museum currently implements. This information, comprised of research and interviews is for our assessment of condition reporting technologies and how we can best serve Te Papa in our recommendations.

2.6.1 Conservation and Documentation Practices at the Worcester Art Museum

The Worcester Art Museum (WAM), in Worcester, Massachusetts is the city's primary art museum, and holds over 35,000 artworks (Worcester Art Museum, 2015). Founded in 1898, the museum has been maintaining artworks for more than a century. Their artwork collection features artifacts dating from before 2500 B.C. to present day, including art from ancient civilizations to contemporary art, largely categorized by region of origin, such as European, Pre-Columbian, and Japanese. The collection spans a wide variety of mediums, from paintings to sculptures to clothing. The museum also hosts many events such as art classes and live armor and sword demonstrations.

The WAM takes pride in its conservation efforts, as shown in 1936 when the museum hired its first conservator. Recently the museum received a grant from the Andrew W. Mellon

Foundation to improve their conservation technology. The museum archives conservation data using software called Conservation Studio and The Museum System (TMS). Format for Conservation Studio is in a style that it is very convenient to museum conservators, although its features may seem unintuitive to a non-conservator. TMS is open-source software, allowing a programmer to tweak the software to the museum's specific needs, making the software very flexible. However, customizing the software requires a dedicated programmer, a luxury the WAM and most other museums do not currently have. Many of the conservation records at the WAM take place on paper, with others scanned into a digital database as a PDF document. This is because many of the conservators are most comfortable with documenting on paper, although the museum is currently shifting towards more digital solutions.

Similar to the Te Papa Museum, the WAM loans out many of its artworks to other institutions. A courier often accompanies these artworks. The courier will arrive at the loaning institution and complete a condition report with the loaning institution, agreed upon and signed by both parties. Unpacking and checking an artwork is time consuming, especially as the museums make a point not to rush the process so as to not hurt the painting. Thus many couriers are usually on tight schedules, and prefer paper copies of condition reports to alternatives as they are reliable and can be completed relatively quickly.

2.6.2 Conservation and Documentation Practices at the Worcester Polytechnic Institute (WPI) Archives

The Curation, Preservation, and Archives Department at WPI is responsible for housing artifacts, newspaper articles, reports, and clothing apparel that are either directly related to the school or have a high monetary value. Examples of artifacts and reports stored in the Archives department include thesis papers from past WPI students, documents and newspaper clippings related to the founding of the school, and memorabilia of WPI students (including T-shirts and yearbooks). The department also takes donations from past WPI students and benefactors to add to their collection, showing that the department takes in a variety of items and artifacts. In total, the Curation, Preservation, and Archives Department contains 4,000 to 5,000 linear feet of material, including about 4,700 books, 1,200 works of art (both framed pictures and sculptures), and over 100 unused T-shirts in one collection alone.

Currently, PastPerfect software tracks information on each artifact regarding its condition and location. The process begins when an employee first admits an artifact. Available staff perform an appraisal to get an idea of the historical or artefactual value. The staff then record the artifact in an accession log done on paper because it is quick and easy to use. This contains the location information of the artifact while in Archives. Finally, a staff member completes a report using PastPerfect, stating the condition and material of the artifact.

When the WPI Archives loans out an artifact, staff create a loan form that lists the object's accession number as a unique identifier. In some cases, artifacts may have multiple identifiers. A permanent staff member signs the artifact out when he or she completes the report. In some cases, if an artifact is too valuable, a staff member may decide to loan a copy of the artifact instead. When the borrower returns the artifact, the Archives staff inspects it for any damages, and checks it in so there is record of the artifact's return. The staff member records additional information such as the travel history of the artifact while on loan.

2.6.3 Conservation and Documentation Practices at the Smithsonian

The Smithsonian, located in Washington D.C., houses a collection of over 138 million artifacts in 19 museums (Smithsonian Collections, 2015). Of these 138 million artifacts, "127 million… [are] held by the National Museum of Natural History[,]...9.3 million digital records [are] available online[, and]...2 million library volumes [are] held by [the various] Smithsonian Institution Libraries" (Smithsonian Collections, 2015). With artifacts from various areas of study such as, but not limited to, natural history, art, and popular culture, the museum is similar in regard to Te Papa as the country's flagship institution for cultural heritage preservation, although it is admittedly on a grander scale than Te Papa.

