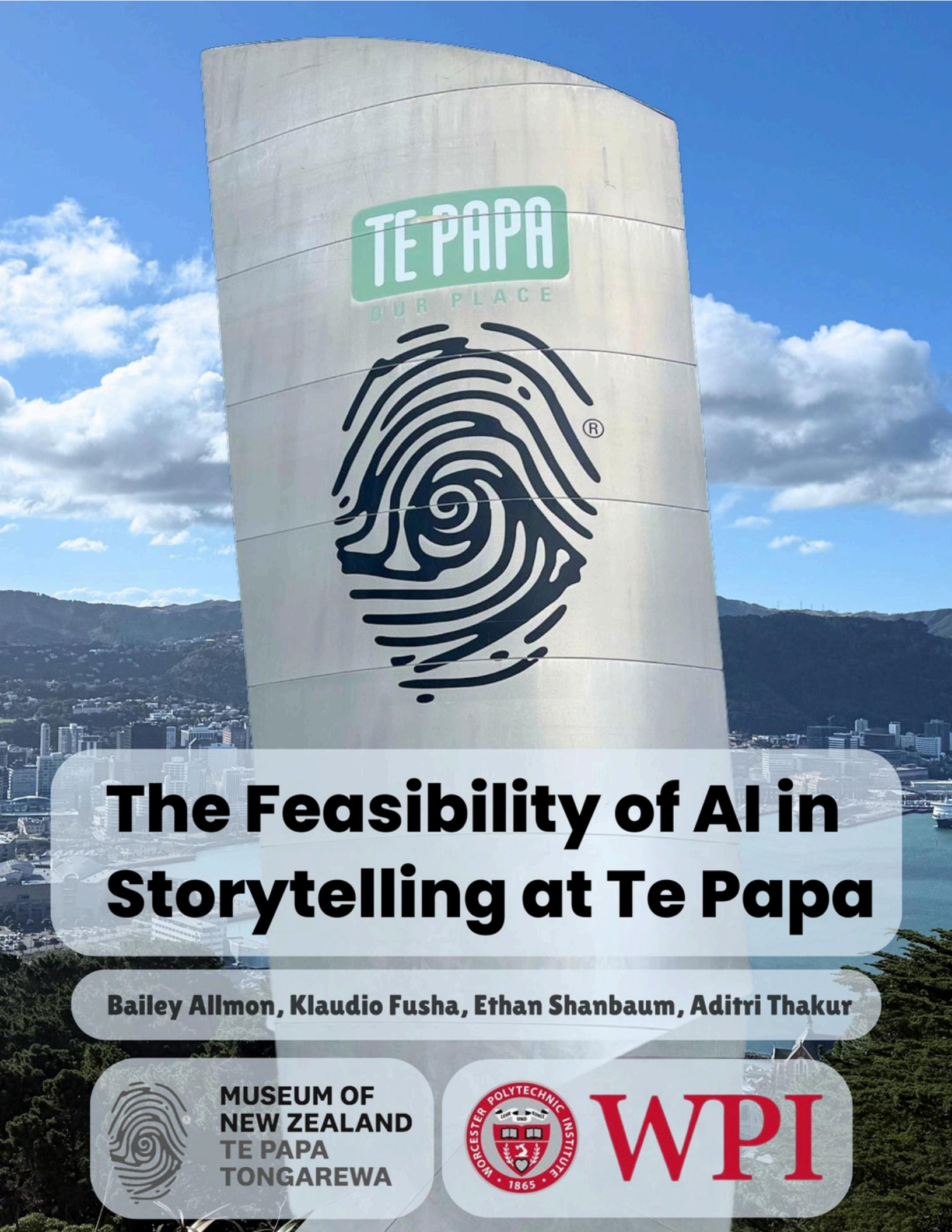

The Feasibility of AI in Storytelling at Te Papa

Bailey Allmon, Klaudio Fusha, Ethan Shanbaum, Aditri Thakur

MUSEUM OF NEW ZEALAND TE PAPA TONGAREWA

WPI

Te Papa Digital: A study exploring the feasibility of Artificial Intelligence in Storytelling at Te Papa Tongarewa, New Zealand's National Museum

An Interactive Qualifying Project Report

Submitted to the Faculty of Worcester Polytechnic Institute
In partial fulfilment of the requirements for the Degree of Bachelor of Science

Submitted on March 6th, 2025

Submitted By:
Bailey Allmon
Klaudio Fusha
Ethan Shanbaum
Aditri Thakur

Submitted To:
Samuele De Stefani
Adrian Kingston
Project Advisors:
Professor Robert Kinicki
Professor Ingrid Shockey

Abstract

This project explored the potential for Artificial Intelligence (AI) to create meaningful experiences at Te Papa Tongarewa, the national museum of Aotearoa New Zealand. We evaluated the feasibility of using AI in storytelling by exploring the limitations of AI, gauging visitors' perceptions of the tool, and assessing preferred engagement in museum platforms. Through participant observation, interviews, archival data analysis, and surveys, we found an opportunity for the museum to serve in an educational capacity about AI. We also noted a need for information accessibility and creative collaboration. Our recommendations included building an exhibition about AI in Aotearoa, creating personalized AI-generated tours, and applying AI in Collections Online to show connections.

Executive Summary

Introduction and Background

Artificial intelligence (AI) innovations aim to transform how we teach, share, and consume information. At Te Papa, AI has the potential to create meaningful experiences through stories, bringing narratives to life through interactive techniques. To explore this opportunity and provide recommendations for responsible AI usage, we identified the following objectives:

1. Explore the technical/cultural limitations and standards of AI in the museum.
2. Gauge Te Papa visitor perceptions of AI implementation and interactivity.
3. Identify and assess prospective methods for AI engagement in platforms or exhibitions.

Te Papa's mission prioritizes the *mana* (authority) of all communities in Aotearoa (Museum of New Zealand - Te Papa Tongarewa, n.d.-f). It celebrates bicultural belonging, cultural sovereignty, and biodiversity as elements that strengthen its influence as a Tiriti-based museum supporting Māori co-governance (Museum of New Zealand - Te Papa Tongarewa, n.d.-f). Given that Māori and Pasifika have authority over their cultural information through data sovereignty, their principles on protecting data and its usage are vital in developing experiences that respect the diversity of Aotearoa (Te Mana Raraunga, n.d.; Ministry for Pacific Peoples, n.d.). Additionally, the voice of museum visitors is integral to Te Papa, since they are the people experiencing these stories.

Insights from our case studies of AI applications provided potential opportunities for Te Papa. The Living Museum is a dynamic online artifact collection based on The British Museum's collection (Talmi, 2024). The Living Museum uses a large language model to provide information conversationally, allowing for engagement with artifacts on a deeper level and opening a possibility for storytelling, but introducing concerns about data sourcing (Talmi, 2024). A clear benefit of AI is its interactivity, enabling personalization as this technology learns from its users. However, it is important to address concerns from both visitors and data owners about the responsible use of information to ensure true representation and respect. Moreover, enhancing stories at Te Papa should be at the forefront of any implementation to create connections between visitors and Aotearoa New Zealand.

Approach to data collection

We conducted interviews with five technical and cultural experts to explore the limitations and standards of AI. We also conducted our own participant observation, analyzed Te Papa's internal archival survey data, collected 97 in-person surveys, and conducted general AI pop-up web surveys with 68 online users to gauge visitor perceptions of AI and interactivity. We coordinated engagement pop-up web surveys to understand visitor experience and engagement, collecting 134 user responses on Te Papa's Collections Online website. Lastly, we interviewed three developers at Te Papa to understand the process for curation and considerations of an engaging and successful platform or exhibition. We summarized our approach to data collection in Figure E.1. Both qualitative and quantitative data informed our results.

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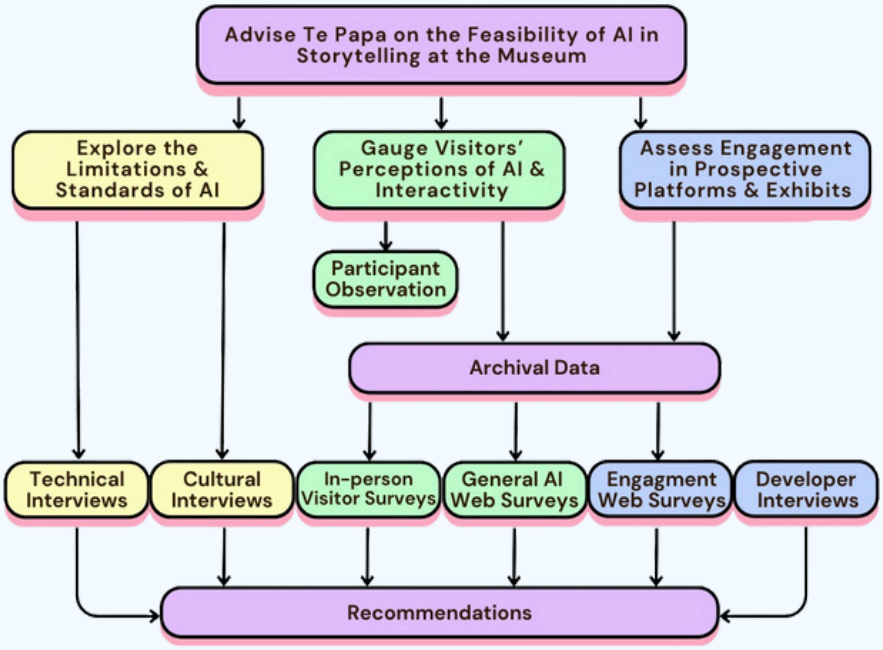

Figure E.1: Flowchart depicting the project goal, objectives, methods, and outcome.

Summary of Key Findings

Objective 1: Explore the technical/cultural limitations and standards of AI in the museum

In discussing the limitations of AI with five technical and cultural experts, we found overlapping concerns of **hallucination**, **bias**, and **data sovereignty** when implementing AI. Four technical experts expressed that training AI models with biased knowledge creates a high chance of **biased outputs**. Each technical expert suggested solutions to minimize these concerns, including **frameworks** and **sovereign AI** models. On the positive side, the experts highlighted the potential for AI to process data in ways and speeds that we cannot do with traditional analysis.

Cultural experts helped us gain insight into the range of perspectives in Aotearoa. To that end, each iwi and community is unique in its *taonga* (treasure), practices, and perspectives of AI. All three cultural experts agreed that **constant collaboration** with data owners is vital to proper representation of their data in any way, but especially in AI considering the uncertainty that surrounds it.

Objective 2: Gauge visitor perceptions of AI implementation and interactivity

From our participant observation, we noted that the museum had an opportunity for AI implementation given their use of technology and interactive mediums. The museum's online database, Collections Online, benefitted from the vastness of the museum's artifacts, allowing us to explore an immense amount of historical and cultural information. Many artifacts include a picture, which helped with feeling immersed, but they lack descriptions, which limits the storytelling ability of the database.

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In the in-person survey of 97 museum visitors, 80% of respondents reported that Te Papa's current interactive exhibits were very or extremely effective in **improving** their **learning** at the museum. The surveys also showed that visitors imagined AI could be used for recreating past scenes, question-and-answer chat-bots, and **tour guides or personalization**. These results encourage continued development of interactive exhibits. When looking to develop this interactivity with AI, we found the most common visitor concern was **inaccuracy**. One factor that could affect visitor concerns is familiarity with AI. Figure E.2 depicts a cross-analysis between responses to two Likert-scale survey questions: "What are your overall feelings toward AI?" and "How familiar are you with Artificial Intelligence (AI)?" As respondents reported **more familiarity** with AI, they also reported **more positive feelings** toward AI. Thus, increasing familiarity with AI may lead to more positive perceptions.

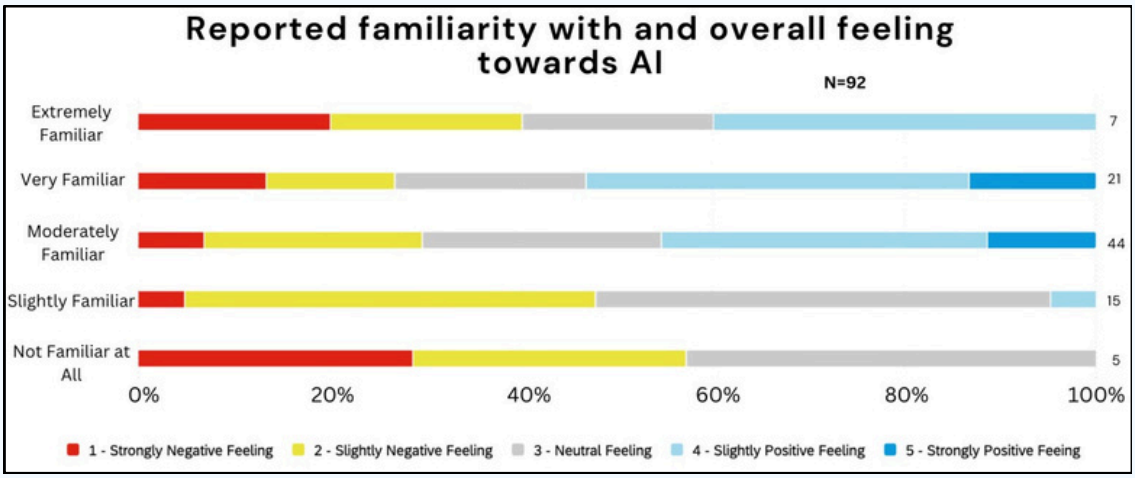

Figure E.2: Visitors' reported familiarity with and overall feeling towards AI.