Given the sheer volume of the Smithsonian collection, the institution requires a sophisticated document management system. In one case study entitled, "Digitizing the Smithsonian Institution NMNH Paleobiology Collection - No Longer a Sisyphean Task", Hollis explains how the process of digitizing the Smithsonian's paleobiology collection began in 1970 and has since been evolving. Originally when the project began, the team digitizing the records used a "primitive database system [called] SELGEM" (Hollis, 2014). SELGEM stands for SELf

GEnerating Master Information System. It was the standard system for the institution until 2001 when the museum decided to switch over to KE EMu (Nguyen, Slide 9).

Having their own central hub for conservation, the Museum Conservation Institute (MCI), it is evident that the Smithsonian takes great interest in preserving their collections. Their conservation institute develops technology to prevent further damage to rare artifacts by researching current strategies and the artifacts themselves (Smithsonian Collections, 2015).

2.7 Data Collection Methods

The following sections describe the various methodology techniques for use in this project. Semi-structured interviews, surveys, and feasibility analyses are the proposed methods for gathering and synthesizing data. Each subsection provides a brief overview of what the methodology is and its applicability to achieving the project goal and objectives.

2.7.1 Semi-Structured Interview

A semi-structured interview is a variation between an unstructured interview, where the direction of the interview is up to the interviewee, and a structured interview, where a preset list of questions does not change and must go in that order (Harrell et al., 2009). In this case, the interviewer develops the questions for the interview beforehand to keep the interview on track, but there is enough freedom to not limit the interviewee to only those questions. If the interviewee wishes to provide additional information on outside topics not mentioned in the interviewer's plan**,** that is acceptable.

Semi-structured interviews are useful when obtaining as much information on a subject as possible (Cohen et al., 2006). Even if the interviewer prepares by planning questions and topics to discuss, it is possible that there are additional topics to consider, especially if the interview design is to obtain information on a specific field of study. In addition, semi-structured interviews are useful when an individual is available for only one interview. Because of the time constraints placed on the project, this method of interviewing allows for rapid data collection while also giving the opportunity for personal interactions with the individual of interest.

2.7.2 Surveys

A survey is a simple technique for gathering information on a specific topic. There are two categories of surveys: questionnaire and interview. A questionnaire survey can be either a simple mail survey or an administered questionnaire (Trochim, 2006). Mail surveys have different techniques from other surveys because mail surveys are relatively inexpensive and are able to reach a wide range of people. The downside of this method is low numbers of respondents and minimal detail in responses. An administered questionnaire is a structured number of questions that an interviewer can ask many different people. This method will ensure a high response rate and will be valuable when surveying people who may need clarification with the survey and its language, such as tourists.

2.7.3 Feasibility Analysis

A feasibility analysis allows an individual or organization to evaluate different options and determine which option is the best choice for the problem at hand (Palvia et al., 1988). The list of options analyzed should only include options that will solve the solution; it is not the role of a feasibility analysis to determine if a solution is viable or not, as previous research should have already have addressed this. Each option has its own strengths and weaknesses, and it is the role of the analyst to consider and weigh these benefits. Often there is no definite or quantifiable winner when comparing options, but based on the opinions of the analyst, he or she can determine which option is best fit for his or her needs.

The first step in performing a feasibility analysis is to determine the criteria the analyst will use to evaluate the different options. After deciding, the analyst must determine which criteria are most crucial to each stakeholder. To properly weigh different options in a feasibility analysis, the analyst must know both the big picture of the problem as well as minute details of each proposed option. Once the analyst is ready to evaluate each option, he or she can compare options and create a list of recommendations.

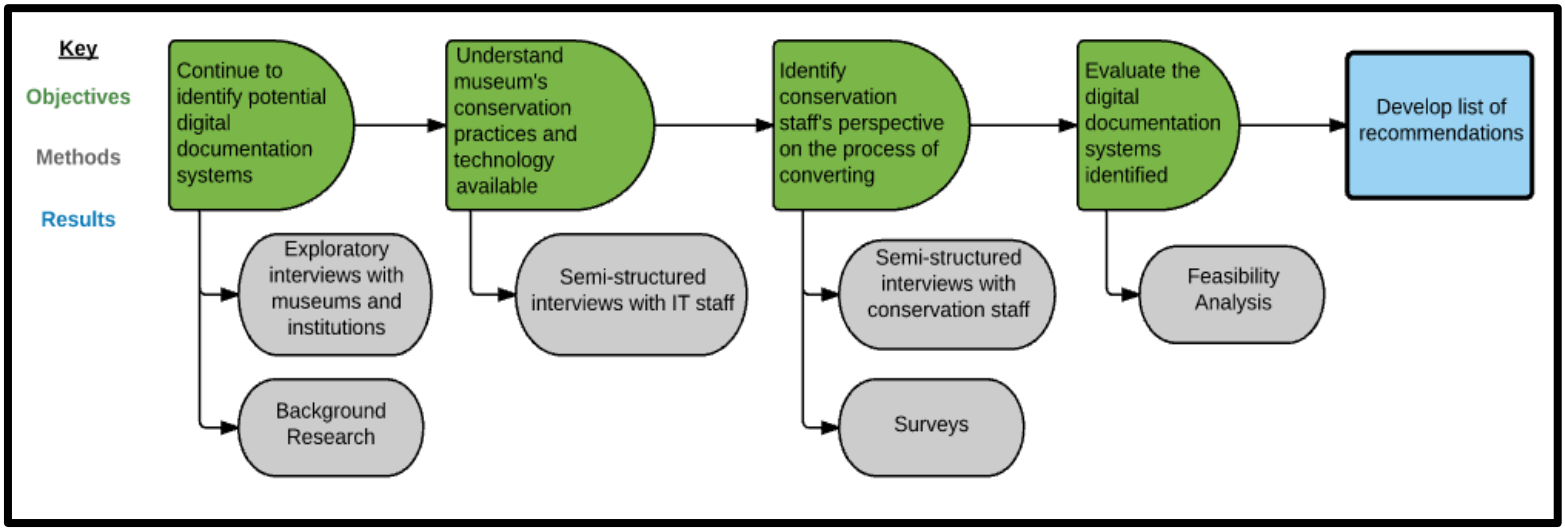
CHAPTER 3. Methodology

The goal of this project is to assist the Te Papa Tongarewa Museum in choosing a digital documentation system to aid in the management of their condition reports that also works with their existing software. To do this, the team will identify existing documentation systems used at other museums and similar institutions to create a list of recommendations based on compatibility with existing software, overall cost of the system, and user-friendliness.

The time frame for the project is from January 14th, 2016 to March 5th, 2016 although actual implementation of a recommended system most likely will occur after the completion of the team's time with Te Papa. Over the course of that time frame, the team hopes to learn more about the conservation methods at Te Papa to make proper recommendations that benefit both the conservation staff and the public who attend the museum.

The following objectives illustrate the plan for the completion of the project. The plan is further illustrated in the flowchart below.

- Continue to identify potential digital documentation systems used by other museums
- Understand the museum's conservation practices and the technology currently available
- Identify conservation staff's perspective on the process of converting to a digital documentation system
- Evaluate the digital documentation systems identified
- Develop a list of recommendations of how the museum can improve their condition reporting system



3.1 Continue to Identify Potential Digital Documentation Systems

While the team is currently identifying digital documentation systems in local museums, the team wishes to continue this research while on-site. Not all museums manage their condition reports the same way due to resources available, the quantity of objects held by the museum, and the specialization of that museum. Because Te Papa has a diverse set of exhibits, the team has the opportunity to search for documentation systems from different types of museums, such as art galleries and natural history museums. By researching other digital documentation systems, the team can learn about the systems of interest and begin formulating the list of recommendations. The list will focus on those that best apply to Te Papa's current situation of manually inputting data from condition reports of objects at the museum and objects that return from loan into KE EMu.

As of now the team has contacted the Worcester Art Museum, WPI Department of Archives, and the Boston Museum of Science. Additional museums of interest to contact include the Los Angeles County Museum of Art, the American Museum of Natural History in New York, the Foundation of the American Institute for Conservation, the National Museum of the American Indian in Washington D.C., the Museum of Science and Industry in Chicago, and the Indianapolis Museum of Art. The team will reach out to representatives of the museums and

schedule interviews with members of their conservation staff or other staff members that have knowledge on the conservation process.