On our general AI pop-up web surveys, some respondents questioned the explicit need for AI and had concerns about authenticity. In addition, a Māori participant noted a perspective on authenticity, stating: "…[AI] may take away the essence of our history and somewhat have an impact on the way we perceive our artifacts." If the museum inputs cultural data, stories, or other *taonga* (treasure) into AI, it may warp how visitors perceive *taonga* and Māori culture.

Objective 3: Identify and assess prospective methods for AI engagement in platforms and exhibitions

Figure E.3 depicts the results of coding 74 open-responses on the engagement pop-up web survey. The most common AI implementations listed were a tool that would help with **finding related items** or **finding connections** between items and a tool that would improve search functionality.

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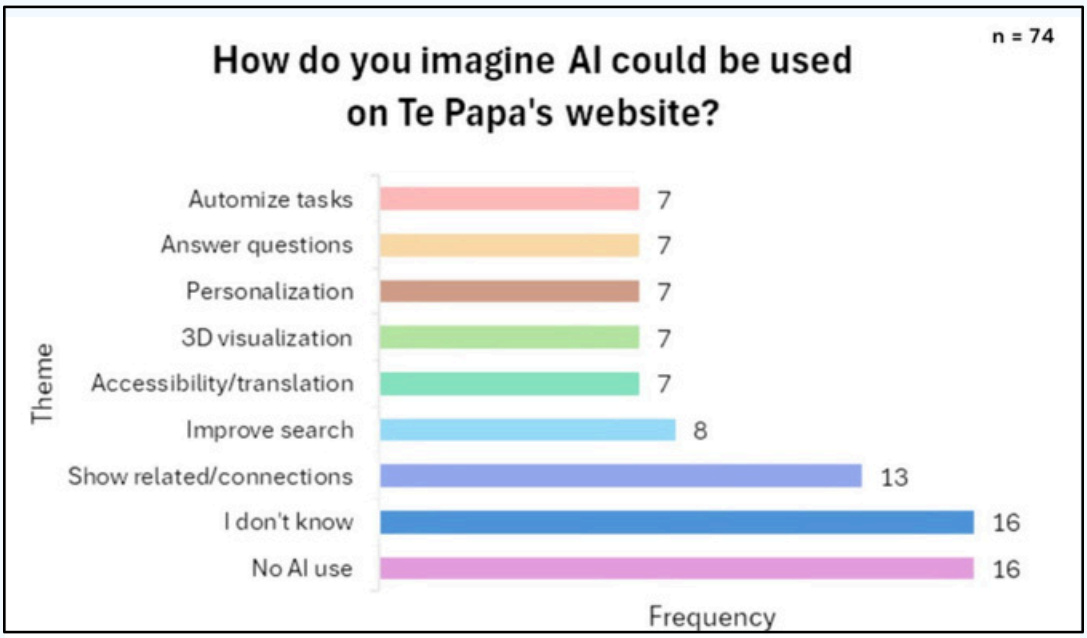

Figure E.3: How do you imagine AI could be used on Te Papa's website?

When Te Papa seeks to implement AI in any of these visitor-suggested ways, we learned from three developer interviews that they value the impact of implementation on their audiences. Adrian Kingston, Head of Digital Channels, emphasized that development on Te Papa's website focuses on finding the best, **accessible ways** to expose new people to **interesting content**. Overall, Courtney Johnston, Chief Executive, explained her vision of success for Te Papa with this quote: "Real success will be when new people who haven't benefited from the collections and the research and the knowledge start to get benefit."

The developers at Te Papa understand that a story is at the heart of exhibitions and is a tool to create connections between content. Consequently, the developers reported concern with AI increasing the bias that already naturally exists in human-created content at the museum. Overall, Te Papa can maintain visitor trust by remaining transparent, demonstrating responsible use of any AI directly to the public, and ensuring its accuracy and respectful implementation.

Recommendations

The results from our methods culminated in three recommendations for AI in storytelling at Te Papa. We hope these recommendations can help inform the future use of AI at the museum.

Recommendation 1: Curate an exhibition that tells the story of AI in the context of Aotearoa

This exhibition would serve to introduce visitors to the opportunity AI creates and help them understand the diverse concerns that this technology brings to Aotearoa. It is important for the exhibition to encourage visitors to recognize that frameworks and consistent collaboration can result in responsible AI use.

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Recommendation 2: Use AI to create personalized in-person tour experiences

A web page would allow the user to put in a couple of relevant topics that they are interested in learning about at Te Papa. An AI tool would then generate a tour based on the topics, and by association create a more personalized storytelling experience. The tool will generate a set of written instructions and an accompanying map to help the user navigate the museum to find their specific interests.

Recommendation 3: Apply AI in Collections Online to draw connections between artifacts and enhance search functionality

An AI tool that generates summaries based on the user's search query in Collections Online could improve access to information on the website. An additional page that focuses on connecting the information of artifacts based on user-input topics could also enhance the interconnectedness of artifacts and the stories they tell (see Figure E.4). Te Papa can provide an option to search the collections without AI for users who have concerns with this technology. It is also essential to ask Collections Online data owners for permission to use their data in these AI tools to ensure data sovereignty.

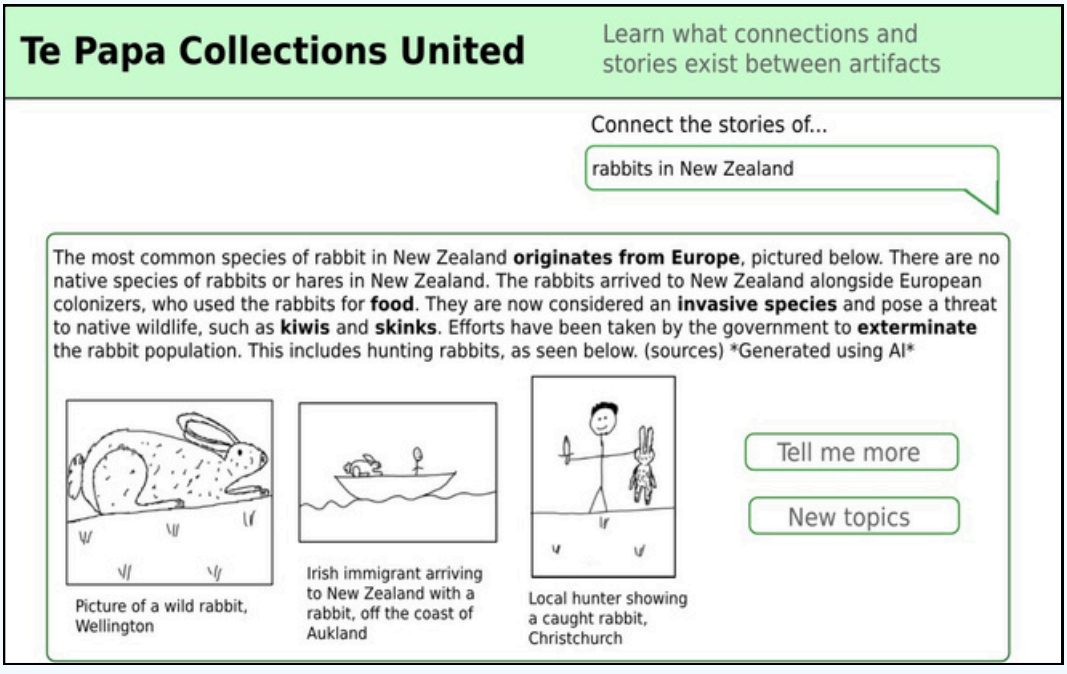

Figure E.4: Mock-up of an AI tool to connect stories of artifacts.

Conclusion

As the national museum of Aotearoa, Te Papa is a leader for museums and educational institutions across New Zealand. We hope these recommendations would not only enhance the storytelling abilities of Te Papa, but potentially other museums if they take inspiration from Te Papa's actions. Additionally, our recommendations could contribute to the inclusivity of Māori and Pasifika voices when collecting and understanding cultural data. By creating meaningful experiences with AI responsibly and respectfully, Te Papa can teach visitors about New Zealand's treasures–its stories.

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Acknowledgements

We would like to thank the many individuals that played a role in the success of our project. First, we appreciate our eight interviewees that took the time to speak with us and provide us with insight on the technical, cultural, and museum development factors to consider in assessing the feasibility of AI at Te Papa. Additionally, we would like to thank the 97 in-person survey respondents and 202 web survey respondents whose opinions were integral to our project.

We enjoyed working with Te Papa and learned so much about audience considerations and representation through our project. Specifically, we are very grateful for our partners Samuele DeStefani and Adrian Kingston for the opportunity to collaborate with Te Papa, their support throughout the project, access to archival data, organization of interviews, and invaluable guidance. We appreciate all the time spent and feedback given by our advisors Professor Robert Kinicki and Professor Ingrid Shockey. Finally, we would like to thank Worcester Polytechnic Institute's Global Projects Center for their hard work that made this opportunity for us to grow as students and people possible.

Authorship

Section	Author	Editor
Abstract	A. Thakur	B. Allmon
Executive Summary	All	All
Acknowledgements	B. Allmon	All
Chapter 1 - Te Papa's Opportunity	All	All
Chapter 2 Preface	B. Allmon	A. Thakur, E. Shanbaum
2.1 - The Promise of AI	A. Thakur	B. Allmon, K. Fusha
2.2 - Te Papa: A mission to engage, attract, and educate	B. Allmon	A. Thakur, K. Fusha
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2.4 - Museum safeguards for responsible AI usage	E. Shanbaum	B. Allmon, A. Thakur
2.5 - Public perceptions and cautions about the use of AI	E. Shanbaum	A. Thakur, B. Allmon
2.6 - Learning from museum applications of AI	B. Allmon	K. Fusha
2.7 - Summary	E. Shanbaum	A. Thakur, B. Allmon
Chapter 3 Preface	K. Fusha	E. Shanbaum, B. Allmon
3.1 - Objective 1	K. Fusha	B. Allmon, E. Shanbaum
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4.1 - Objective 3	A. Thakur, B. Allmon, E. Shanbaum	K. Fusha
4.2 - Discussion	All	All
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Chapter 5 Preface	B. Allmon	E. Shanbaum
5.1 - Recommendation 1	B. Allmon	A. Thakur
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Appendix J	B. Allmon	A. Thakur

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Appendix L	E. Shanbaum	K. Fusha
Appendix M	All	All

Note: All team members contributed equally

Meet the Team

Bailey Allmon

Kia Ora! My name is Bailey Allmon and I'm from Maryland. I'm a current third-year Biomedical Engineering major at WPI. I've really enjoyed exploring Te Papa and the diverse cultures and wildlife of Aotearoa! I am very grateful for the experience to work with Te Papa, as I've learned its value to the community and reflected upon the responsibilities of museums.

Klaudio Fusha

Hello everyone! My name is Klaudio Fusha and I'm from Waterbury, Connecticut. I'm a junior double-majoring in Computer Science and Data Science at WPI. I have been grateful for the ability to dive deeper into real-world applications for AI, especially in Aotearoa. Oftentimes, we ignore the impact of these technologies. Through this project, I learned that we need to take cultural considerations for AI use into account on a global scale.

Meet the Team

Ethan Shanbaum

Hello! My name is Ethan Shanbaum and I'm from Southbridge, Massachusetts. I'm a junior double-majoring in Computer Science and Data Science at WPI. I've had a blast exploring Wellington and understanding more about the culture of Aotearoa. This project has expanded my perspective in regards to the use of artificial intelligence. It has been amazing making connections with the staff at Te Papa and getting to explore the museum!

Aditri Thakur

Hey there! My name is Aditri Thakur and I'm a third-year Robotics Engineering and Computer Science student at WPI. I've had an amazing time in Aotearoa New Zealand and I've loved working with Te Papa. This project has taught me a lot about the complexities of authority and integrity within AI. It has been great talking to so many people from visitors to experts and hearing their perspectives!

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Chapter 1: **Te Papa's Opportunity**

A revolution in digital learning is shaping approaches to teaching, sharing and consuming information in the public educational space. Among these institutions, museums are uniquely in a position where they can leverage emerging artificial intelligence (AI) technologies for public interactivity. These tools offer a fresh mechanism for attracting visitors and amplifying the scale and impact of exhibitions and museum platforms by making them more immersive and personalized. Nevertheless, research in AI museum applications must weigh both the feasibility and challenges of implementations on a case-by-case basis.

Te Papa Tongarewa, the national museum of Aotearoa New Zealand, has a mission to provide meaningful experiences to its visitors. The museum is a point of pride for Wellington and all of Aotearoa New Zealand. It upholds its mission to value the past in order to better the present, and to focus on the future while prioritizing the nation's multicultural values (Museum of New Zealand - Te Papa Tongarewa, n.d.-f). The museum has garnered a global audience for both this "scholarly" and "innovative" approach to education, both in the physical and online space (Museum of New Zealand - Te Papa Tongarewa, n.d.-a).

To remain on the cutting edge in museum technologies and continue to captivate visitors, Te Papa saw an opportunity to harness AI applications, particularly to explore prospective implementations that enhance storytelling. AI offers ease of use, rapid information processing, and the option for wide distribution. While AI-driven applications can serve as valuable tools, responsible implementation of AI in any use case necessitates understanding public perceptions and laws. At Te Papa, this means acknowledging visitor feedback, exploring ethical considerations, and ensuring that the application follows the museum's standards to express and share the history and culture of Aotearoa. AI also raises questions about data sovereignty for Māori and Pasifika stories. As noted by Tahu Kukutai, a Māori expert in data sovereignty issues, "For Māori, the desire for such autonomy is rooted in history…" and therefore, careful research may ensure accordance with the museum's mission (Hao, 2022; Museum of New Zealand - Te Papa Tongarewa, n.d.-f).

The goal of the project was to advise Te Papa on the feasibility of AI in storytelling at the museum. We identified the following objectives to achieve our goal:

1. Explore the technical/cultural limitations and standards of AI in the museum.
2. Gauge Te Papa visitor perceptions of AI implementation and interactivity.
3. Identify and assess prospective methods for AI engagement in platforms or exhibitions.

We determined that it is important for Te Papa to mitigate data sovereignty concerns by involving Māori and Pasifika communities throughout the process of any AI implementation. We also found an opportunity to increase familiarity with AI. More familiarity may lead to more positive outlooks of AI, which provides an opportunity to implement this technology at Te Papa. Lastly, we concluded that storytelling is essential throughout the museum and it is feasible for AI to expand storytelling opportunities and accessibility with transparent and responsible implementation. These findings inspired final recommendations, which encourage Te Papa to:

1. Curate an exhibition that tells the story of AI in the context of Aotearoa.
2. Use AI to create personalized in-person tour experiences.
3. Apply AI in Collections Online to draw connections between artifacts and enhance search functionality.

By considering these AI implementations and the perceptions our research collected, Te Papa can enter this evolving field with confidence pertaining to what is feasible in a museum setting.

Chapter 2: **Understanding AI in Society**

This chapter presents the promise of AI and highlights concerns and controversies that might shape its use in an educational setting. We also discuss its application opportunities.

2.1 **The promise of AI**

Artificial intelligence is an emergent field designed to imitate human abilities in learning, conversing, and the generation of knowledge. The type of AI seen most often today is Generative AI (Gen AI); Gen AI draws from a "…simplified representation of…[its]…training data … to create new work that's similar, but not identical…" (Kavlakoglu & Stryker, 2024). However, the concept of AI has been around since 1935. In the last decade, scientific innovation has transformed AI to human-level performance due to the growth of machine and deep learning tools (Copeland, 2024).

The relationship between data and AI is symbiotic. For example, some generative AI relies heavily on vast amounts of data to learn patterns and make predictions (Mucci, 2024). When this data includes user-specific information, such as a user's previous interaction, AI can make its predictions specific to the user, creating a personalized experience that many consumers are beginning to expect (M. Lee, 2024). This capacity for personalization may enhance learning to become more dynamic for each unique learner.

Applications that harness AI's ability to analyze large quantities of data make it an exciting tool at the cutting edge of education. With careful design and curating, AI can potentially create meaningful stories using museum data, bringing narratives to life through visual and multimedia techniques. Storytelling is a powerful framework for museums to strengthen connections between visitors and the exhibition, making it an effective tool for engaging diverse audiences and conveying elaborate topics (Boris, 2017). Additionally, connections that storytelling creates can result in improved knowledge retention (Boris, 2017). This research suggests that using AI for interactive storytelling can help visitors be more engaged with a museum's experiences, with the potential for personalization to further enrich learning.

2.2 **Te Papa: A mission to engage, attract, and educate**

Located on Wellington's waterfront, Te Papa, the national museum, is a point of pride for Aotearoa New Zealand. Having reached 30 million visitors in 2019, including international audiences, Te Papa understands that their "...success is built on…[their]...relationships with and … ability to represent…[their]...community" (Museum of New Zealand - Te Papa Tongarewa, n.d.-e, n.d.-a). Te Papa's mission prioritizes the *mana (authority)* of all communities, bicultural belonging, sovereignty, and biodiversity which guides their decisions and maintains an influential *Tiriti-based museum* in support of Māori co-governance (Museum of New Zealand - Te Papa Tongarewa, n.d.-f). Figure 2.1 depicts the principles of Te Papa's operations. Te Papa has an Audience and Insight Directorate that prioritizes their audience throughout the development of exhibits to create impactful visitor experiences (Museum of New Zealand - Te Papa Tongarewa, n.d.-d). This includes exploring novel engagement technologies, such as AI.

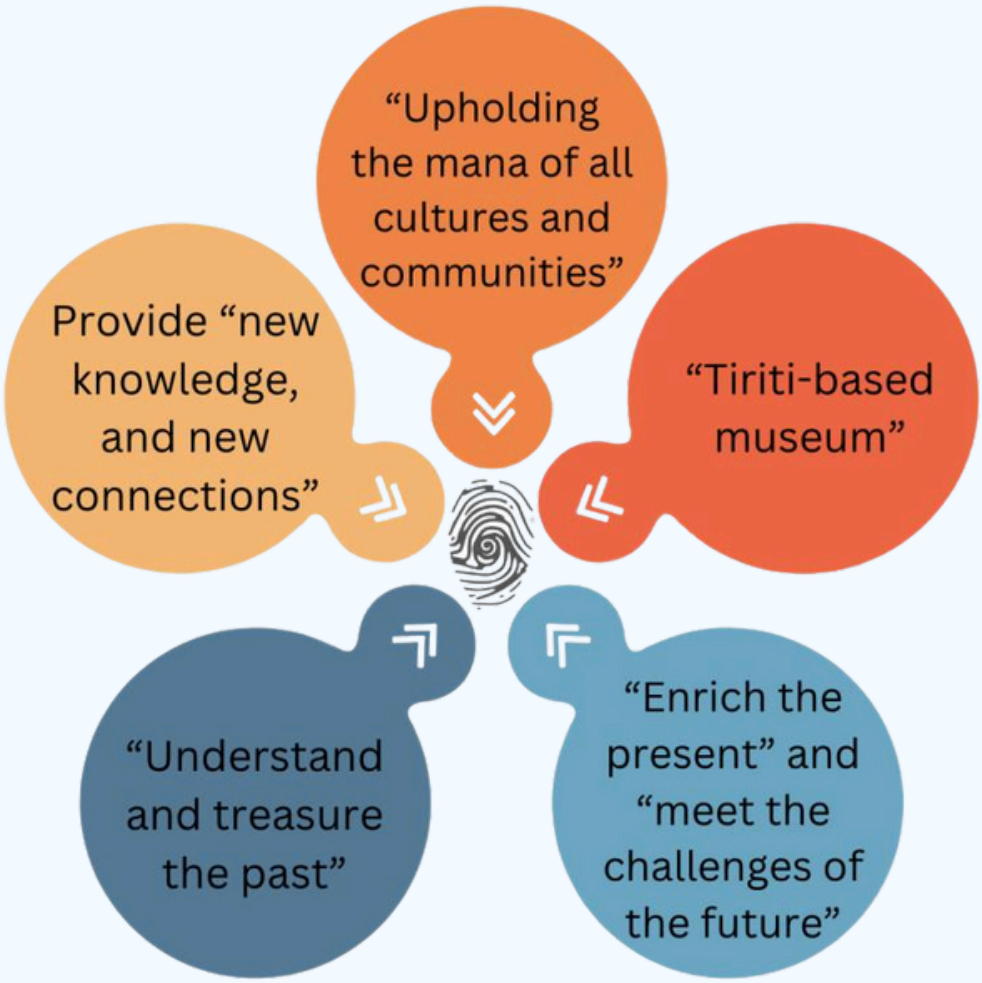


Figure 2.1: Te Papa's priorities that fuel their empowerment of the Aotearoa New Zealand identities (Museum of New Zealand - Te Papa Tongarewa, n.d.-f).

One of Te Papa's main goals in "The Museum of New Zealand Te Papa Tongarewa Act 1992" is to "unite the collections… so that New Zealand's stories could be told in an interdisciplinary way" (see Figure 2.2) (Museum of New Zealand - Te Papa Tongarewa, n.d.-e). The collections at Te Papa, composed of over two million artifacts, represent a wide range of topics such as natural history, art, and the cultures of the diverse people of the country (Museum of New Zealand - Te Papa Tongarewa, n.d.-b). By displaying these diverse artifacts both in- person and online, the knowledge they represent unites into a comprehensive story about Aotearoa. Not only is the union of knowledge important for the museum, but it is also important for the visitors. This union creates storytelling opportunities to draw connections between the visitor and the culture of Aotearoa. AI could provide the opportunity to further emphasize these connections.

Figure 2.2: Museum of New Zealand - Te Papa Tongarewa in Wellington, New Zealand (Photo taken by Ethan Shanbaum).

2.3 **Learning from trends in visitor engagement**

Museums actively explore techniques to boost engagement and learning. To do this for all visitors, they must cater to skimmers, swimmers, and divers; our partners at Te Papa highlighted this categorization that represents the depth of learning that visitors want from the museum. Exhibition and online platform developers must ensure that all three types of visitors and their learning styles can be satisfied in the museum and website through various ways to present information. A more recent development is that of mobile applications (Wen & Ma, 2024). For example, a study of *Ask Dr. Discovery* observes the effects of traditional versus game versions of mobile applications for engagement (Nelson et al., 2020). The traditional *Ask Mode* served as the default component where museum visitors could ask Dr. D questions about objects on display and receive pre- programmed responses, while the *Game Mode* sent visitors on a mission with the aforementioned character to get him to his spaceship by asking questions (Nelson et al., 2020). Analysis of pre- and post-surveys of 1539 participating visitors compared the effectiveness of both versions of the application (Nelson et al., 2020). Ultimately, *Game Mode* resulted in a use rate about two times greater than *Ask Mode* (Nelson et al., 2020). This demonstrates that games can help engage visitors, and indirectly encourage learning.

Museums have long boosted engagement and learning through technologies tied to kiosks or virtually linked audio guides (Pallud, 2017). This type of audio platform reduces the area for physical text needed to explain exhibits and encourages interactivity. Furthermore, interactive kiosks adopt a Q&A strategy to provide visitors with ample amounts of information. Professor Jessie Pallud determined that "...ease-of-use and interactivity…" aspects of these technologies boosted engagement and subsequently improved learning (Pallud, 2017). With this digital effectiveness, the incorporation of more advanced technologies, specifically in the realm of AI, prompts further investigation to explore the potential for enhanced storytelling experiences using existing devices.

2.4 **Museum safeguards for responsible AI usage**

Like most institutions, Te Papa has already brought AI into their operations (Chumko, 2023). They proactively established an AI Guidance Group to prioritize the exploration of generative AI applications and to evaluate its impact (Watkins, 2024). The museum also acknowledges an ethical responsibility to provide a learning space that reflects its mission and the interests of the owners of the stories that the museum presents in its exhibitions. The ethical representation of culture and identity is essential in a multicultural learning environment. Thus, safeguarding against AI bias becomes integral, especially given the known concerns of AI misrepresentation (Holdsworth, 2023).