Multiple members of the team will attend an interview in the event that it is possible to meet with a museum. The team will conduct semi-structured interviews with open ended questions in order to obtain answers on the conservation process, the digital documentation system in place at the museum, and the causes for the implementation of that documentation system of the museum being interviewed. When the team conducts an interview, one member will write notes of the responses while another member will facilitate the interview by asking questions. Afterward, the team will revise the notes and send them to the interviewee, along with a thank you note for taking time out of their schedule to meet. Appendix A contains the general interview planning sheets.

Due to the time constraints placed on this project, the team may not be able to speak with every representative from the listed museums. In the event museum staff are not available, the team will perform a literary review of the museum's conservation process. The main sources the team will look at are the museum website, case studies on the conservation process, or annual reports the museum publishes. The data that the team will analyze are the conservation process the museum undergoes when creating a condition report, the documentation system used to manage these reports, and the reasons justifying the use of that particular documentation system.

3.2 Understanding the Current Hardware and Digital Infrastructure at the Museum

To aid in proposing a digital documentation system that can best meet Te Papa's needs, the team must understand the hardware and digital infrastructure currently in place at the museum. By understanding the current system along with its advantages and limitations, it is easier to identify digital documentation systems that work within the constraints of the existing system and require little to no digital infrastructure upgrades. The team will also learn about the hardware and software currently available to determine if potential solutions using Te Papa's existing technology exist. In addition to inquiring about the current state of the museum's digital infrastructure as well as the hardware and software they have at their disposal, it is also important to ask if they plan on upgrading their digital infrastructure in the near future. If they plan to upgrade their infrastructure, the team can propose potential upgrades that will

accommodate advanced digital documentation technology. If they are not planning on upgrading in the near future, then the team's recommendations must remain within the current technological constraints.

The best way to answer these questions is to interview the IT staff at the museum. The IT staff are the most knowledgeable about the current digital infrastructure as well as its utilization at the museum. A semi-structured interview will ensure the team addresses all questions as well as provide an opportunity for the interviewee to inform the team of additional information not covered in the interview. At the beginning of each interview, the team will introduce the project goal and objectives of the project. In addition, the team will ask for consent on the use of the interviewee's name and the accompanying information in the final report. The team will record the interview with consent of the interviewee and then transcribe the recording into a word document. After data collection, the team will analyze the data with coding, taking into account key words and phrases that converts qualitative data into quantitative data. The interview planning sheet that addresses these questions is in Appendix B.

3.3 Understanding the User Experience

The ability to understand the user experience from the perspective of the conservation staff is a major focus of this project. The conservation staff holds a large stake in the project since they primarily benefit from the research. Information about their current procedures for conservation and condition reporting is necessary to set the standard for what potential digital documentations systems must have in order for the staff to perform their daily routine. In addition, in order to incorporate the features the staff both want and need in a digital documentation system it is important to inquire about the advantages, disadvantages, and potential improvements of the current condition report system. This information provides preliminary insight into the requirements of potential digital solutions and how to best accommodate the user. In addition to asking about the current system it is also important to query the conservation staff about their perspective on converting to digital methods, their concerns with the switch, and their general comfort level and experience in using modern digital technology. The difficulty of shifting from hard copy to digital is hard to discern if there is no background information on the past experiences of the user and their perspective on the topic.

Taking their comments into consideration is inherent to providing the user-friendly and flexible experience requested by the staff.

To garner the answers to these research questions interviewing and surveying the conservation staff is necessary. A semi-structured interview is an ideal method for gathering the bulk of the information while also allowing for flexibility to further inquire about any relevant information provided. A survey that assesses the degree to which the staff interact with digital technologies in their work and personal life is important when considering possible digital documentation systems. This is because the information gathered delineates and quantifies where the conservation staff stands as individuals and as a team in respect to comfort level and perspective. The interview planning sheet for the conservation staff is found in Appendix C.

Similar to the IT interviews, the interview begins with requesting consent from the interviewee to use their name and the accompanying information in the final report. Pending the consent of the interviewee the team records the meeting and later transcribes it into a word document. Once transcribed, the team codes the data and the uses the results for analysis of potential digital documentation systems. The survey requires a similar process. The team requests consent from the person surveyed to use their name and accompanying information, and gives the participant the survey to fill out. Once the survey is complete, the team transcribes the survey data into an excel document and then codes the data for analysis. The questions for the technology comfort survey is found in Appendix D.