The Te Mana Raraunga is an organization dedicated to the preservation of Māori data sovereignty in an increasingly technological world (Te Mana Raraunga, n.d.). Similarly, the Ministry for Pacific Peoples dedicates itself to advising on topics and policies relating to Pacific peoples, including the nuances of data sovereignty (Ministry for Pacific Peoples, n.d.). Given that Māori and Pasifika consider data to be cultural treasures, their principles on protecting data and its usage are vital feedback in developing an exhibition that respects the diversity of Aotearoa. Finally, the voice of museum visitors is integral to project development success, since they are the people experiencing the stories Te Papa hosts.

2.5 **Public perceptions and cautions about the use of AI**

AI learns from training data and then analyzes it to create new content. Some AI models like large language models need hundreds of gigabytes of data to make reasonable predictions. Thus, many creators purchase large amounts of data or use web-scraping which makes no distinction between work in the public domain and copyrighted work (Nature, 2024). This leads to AI work using copyrighted sources without proper citation or accreditation. When used in a storytelling-based application, this can create issues with reliability, authority, and ownership of the stories. AI applications can also collect data from their users to personalize outputs, generating user privacy concerns. Finally, AI is a human creation, meaning it will reflect biases present in its training data and algorithms. Understanding the limitations of the use of AI is an important component for recommendations.

There are frameworks in place that creators can adopt to mitigate these issues. For instance, the EU has a general policy on the development of training data that can boost credibility and mitigate stolen work by requiring developers to credit sources of training data (Nature, 2024). Policies can also create safeguards for protecting ownership of user data collected by AI applications. Additionally, equipping new AI models with a Retrieval-Augmented Generation framework can enable these technologies to eliminate training data gaps by fetching information from outside sources and citing relevant papers (Merritt, 2023; Nature, 2024). Recent advancements in open-source models, such as DeepSeek R1, have enabled researchers to better understand how these AI models operate (Duncan, 2025). This is because technical data about the development of DeepSeek R1 is publicly available, which implies greater transparency when using the model (Duncan, 2025). The open-source nature of this model could enable individuals to more easily create their own custom and personalized models, which could be of interest to Te Papa.

The government of New Zealand established a legal framework for the use of algorithms in 2020. Stats NZ published the *Algorithm Charter for Aotearoa New Zealand*, which assesses risks that could result from the use of complex algorithms with large data sets and provides governmental guidance (Stats NZ Tatauranga Aotearoa, 2020). This may include predictive algorithms that AI software uses and data sovereignty challenges unique to Aotearoa. The Algorithm Charter addresses these challenges by suggesting that the use of algorithms should coincide with the Treaty of Waitangi and ensure a degree of human oversight to determine biases and unintended consequences (Stats NZ Tatauranga Aotearoa, 2020). Although AI models have advanced greatly since the publishing of the charter, this technology still uses algorithms to train and operate. Therefore, the recommendations provided in the charter are still relevant.

The Treaty of Waitangi is the framework for the relationship between Māori and the British Crown (Orange, 2012). One way this manifests is through the idea of data sovereignty, or the idea that the use of cultural data should remain under the authority of the owning entity (Te Mana Raraunga, n.d.). Attention to preserving this sovereignty is critical since early examples of AI received public criticism for perpetuating dominant narratives and offensive stereotypes (Holdsworth, 2023). Currently, these issues continue to be a topic of discussion. A document on Māori data sovereignty articulates that the "Māori have the right to control the development, and use of an algorithm…," demonstrating that the Māori consider algorithms involving their data to be *Mātauranga Māori* (Māori knowledge) and the use of such algorithms should take into account Māori perspectives (Brown et al., 2024). Therefore, any use of Māori information or stories in AI algorithms or data sets must abide by Māori cultural principles.

Like the Māori, the Pasifika have their own perspective on data sovereignty. A report by the Ministry for Pacific Peoples (MPP) examines data collection through the lens of the Kakala framework, a traditional Tongan weaving practice (Ministry for Pacific Peoples, 2023). Utilizing data-related technology through this lens can lead to a better understanding of the Pasifika community and their perspective on cultural data in contrast to Western views (Ministry for Pacific Peoples, 2023). The MPP recognizes a lack of inclusion of Pasifika people in the accumulation and analysis of their cultural data. Therefore, Te Papa must also abide by data sovereignty principles when handling data and cultural knowledge from Pacific sources.

Finally, Te Papa should honor the perceptions or concerns that New Zealanders have towards AI. In 2023, Verian – an independent research group – conducted a survey with 853 New Zealanders who know about AI. It revealed that 42% of respondents said they were "more concerned than excited" about AI, while only 11% of responders were "more excited than concerned," indicating that many citizens, and potential visitors, had some form of concern relating to the use of AI as of 2023 (Matika, 2023). The primary items cited included malicious use of AI, a lack of regulation, unintentional consequences, inaccurate information, and privacy (Matika, 2023). Given the public's perceptions on this technology, Te Papa has a responsibility to consider and address privacy and accuracy concerns about the use of AI and to ensure a positive and comfortable visitor experience on a case-by-case basis.

2.6 **Learning from museum applications of AI**

Integrating the newest technological developments appears to be successful for museums, inviting visitor interest from the application alone. Recent implementations that harnessed AI can provide insight into opportunities at Te Papa.

The British Museum compared to The Living Museum conversations

Still in development, *The Living Museum* is a dynamic online collection of 1.2 million objects from The British Museum's (TBM) total collection of 8 million (Talmi, 2024; The British Museum, 2020). It is one of the newest and largest innovations in museum AI implementation, and known for its use of direct conversation to bring the collection to life. However, an unaffiliated application of AI makes TBM's collection more impactful to visitors. Instead of stagnant images and facts, *The Living Museum* uses AI to carry a conversation between the artifact and the visitor. The visitor can ask any question, and the AI model will suggest points of interest, and share the story of the artifact. The AI behind the Living Museum provides highly personalized interaction and freedom for exploration that benefits visitor learning (Talmi, 2024). This conversational AI allows for engagement with artifacts on a deeper level without any physical presence, opening a possibility of storytelling through generated conversation.

Another change to TBM's traditional collection through AI implementation lies in data sourcing. TBM's collection includes information compiled from 250 years of museum content, ensuring online visitors receive credible content (The British Museum, n.d.). *The Living Museum* draws upon knowledge from large language models to provide information in a conversational manner (Talmi, 2024). This raises questions about the reliability of the information distributed through the conversation with AI. The sourcing of information presented in conversation is also unknown to the public in this application, highlighting three important factors to consider in determining the feasibility of implementation at Te Papa: reliability, authenticity, and data sourcing.

NoRILLA for STEM education

NoRILLA is an application on the cutting edge of STEM education and engagement for children. It is a mixed-reality AI exhibit that Carnegie Mellon University's faculty developed for museums and other educational settings (Children's Museum of Atlanta, 2021). NoRILLA utilizes tangible props such as blocks and earthquake tables, along with a virtual AI helper, and AI feedback to explore learning based on users' interactions with the space (see Figure 2.3) (Lacovara, 2024). During primary testing, researchers found that this mixed reality system improved scientific understanding, engineering implementation, and increased the amount of time spent at the exhibit while maintaining enjoyment for children (Yannier et al., 2022). NoRILLA's implementation assessments indicated that mixed reality systems can enhance interactions, resulting in up to five times more learning than interactions conducted solely with a screen (Children's Museum of Atlanta, 2021).

Figure 2.3: The mixed-reality platform NoRILLA, reprinted with permission (Yannier et al., 2022).

Te Papa may be able to implement similar systems that engage their many school groups and young visitors in a more educational experience than traditional methods. Particularly, NoRILLA's usage of AI to follow the motion of objects and users as they explore suggests the value of implementing a system adaptable to each user and applicable to a wide array of audiences and exhibits. Exploring NoRILLA's teaching methods of "contrasting cases, self-explanation, predict-observe-explain, and real-time interactive feedback" could elevate educational impact in a unique way (Yannier et al., 2022). In implementing AI, it may be of interest to create a foundation of these effective teaching methods in order to avoid the common pitfall of meaningless, but eye-catching interactivity.

2.7 **Summary**

AI can provide an opportunity to expand the museum's visitor engagement. A clear benefit of AI is its interactivity, enabling personalization as this technology learns from its user. It is important to address concerns from both visitors and data owners about the responsible use of information that ensures true representation and respect. The goal of AI implementation is to provide meaningful user connections that can maintain integrity and sustainable delivery of the museum's goals. Enhancing stories at Te Papa should be at the forefront of any implementation to create the connections between visitors and Aotearoa New Zealand.

Chapter 3: **Approach**

The goal of this project was to advise Te Papa on the feasibility of AI in storytelling at the museum. To achieve this goal, we identified the following objectives:

1. Explore the technical/cultural limitations and standards of AI in the museum.
2. Gauge Te Papa visitors' perceptions of AI implementation and interactivity.
3. Identify and assess prospective methods for AI engagement in platforms or exhibitions.

This chapter explores the methods the team implemented to address these objectives. Figure 3.1 illustrates the project flow from these objectives, to methods and producing recommendations for an AI implementation at Te Papa.

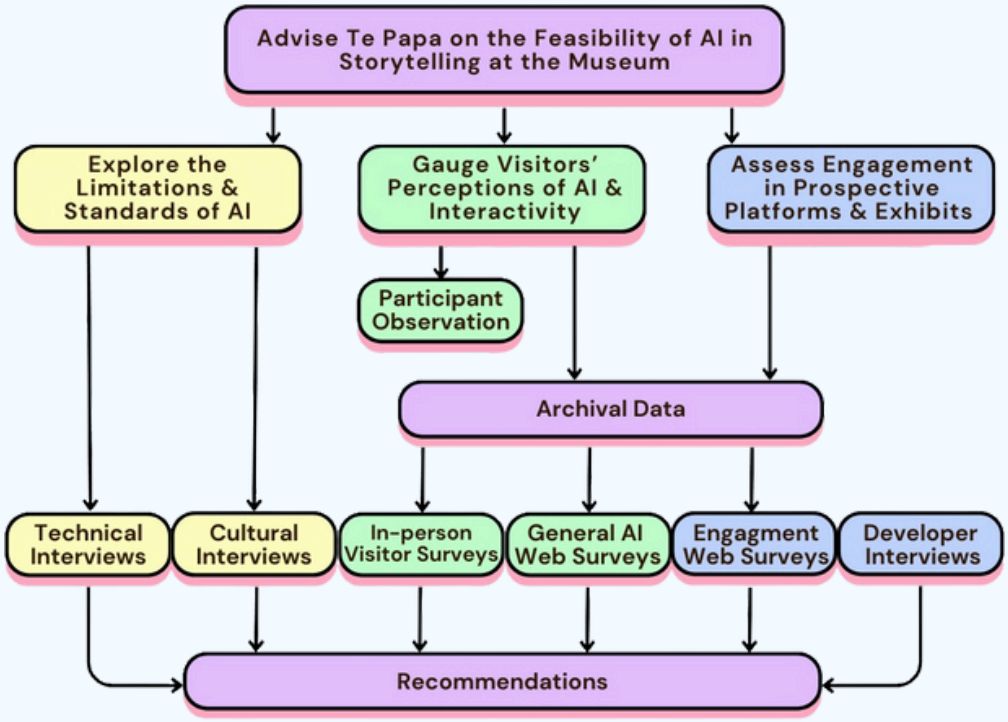


Figure 3.1: Flowchart depicting the project goal, objectives, methods, and outcome.

3.1 **Objective 1: Explore the technical/cultural limitations and standards of AI in the museum**

In this first objective, we explored the technical/cultural limitations and standards of AI in the museum setting. We conducted five interviews with cultural groups, technical staff at Te Papa, and external AI experts. We designed interviews to give insight into limitations regarding use of data, as well as on the technical/cultural limitations and museum standards for AI.

Data sovereignty topics concerning the Māori and Pasifika people of Aotearoa New Zealand were the first focus for this objective. We conducted in-depth interviews throughout the project schedule focused on data sovereignty and representation, specifically within the broader Māori and Pasifika communities. We also asked questions that informed the cultural boundaries for our potential recommendations (see Appendix A). Regarding academic/industry experts and technical staff, we reached out for contacts that provided expertise about recent discussions about AI. A sample of interviews with museum technical staff members and external experts gauged ethical boundaries and the current standards that impact Te Papa's mission (see Appendix B). Appendix C contains a complete list of interviewees.

Two team members conducted the interviews with technical and cultural experts. We conducted interviews with museum staff in a quiet space at Te Papa, while interviews with non-museum experts took place over Zoom. Before asking the interview questions, we gained verbal consent from our interviewees (see Appendix D). During in-person interviews, we recorded audio using a group member's personal device. We then used the Voice Memos app to generate a transcript of the interview. For Zoom interviews, we used the software's transcription feature to create a transcript. Finally, we manually edited all transcripts to improve clarity by fixing any transcription errors or misspellings based on the audio recordings. After completing and transcribing interviews, we read through them individually and picked out the most important quotes. From these quotes, we then pinpointed common opportunities and concerns from both technical and cultural perspectives.

3.2 **Objective 2: Gauge visitor perceptions of AI implementation and interactivity**

The second objective gauged Te Papa visitor perceptions of AI implementation and interactivity. We addressed this objective by conducting a participant observation study and examining archival data. Additionally, we conducted an in-person visitor survey and an online general AI pop-up web survey to collect visitor perspectives.

The rationale of our participant observation study was to collect information that only an active participant in the Te Papa visitor experience can observe (see Appendix E) (Price et al., 2017). To collect our initial experiences, we first split up and took different floors to explore. Each team member interacted with the exhibits as a visitor would, noting aspects of storytelling, AI or data implementations, and exhibit interest. We took individual field notes and compiled them into one large text document. To analyze these notes, we created a coding system that grouped together similar stories, levels of engagement, and important observations across all the exhibits.

Te Papa's Audience and Insight Directorate, along with the Collections and Research Directorate, already collect surveys on visitor opinions of the museum experience and staff perceptions of AI implementation. These surveys served as archival data for our study. In the third week of project development, the survey templates they had used influenced the design of targeted surveys for our study. In the fifth week, our archival research study included utilizing Te Papa's past survey results to identify trends in engagement and perceptions.

To gauge visitor perceptions, our surveys contained both closed and open-ended questions. This approach provided a standardized list of questions but allowed for some digression to gain deeper explorative data without the need for formal interviews (Bullard, 2016). Closed questions made use of Likert scales to visualize and assess broad attitudes (e.g., from "Strongly Disagree" to "Strongly Agree") towards AI, interactivity, and user engagement. Best practices included attaching text and incorporating numerical depiction of responses (South et al., 2022). Surveys were available on both physical tablets in the museum (see Appendix F) and as pop-up website surveys (see Appendix G). The first section of the surveys was an informed consent form (see Appendix H). For in-person museum surveys, we surveyed visitors at the exit and on the different exhibit floors. We collected samples by asking and handing every 10th group of visitors a tablet with the survey containing all the questions. These survey questions were set up in Qualtrics XM, a surveying and data analysis tool.

We placed our general AI pop-up web surveys on the main Te Papa website for 11 days starting from Wednesday, February 5th. For these surveys, a window containing questions appeared on the screen prompted by a visitor browsing in-person exhibit information on Te Papa's website (see Appendix G). Pop-up web surveys are valuable for their ability to quickly and easily collect information from the preferred audience in real-time via their interaction with the website. Specifically, we utilized collapsible pop-up web surveys for their ability to appear on screen upon a certain visitor's action and allow visitors to reopen the survey (Khan, n.d.) Our surveying for in-person and general AI pop-up web surveys ended on February 8th and 12th, respectively, to allow for enough time to analyze responses. On closed questions, we used quantitative data-analysis methods, and on open-ended questions, we used qualitative data-analysis methods to assess visitor perceptions. For quantitative data, we evaluated the average response along with visualization tools like distribution graphs. For qualitative data, we grouped together and coded similar responses for common themes and threads.

3.3 **Objective 3: Identify and assess prospective methods for AI engagement in platforms and exhibitions**

The third project objective identified and assessed prospective methods for AI engagement in platforms and exhibitions. Platforms encompassed Te Papa's websites, including the main museum website and the Collections Online database, as well any AI projects in development. We used internal museum archival resources to determine the methods of engagement used online. In addition to archival data, we conducted interviews with Te Papa's exhibition and platform developers who work on visitor experiences. Unlike the interviews in Objective 1, which focus on collecting technical and cultural feedback concerning AI, these interviews focused on the process that these developers use to work on their platforms and exhibits. It is important that these interviews occurred after our surveying to provide visitor feedback to the developers. Additionally, we conducted engagement pop-up website surveys to further collect visitor opinions during their interaction with Te Papa's website.

Two group members held half-hour interviews with three exhibition and platform developers at Te Papa to help us understand how exhibition and platform management teams view the use of AI and how they could implement it into their respective projects (see Appendix C). The consent and transcription processes for these interviews were the same as those in Objective 1 (see Appendix D). Appendix I contains the questions we asked during these developer interviews. Our partners at Te Papa helped us contact each person to establish a location and time to meet in-person. During these interviews, we asked questions relating to the creative and technical processes that the teams use to develop meaningful content, storytelling opportunities, and the team's experiences with AI development. Finally, we presented the exhibition and platform developers with concerns from expert and visitor feedback received during Objectives 1 and 2 to understand how the museum may already address these perspectives. By providing concerns and feedback prior to our recommendations, we better understood the relationship between the perspectives of the developers, the experts, and visitors. We analyzed these interviews in a similar way to those in Objective 1.

To assess online engagement, we conducted engagement pop-up web surveys. Te Papa hosted these surveys on their general website for 10 days. For a few days, we limited this survey to just the collections site to allow the other pop-up survey more space for visitor participation. The first section consists of a consent form (see Appendix H). Appendix J contains the survey questions. The primary digital platform relevant to this project is Te Papa's website. Specifically, we determined Te Papa's Collections Online to be the most applicable web page due to its interactive features. These surveys allowed us to collect the opinions of only website visitors capable of providing insight into their engagement experience within the investigated page. We quantitatively analyzed these web surveys based on Likert scales and manually coded open-ended responses which provided information on the effectiveness, interactivity, and learning experience of the online exhibits.

3.4 **Summary**

The culmination of cultural interviews, technical interviews, exhibition and platform developer interviews, in-person surveys, general AI pop-up web surveys, and engagement pop-up web surveys provided a comprehensive view of current considerations for AI implementation at Te Papa. The goal was to capture perspectives of visitors and experts alike through graphical representations of Likert scale data and common themes from interviews and coded open responses.

Chapter 4: **Results & Discussion**

This chapter presents the highlights from our study organized by the project's three objectives, along with an analysis of key results.

4.1 **Results**

Objective 1:
Explore the technical/cultural limitations and standards of AI in the museum

Technical and Cultural Interviews

In discussing the limitations of AI with technical and cultural experts pictured in Figure 4.1, we found overlapping concerns about **hallucination** (false AI-generated information), **bias**, and **data sovereignty**. Technical and cultural experts alike noted the aforementioned concerns, citing them as the most important considerations when implementing AI. Technical expert Craig Le Quesne raised unique concerns about the cost of AI implementation as well as change management specifically with respect to jobs. Four technical experts expressed that training AI models with biased knowledge creates a high chance of **biased outputs**. On the positive side, the experts highlighted the potential for AI to process data in ways and speeds that we cannot do with traditional analysis.

Figure 4.1: Technical and cultural expert interviewees, reprinted and adapted with permission (Marshall, n.d.; Taiuru, n.d.; Tava, n.d.; Te Papa, 2020).

Each technical expert provided practical solutions for minimizing bias, such as **frameworks** and **sovereign AI** models. For example, Ivan Tava noted the Pacific Data Sovereignty Network is currently working on a report about Pacific data and AI's impact. This report would signify what the community actually supports in hopes of minimizing concerns with AI. This would effectively serve as a framework for people using cultural data in AI models. Additionally, Dr. Taiuru specifically mentioned that "'...different countries can have their own sovereign AI…'" as a way of potentially reducing bias and misinformation. Therefore, New Zealand developers would have to train AI models "...on local datasets to promote inclusiveness with specific dialects, cultures and practices" (A. Lee, 2024). However, every interviewee displayed some limitations in these solutions. Limitations included a lack of solidly defined AI frameworks, as these are still developing alongside AI, as well as changing policy and uncertainty in what it means to be a Tiriti-based museum.

Cultural experts helped us gain insight into the range of perspectives of Aotearoa. To that end, each iwi and community is unique in its *taonga* (treasure), practices, and perspectives of AI. Dr. Taiuru noted an iwi currently using AI for language preservation while other iwis are concerned about language destruction from AI. All three cultural experts agreed that **constant collaboration** with data owners is vital to proper representation of their data in any way, but especially in AI considering the uncertainty that surrounds it. Carolyn Roberts-Thompson captures the meaning of this collaboration for Te Papa; upholding relationships with the owners of the *taonga* and letting them tell their knowledge in their own way ensures they keep their *mana*. Appendix K contains quotes from the interviews that support the summary presented here.

Objective 2: Gauge visitor perceptions of AI implementation and interactivity

We fulfilled the second objective through participant observation studies, in-person visitor surveys, and a general AI pop-up website survey to gauge visitor perceptions of AI implementation and interactivity.

Participant Observation

As our field notes example shows, our own participant observation as new visitors brought considerable insight (see Figure 4.2). We felt most exhibits and stories of both people and the land were both immersive and educational. We noted that the museum had an opportunity for AI implementation given their use of technology and interactive mediums. We also noticed that many exhibits use external or visitor-collected data. Te Papa's website hosted a variety of games, such as quizzes and jigsaw puzzles, and the Collections Online database that the user could utilize. We observed that although the games provided some interactivity, they did not create immersive storytelling experiences. Collections Online, however, benefitted from the vastness of the museum's artifacts, allowing us to explore the database for an immense amount of historical and cultural information. Many artifacts include a picture, which helped with feeling immersed, but they lack descriptions, which limits the storytelling ability of the database.

Field Notes - 1/14

Note Taker: Ethan
Date: 1/14/25
Location: Floor 2, Nature
Exhibit Name: Quake Nation

Topic: Earthquakes of New Zealand

Story: Earthquakes are extremely common in New Zealand but vary in magnitude, due to the tectonic plates.

Interactive Components:
- Touchscreen for users to interact with earthquake timeline to see when and where earthquakes occur, as well as the magnitude.

Use AI? No
How is AI used?

Use data? Yes
What data is used? Information about Earthquakes that occur in New Zealand, going back all the way to the 1800s.

Immersion:
Very Immersed

Information Presentation:
- [x] Images
- [ ] Video
- [x] Text
- [x] Diagram/Chart
- [ ] Physical Model
- [ ] Museum Staff
- [ ] Website

Other Notes / Pictures:

Good example of an engaging way to display and interact with data.

Figure 4.2: Example of participant observation field notes.

In-Person Visitor Surveys

When we conducted in-person surveys, people were very willing to help and were often interested or opinionated when we explained the purpose of our study. This contributed to our success in gaining 97 total responses that were of high quality (see Figure 4.3).

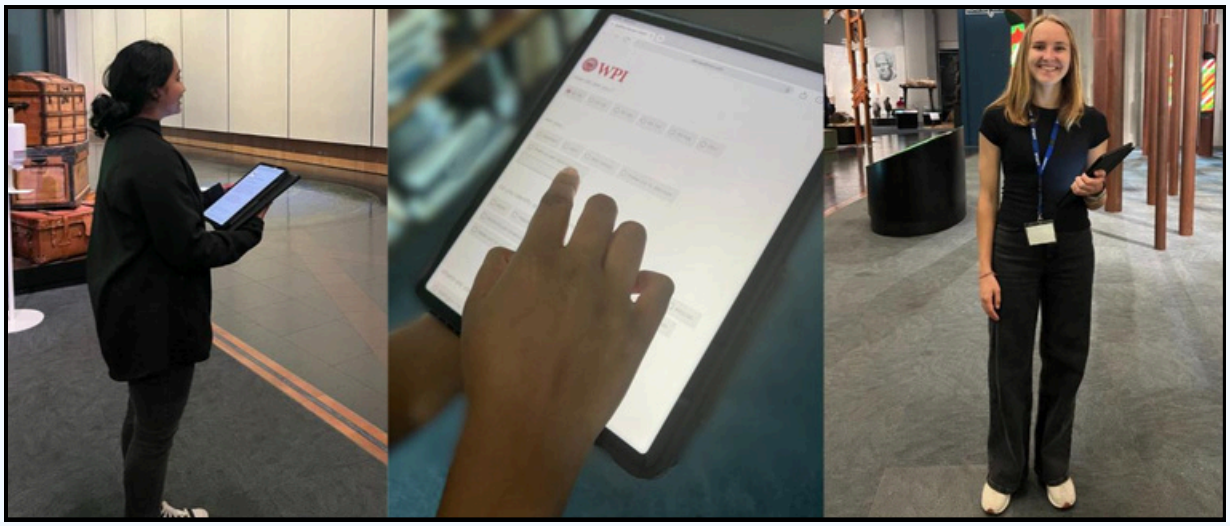


Figure 4.3: Group members surveying in Te Papa
(Photos taken by Bailey Allmon & Aditri Thakur).