3.4 Conducting a Feasibility Analysis

After the team has collected a list of acceptable digital documentation systems, the team must decide which of the potential systems will best fit Te Papa's needs by conducting a feasibility analysis. While there are likely multiple available systems that will satisfy the given requirements, the team can assist Te Papa determine which system best benefits its personnel by weighing the pros and cons of each system. Some of the factors the team anticipates to consider include the cost of the system, time spent converting the current system to the new system, and any employee training necessary to use the system. This is an important step in the process, as it could potentially save Te Papa time and money otherwise lost by using an inefficient or overly expensive system.

To analyze each system, the team will evaluate both the quantitative data of a system, such as cost, along with the qualitative data, such as user-friendliness. Using the previously collected data on the museum's technological infrastructure and the user experience, the team will determine which factors are most important to consider. The coded data gathered from interviews and surveys will allow the team to easily identify these factors. To ensure the team is weighing the factors appropriately, it is important to discuss the analysis with our sponsor once the data analysis is complete. If there is any information missing that is necessary to complete the feasibility analysis the team will address this with the sponsor during these discussions. This also assures the sponsor is able to provide feedback throughout the process and not overlook any issues. The team cannot determine many details of planning the feasibility analysis until after collecting and analyzing the data.

3.5 Generating a List of Recommendations

After evaluating and analyzing all the digital documentation systems identified with the data collected, the team will present Te Papa a list of recommended digital documentation systems. The list of recommendations will explain the details, along with the highlights of each option. Te Papa's final opinion on our recommendations is important because they will be operating and maintaining the system once the project is over. Our recommendations will hopefully help Te Papa chose the best digital documentation system to transition their condition reports to a paperless process.

Topic	Prep	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Background Research								
Interview IT and Conservation Staff								
Conduct Survey								
Evaluate potential methods								
Report and Presentation								

Figure 2: Gantt Chart

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Appendix A: Interview Plan Sheet for Additional Museum Documentation Systems

The main objective of these interviews is to learn about the digital documentation systems available at other museums. We hope to gather information on the process for creating condition reports, the documentation system in place to manage these reports, the advantages and disadvantages to the process and system, and the reason for its implementation. These interviews are aimed at conservation staff from the following museums:

- Boston Museum of Science
- Los Angeles County Museum of Art
- American Museum of Natural History
- Foundation of the American Institute for Conservation
- Smithsonian National Museum of the American Indian
- Chicago Museum of Science and Industry
- Indianapolis Museum of Art

The amount of interviews conducted will depend on the amount of responses the team gets after reaching out to the museums.

1. What is your role at the museum?
2. What makes the museum unique from a conservator's standpoint?
3. How often are condition reports created for objects on site?
4. Does the museum ever loan objects to other museums, and if so, how does the museum handle the process?
   - Amount of times objects loaned out
   - Types of objects
   - Requirement of condition reports, and if so, how frequently they are performed?
5. What are the advantages and disadvantages to this process?
6. Why did your museum adopt this system?
   - Efficiency
   - Cost of system
   - Complaints about past systems
7. Is there anything you wish the museum did differently to improve the process?

Appendix B: Information Technology (IT) Staff Interview Plan Sheet

The main objective of these interviews is to learn as much as we can about the current technology in place at the Te Papa museum, so we can better understand what constraints the proposed system will have to work with. This interview will be conducted with one or more IT staff at the Te Papa museum. One interview may be enough to gather the information we need, although multiple interviews may be necessary for us to fully understand the digital infrastructure in place.

1. What is your name? (optional)
2. What is your job title?
3. What is your job description?
4. Can you describe the digital infrastructure of the museum (i.e. Wi-Fi capabilities, bandwidth, available software, hard wired internet capabilities)?
5. What are the technological constraints of the digital infrastructure?
6. Have you worked with the conservation team before?
7. If yes, can you describe your working relationship with the conservation team?
8. Are you familiar with the KE EMu Software used by the conservation team?
9. If yes, how does the team utilize the software? Are there additional features you know of that are not utilized as of now?
10. Are there any current plans to upgrade the system in the near future?
11. Do you have any additional comments about the museum's technology?