We modified our initial in-person survey to be shorter by only asking the most relevant questions to our interests in AI perceptions (see Appendix F). Subsequently, we amended 16 responses from this initial version of the survey to our revised version. Additionally, in order to increase the number of responses for our data while remaining unbiased, we asked every 3rd group of visitors rather than every 10th. In the end, we collected 81 responses by using this shortened version and combined the responses from both surveys to encompass 97 museum visitors in total.

In this in-person survey of 97 museum visitors, respondents had great experiences with Te Papa's interactive exhibits, rating their experience, on average, 4.5 out of 5. Figure 4.4 shows that 80% of respondents reported that Te Papa's current interactive exhibits were very or extremely effective in **improving** their **learning** at the museum. This encourages continuing development of interactive exhibits.

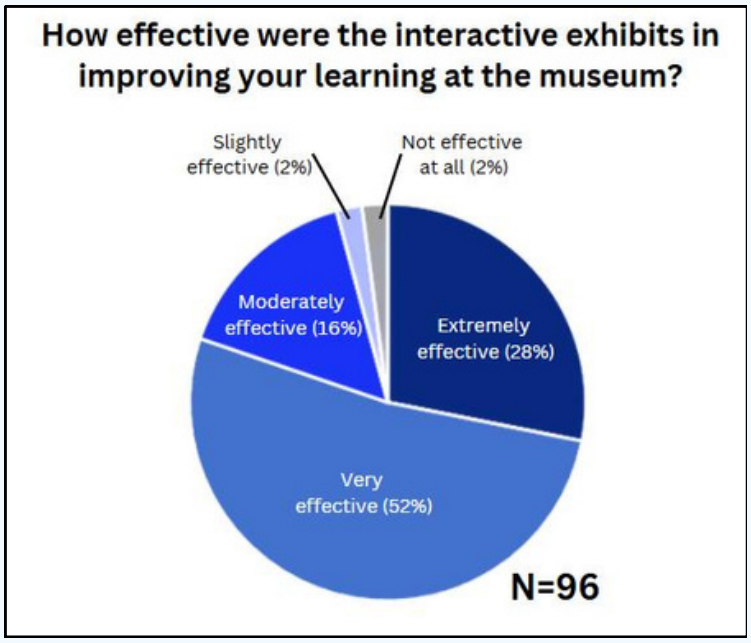


Figure 4.4: How effective were the interactive exhibits in improving your learning at the museum?

Figure 4.5 graphs the results from the question “What are your overall feelings about AI” in our in-person survey. The graph demonstrates a wide range of overall feelings toward this technology with only a 2% difference in the percentage of negative and positive leaning feelings. This demonstrates that there is no consensus in overall opinions about AI, suggesting that we need to gather further insights for our project.

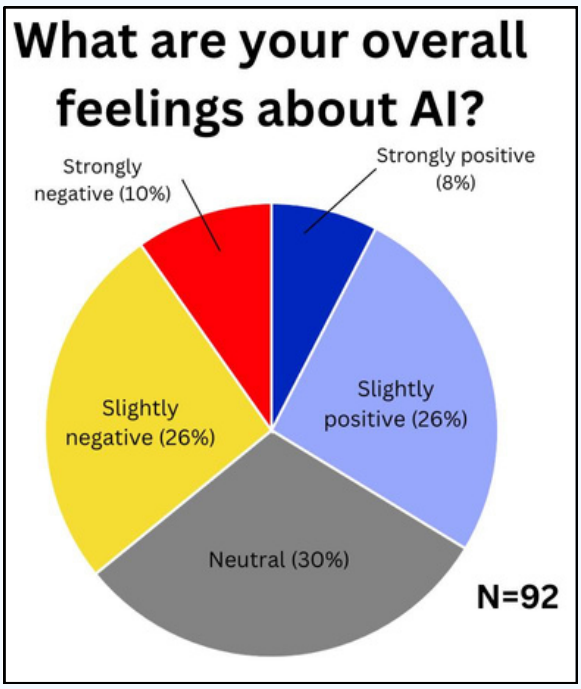


Figure 4.5: What are your overall feelings about AI?

The question “Do you have any concerns about AI in museums? Please select all that apply” garnered several closed- and open-response answers. We manually coded open-response answers to organize all responses into common themes. From this analysis, we found **inaccuracy** to be the most common concern for AI with 50% of visitors reporting this concern. Figure 4.6 depicts a word cloud indicating the frequency of respondents indicating specific concerns about AI.

Figure 4.6: Word Cloud indicating respondent concerns of AI implementation in museums.

Despite these concerns and the range of personal feelings toward AI, visitors display interest in seeing exhibits enhanced by AI in the museum. Figure 4.7 illustrates this reported interest in AI enhancement in the museum setting. Only 12% of respondents were not interested in seeing AI used to enhance museum exhibits. Additionally, most respondents (about 60%) reported that they are moderately, very, or extremely interested in AI enhancement of museum exhibits.

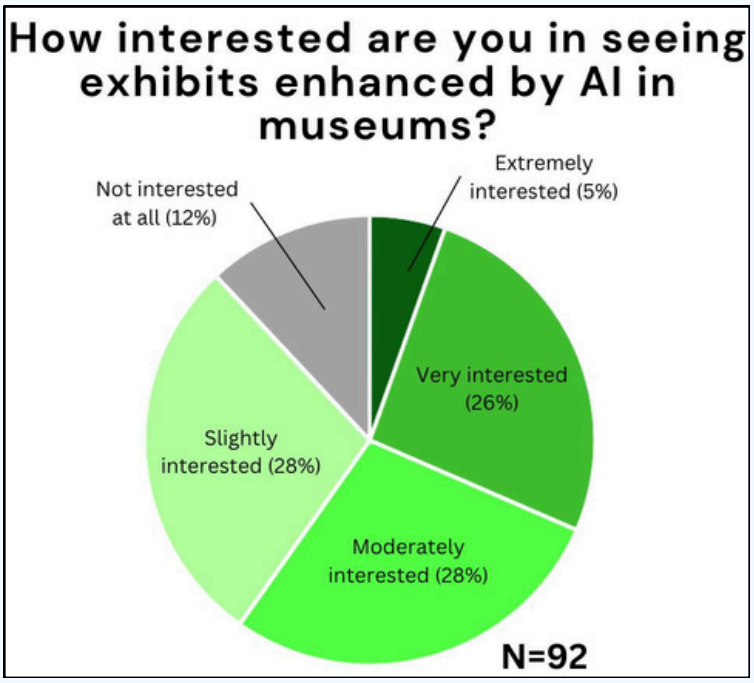


Figure 4.7: How interested are you in seeing exhibits enhanced by AI in museums?

A cross-analysis of age range and familiarity showed that as a respondent's **age** increases, their **familiarity** with AI is likely to decrease. Figure 4.8 shows this trend. On a scale of 1-5, with 1 representing “Not Familiar at All” and 5 representing “Extremely Familiar,” the averages for the age groups 18-24, 25-34, 35-44, and 45-54 were all between 3.1 and 3.2, indicating an average of moderate familiarity. The average familiarity for 55-64 year-old respondents was 2.67, between slight and moderate familiarity. The average for 65+ respondents was 2.06, showing only slight familiarity. The correlation between age and familiarity demonstrates an opportunity to increase visitor understanding of AI, especially for older visitors.

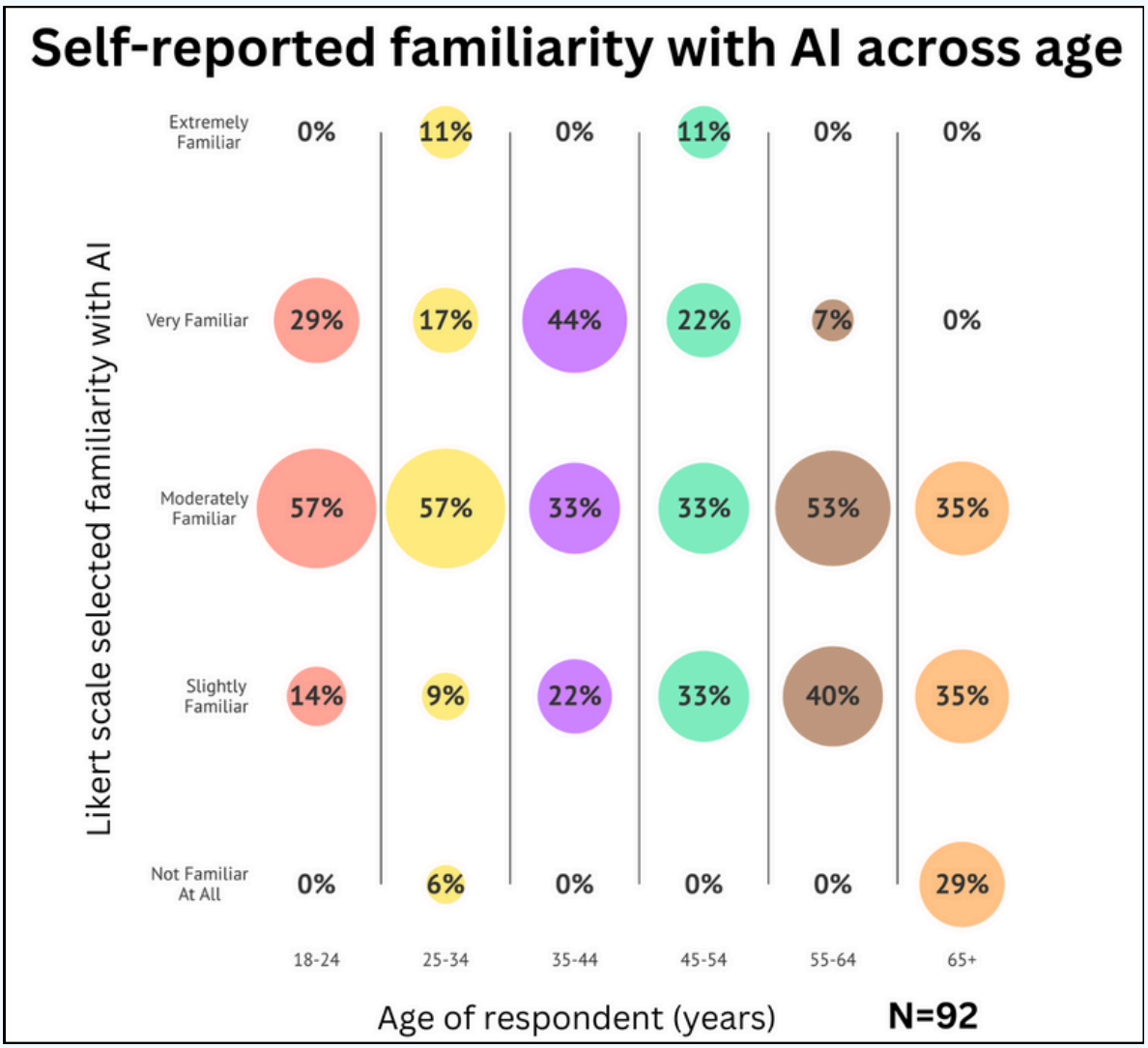


Figure 4.8: Visitors' self-reported familiarity with AI across age.

Figure 4.9 depicts a cross analysis between responses to two Likert-scale survey questions: "What are your overall feelings toward AI?" and "How familiar are you with Artificial Intelligence (AI)?" As respondents reported **more familiarity** with AI, they also reported **more positive feelings** toward AI. The chart demonstrates this trend through the decreasing percentage of red and yellow (negative feelings) and increasing percentage of blue (positive feelings) in increasing levels of familiarity. Notably, 0% of respondents who reported **not familiar with AI** had positive overall feelings toward it, while 53% of respondents who reported **very familiar with AI** had positive overall feelings toward it. Thus, increasing familiarity with AI may lead to more positive perceptions.