Appendix C: Conservation Staff Interview Plan Sheet

The main objective of these interviews is to learn more about the conservation process at the Te Papa museum and the conservators opinions on their current methods of conservation. We also hope to learn more about the use of KE EMu at the Te Papa museum. This information will aid us in our feasibility analysis of potential digital documentation systems. These interviews will be conducted with willing participants at the Te Papa museum. We are not yet sure how many conservators we will be able to interview, as this depends on the number of conservators at the Te Papa museum at the time we are in New Zealand, as well as their availability.

Conservation Staff Interview Plan Sheet

1. What is your name (optional)?
2. What department do you work for?
3. What is your job title and description?
4. Describe a typical work day.
5. What is your role in the conservation process? Be as detailed as possible.
6. Do you work with condition reports?
7. If you do work with condition reports, can you describe the process of creating or editing the report?
8. What are the advantages/disadvantages of the current process of creating these reports?
9. How often do you work with the information technology (IT) staff? Can you describe your working relationship with the IT staff?
10. Are you familiar with the KE EMu software that is used for documenting condition reports?
11. If you use KE EMu, can you describe when and how you use it?
12. From our research, we found that when Te Papa creates a hard copy condition report (or receives condition reports after an artifact comes back after being on loan), the data recorded are inputted into the KE EMu software. Can you describe this process?
13. What are the advantages/disadvantages of using KE EMu?
14. Have you worked with IT staff before? If yes, could you describe the experience?
15. What do you like about the current digital system used in the museum? What are some things you wish you could change about the digital system?

16. Describe your ideal condition reporting system.
17. Do you have any additional comments on the digital infrastructure, condition reporting system, or the KE EMu software?

Appendix D: Technology Comfort Survey

This survey will help us learn about the Te Papa conservators' comfort levels with digital technology to help us determine what aspects of user-friendliness to look for in potential digital documentation systems. From this, we can predict how the Te Papa staff will react to a change towards digital technology. This survey will be sent out to Te Papa conservators and possibly any other staff who might be relevant. We hope to collect feedback from every willing Te Papa conservator.

1) What is your name and job title? (this will be kept confidential)

_____

2) How old are you? (please circle)

0 - 20 years 20 - 30 years 30 - 40 years 40 - 50 years

50 - 60 years 60+ years

3) During a typical week, how many hours do you spend using digital technology in your personal life? (please circle)

0 hours less than 10 hours 10 - 20 hours 20 - 30 hours

30 - 40 hours 40 - 50 hours 50+ hours

4) What aspects of your personal life do you believe have been *improved* by digital technology?

5) What aspects of your personal life do you believe have been *hindered* by digital technology?

6) During a typical work week, how many hours do you spend using digital technology in your routine at the museum? (please circle)

0 hours less than 10 hours 10 - 20 hours 20 - 30 hours

30+ hours

7) What aspects of your work routine (if any) do you believe have been *improved* by digital technology?

8) What aspects of your routine (if any) do you believe have been *hindered* by digital technology?

9) On a scale of 1 to 10 (1 being not comfortable and 10 being very comfortable), how comfortable are you using modern digital technology? (i.e. computers, electronic tablets, smartphones) (please circle)

1 2 3 4 5 6 7 8 9 10

10) What is your role in the conservation team?

11) Do you use the KE EMu Software as part of your work routine?

12) How much training have you completed on using the KE EMu Software?

13) How comfortable are you with using the KE EMu System?

14) Do you handle, create, or edit condition reports?

Yes No

If yes to question 14, please answer the following questions

15) When creating condition reports, which do you prefer? (please circle)

Hard copy (paper and pencil) Digital (computer)

16) Please elaborate.

17) Are you comfortable using a digital technology (i.e. computers, electronic tablet, smartphone) for condition reporting?

Yes No

18) If no, what aspects are you not comfortable with?

19) Have you ever used a stylus (electronic pen) to write or draw?

Yes No

20) Would you be comfortable using a stylus on an electronic tablet to complete condition reports?

Yes No

21) If no, what aspects are you not comfortable?

22) Do you have any additional reservations or comments about using digital technology to create, edit, or handle condition reports?