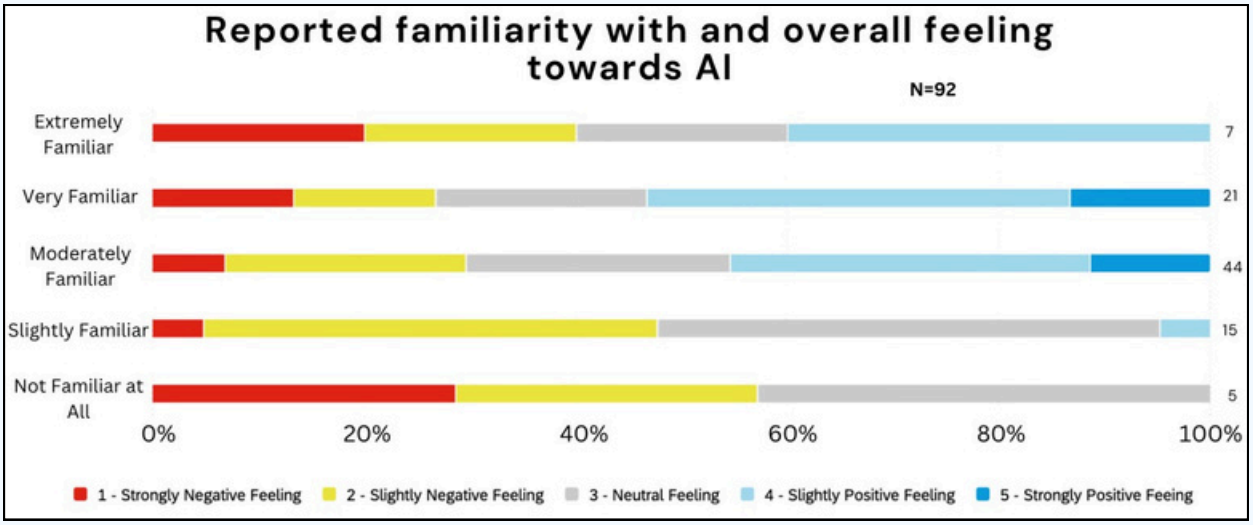


Figure 4.9: Visitors' reported familiarity with and overall feeling towards AI.

Finally, Figure 4.10 depicts the coding results of visitor responses to the question "How do you imagine AI could be used at Te Papa?" Out of 43 open-ended responses (with two responses falling into two codes), the most common visitor suggestions for AI implementations were **recreating historical scenes**, people, or animals from the past, **question-and-answer** chatbots, and **tour guides or personalization**. However, the most common type of response was that respondents **did not know** how Te Papa could implement AI.

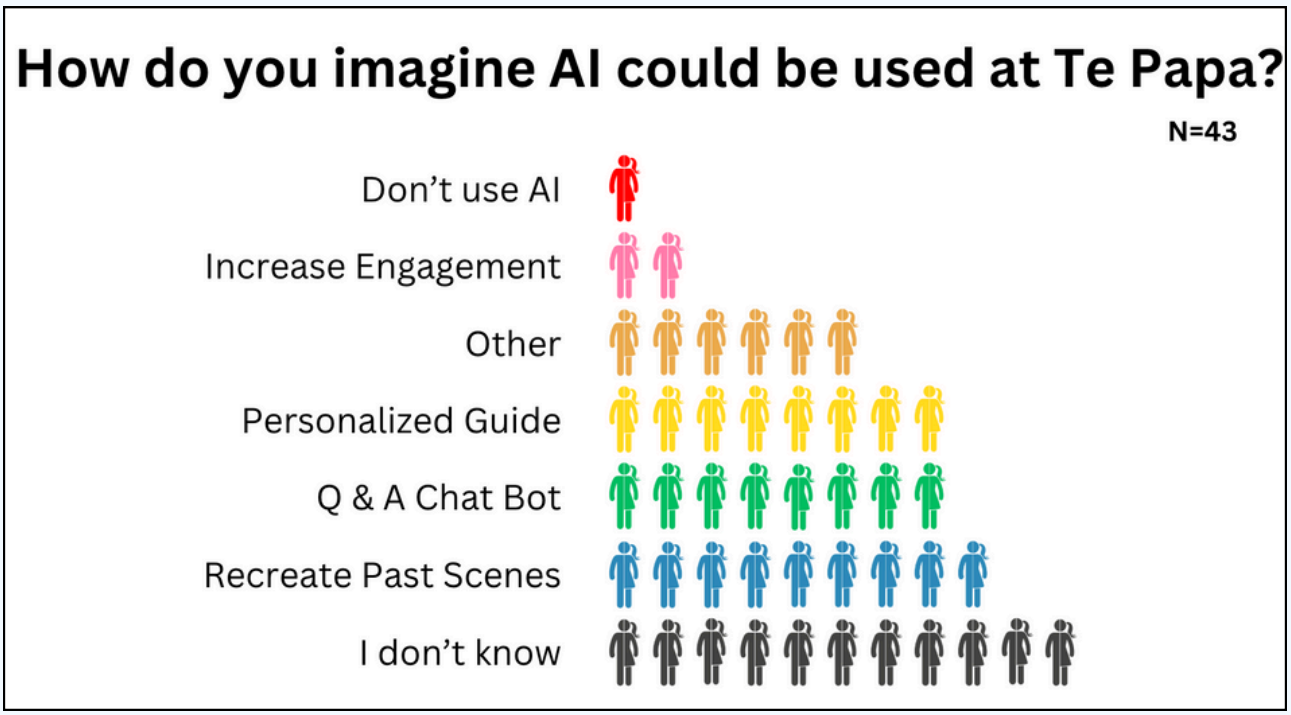
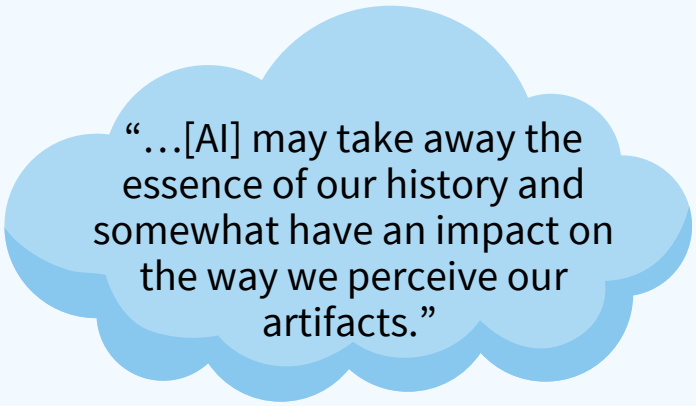


Figure 4.10: How do you imagine AI could be used at Te Papa?

General AI Web Surveys

Our AI pop-up web surveys, located on the read-watch-play pages of Te Papa's website, collected 68 responses in 11 days on the website. Common themes in considerations for AI implementation on Te Papa's website surfaced in open-ended questions. These themes included interactivity, accessibility, explicit need, and authenticity. Thus, we extracted that visitors generally believe there is potential for AI to enhance the website's interactivity and accessibility; however, some questioned the explicit need for AI and had concerns about authenticity. In addition, a Māori participant noted a perspective on authenticity, stating:



This sentiment is an example of cultural concerns that AI may create a lasting impact on Māori cultural understanding. If the museum inputs cultural data, stories, or other *taonga* into AI, it may warp how visitors perceive *taonga* and Māori culture. Thus, when innovating with AI, it is important to consider measures that will preserve the authenticity and integrity of cultural portrayals.

Objective 3:
Identify and assess prospective methods for AI engagement in platforms and exhibitions

The project methods designed to address the third objective included assessing Te Papa museum archival data, collecting responses through the pop-up web survey on Te Papa's interactive web platforms, and interviewing museum exhibition staff and platform developers. These methods enabled us to conduct a more holistic review to determine which platforms could benefit from AI implementations and how the curators develop physical exhibits and web platforms.

Archival Data Analysis

Archival survey data collected from the Te Papa Collections Online website provided insight on visitor usage and feedback on the collections. The archival data consisted of 1,437 responses over six months, with varying response rates for each question since all open-ended questions were optional. Figure 4.11 illustrates the coded responses to the question "What do you value the most about Te Papa's Collections Online?" We coded each response to fit into one or two aspects based on the answer provided. The most common response was the **accessibility** of the website, with 184 out of 436 respondents (42%) reporting this.

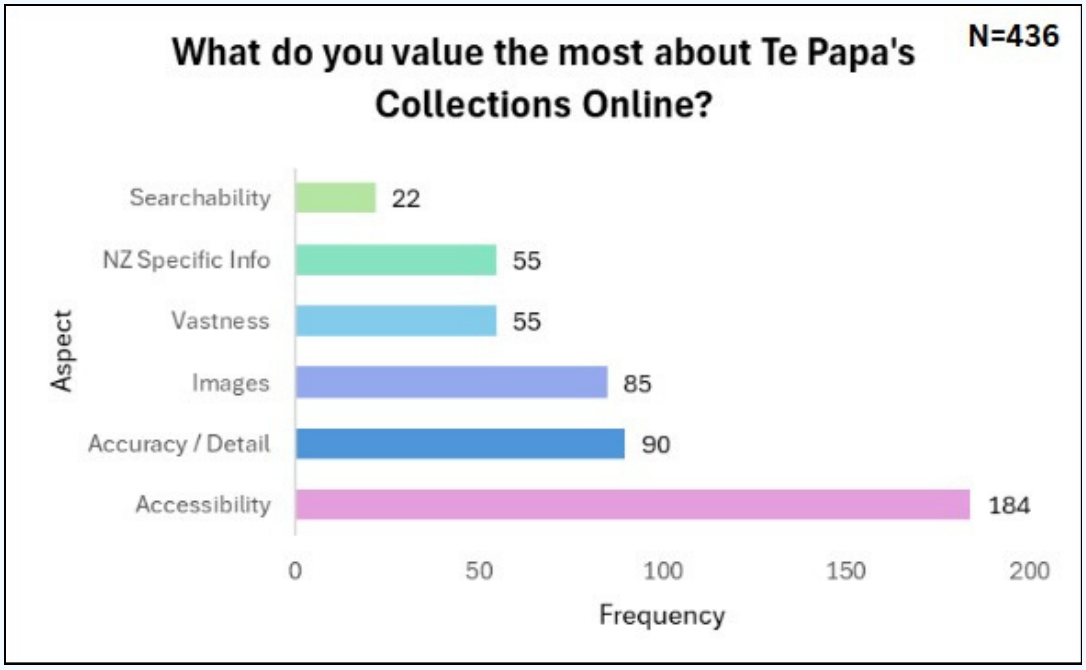


Figure 4.11: What do you value the most about Te Papa's Collections Online?

Some Collections visitors were not able to complete the purpose of their visit. Figure 4.12 shows the responses to why they weren't able to do so. Of the 909 respondents who answered the question "Were you able to complete the purpose of your visit today," 226 respondents, or roughly 25% of the 909 total, answered "No." Out of these 226 "No" respondents, 191 answered the question "Why weren't you able to complete the purpose of your visit today."

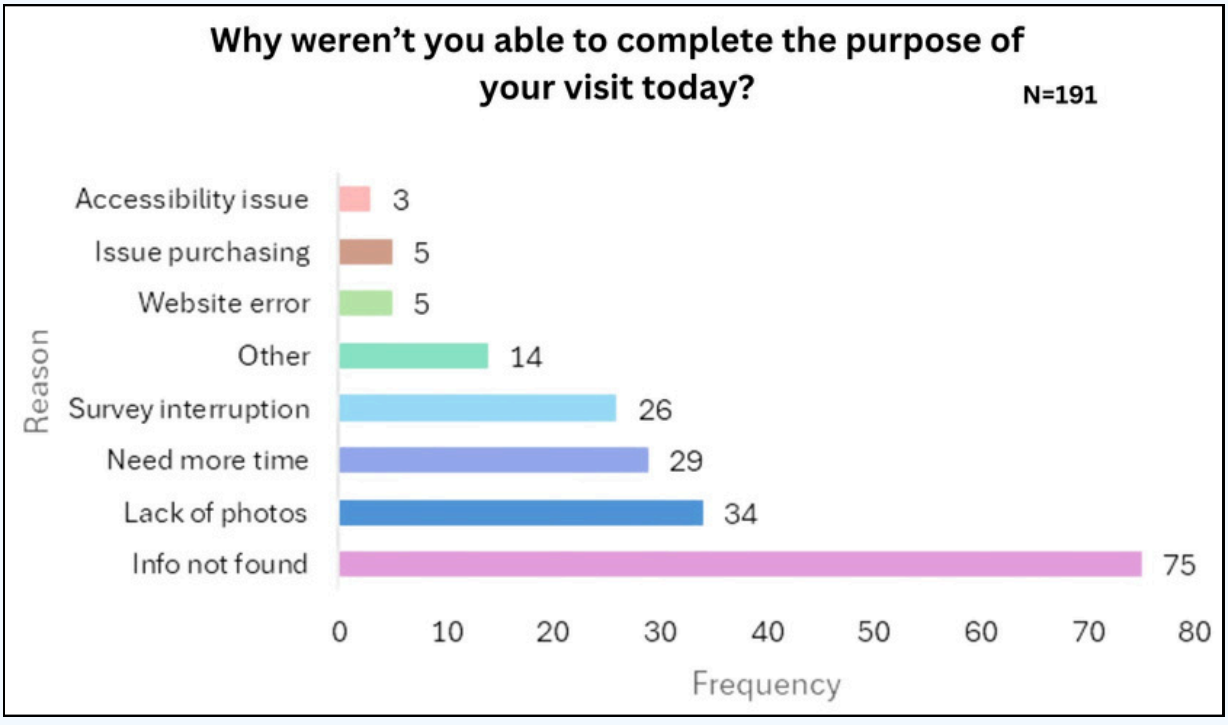


Figure 4.12: Why weren't you able to complete the purpose of your visit today?

The most common reason for users not completing the purpose of their website visit was that they were unable to find the information they were seeking. Specifically, 75 out of 191 respondents (39%) reported this response. Moreover, 29 respondents (15%) reported that they needed more time, indicating similar trends in ease of **finding information** and **searchability**.

Engagement Web Surveys

Our engagement pop-up surveys yielded 134 responses. Figure 4.13 shows the frequency of coded themes present in visitor responses to the pop-up survey question "what do you value the most about Te Papa's website." We coded each response to fit into one or two aspects based on the answer provided. The most common answer at 31 out of 48 (65%) respondents was **quality information**.

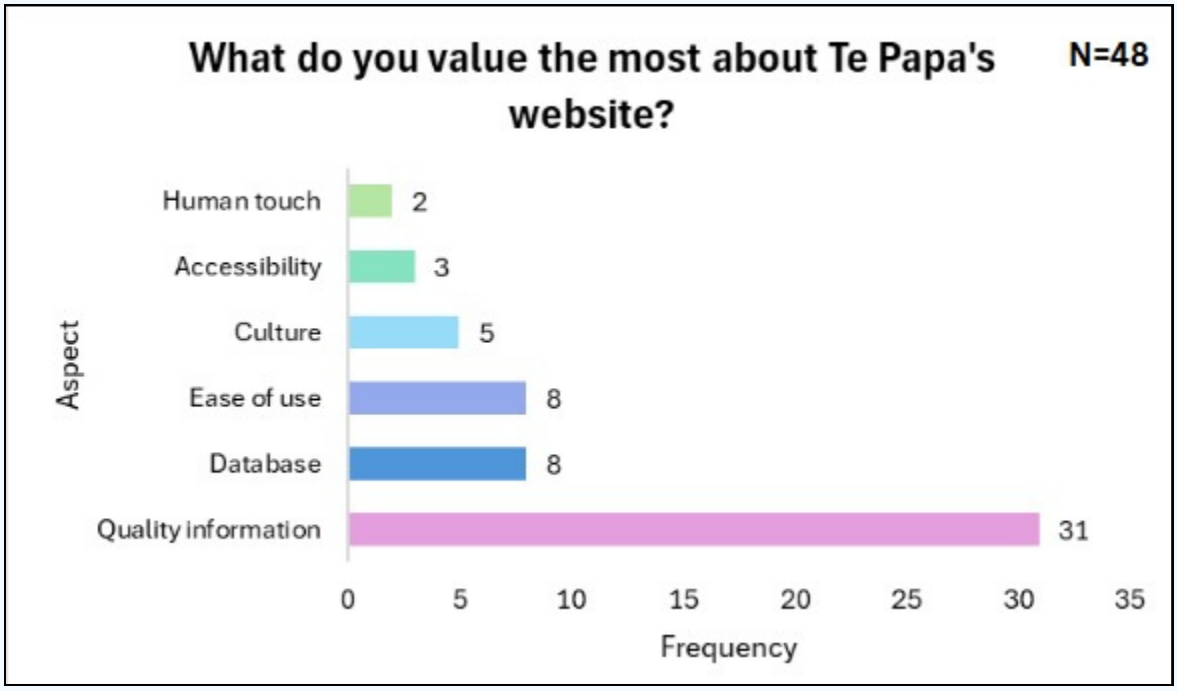


Figure 4.13: What do you value the most about Te Papa's website?

The open-ended question “How do you imagine AI could be used on Te Papa’s website?” received 74 responses across both surveys, with some individual responses containing more than one answer. Figure 4.14 shows the most common responses that we received.

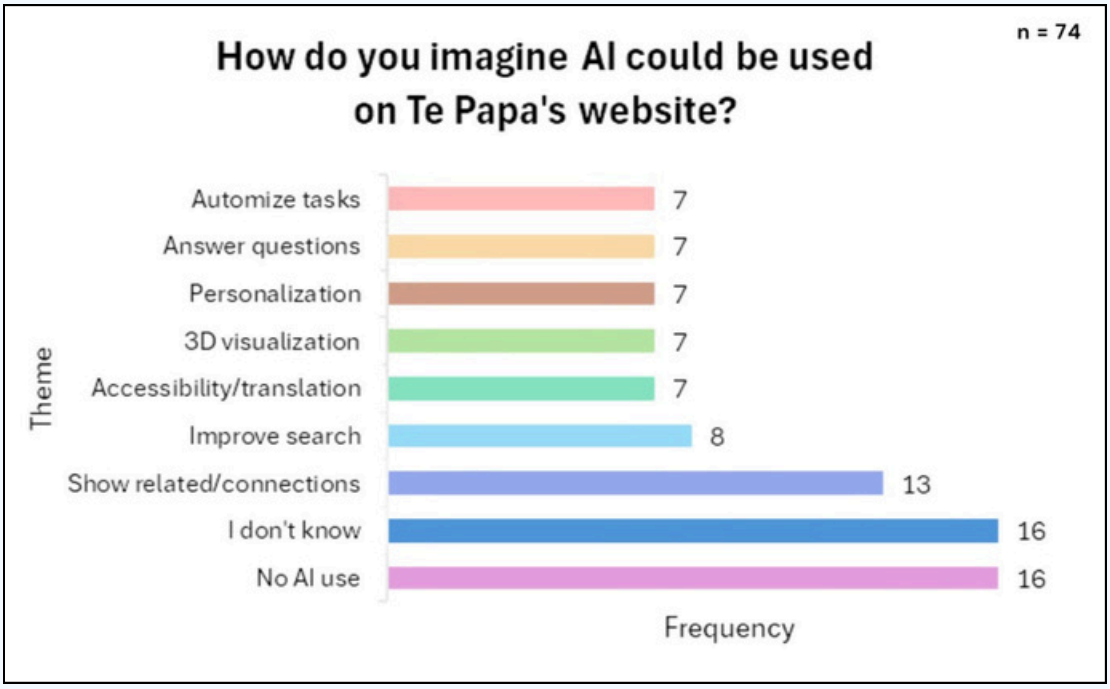


Figure 4.14: How do you imagine AI could be used on Te Papa’s website?

The most common AI implementations listed were a tool that would help with **finding related items** or **finding connections** between items and a tool that would improve search functionality. Again, the “I don’t know” theme appears at a high frequency, suggesting uncertainty in AI uses. Overall, the engagement pop-up survey revealed important and interesting sentiments about how online visitors feel about Te Papa’s website, interactivity, and AI.

Exhibition and Platform Developer Interviews

Our three interviews with museum exhibition and platform developers provided meaningful insights on how they produce exhibitions and platforms. We also discussed considerations of an AI exhibition from an audience impact perspective. Figure 4.15 depicts our developer interviewees.

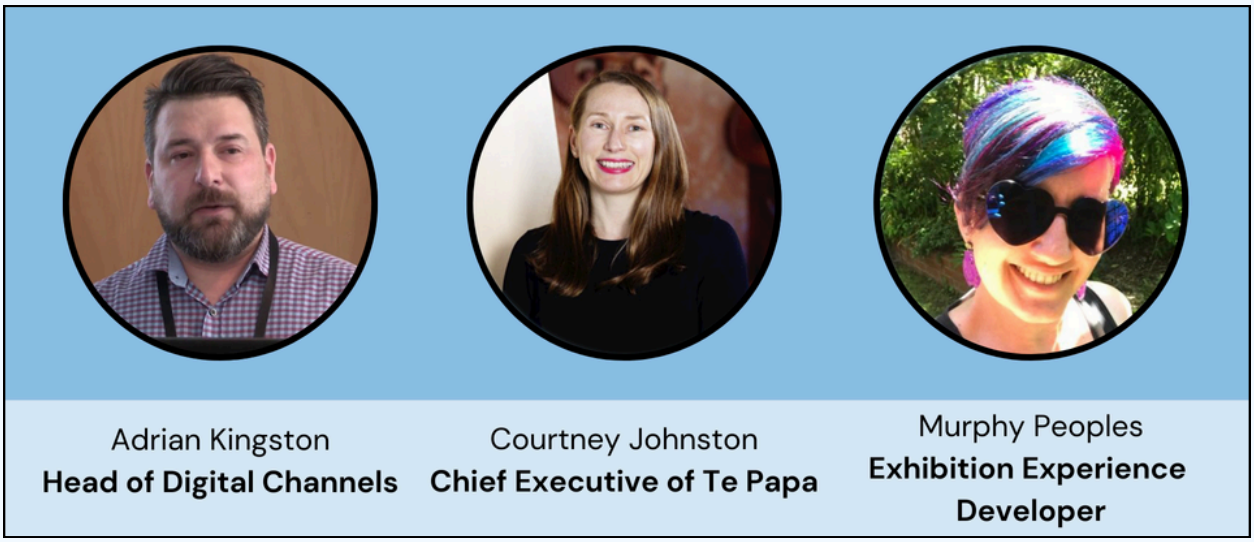


Figure 4.15: Exhibition and platform developer interviewees, reprinted and adapted with permission (National Digital Forum, 2016; Peoples, n.d.; Rose, 2019).

Murphy Peoples, Exhibition Experience Developer, taught us how an exhibition is planned and focused through the Audience Impact Model (AIM). Throughout development, the team must refocus on the target audience and what they want the audience to gain from experiences with the exhibition. Adrian Kingston, Head of Digital Channels, emphasized that development on Te Papa's website focuses on finding the best, accessible ways to expose new people to **interesting content**. Overall, Courtney Johnston, Chief Executive, explained her vision of success for Te Papa with this quote:

> "Real success will be when new people who haven't benefited from the collections and the research and the knowledge start to get benefit."
>
> -Courtney Johnston

The developers at Te Papa understand that a story is at the heart of exhibitions and is a tool to **create connections** between content, especially online where the available content is so diverse. Across the museum's platforms, Te Papa strives to empower citizens to tell their stories in their own way. Consequently, the developers reported concern with AI increasing the bias that already naturally exists in human-created content at the museum. As per our interviews, Te Papa formed their own AI Guidance Group to create a positive space to explore safe AI usage. Overall, Te Papa must demonstrate responsible use of any AI directly to the public and ensure its accuracy and respectful implementation. Appendix L contains quotes from these interviews that support the following results.

4.2 **Discussion**

Taken together, our results captured trends across the wide range of perceptions reported toward AI. It seems that there is anxiety about the use of AI amongst visitors and experts alike. Visitors are primarily worried about inaccuracy and malicious use which coincides with experts' concerns about hallucinations, bias, and data sovereignty. Experts' concerns are in AI's process of creating content, as it can produce inaccurate or malicious outcomes–visitors' concerns. These potential problems directly conflict with Te Papa's foundation of biculturalism and visitor trust. Thus, it will be important for Te Papa to remain transparent about any AI usage, adhere to AI usage frameworks, and maintain constant collaboration with data owners, especially Māori and Pasifika data owners, throughout the process of AI implementation.

Despite these concerns, there is interest and cautious optimism for AI usage at Te Papa from both visitors and Te Papa staff. There is an opportunity to remedy uncertainty through further exposure to AI usage and education surrounding the topic. Additionally, younger generations are more accepting of AI, indicating that AI could be even more commonplace in their lives, and they may come to expect AI implementations at the museum and on its web platforms. For example, some visitors imagine AI being used to draw connections between artifacts which goes hand in hand with developer interest in storytelling. Altogether, improving AI understanding may result in more positivity, open-mindedness, and creativity when it comes to implementing AI.

Overall, we see an opportunity for AI implementation at Te Papa considering visitors' positive feedback of interactive exhibits, the shared value of information accessibility, and the expansiveness of both the in-person and online museum experience. AI's potential for personalization and data processing may be able to improve searchability, navigation, accessibility, and artifact connections or stories. This potential aligns with visitor expectations as well as Te Papa's emphasis on storytelling, as it is at the heart of all exhibitions, and Te Papa's overarching goal to provide access to new audiences. We recognize the strong relationship Te Papa has with its community that puts storytelling, representation, accessibility, and trust at the core of its operations. Therefore, the museum must discuss AI's usage openly with visitors and data/story owners to allow Te Papa to extend its impact while maintaining community trust. The corresponding recommendations to our results will help the museum implement AI in an impactful, yet conscientious way.

4.3 **Project limitations**

We would like to acknowledge that the time constraint of seven weeks limited the scope of our results. Time played a role in the sample size of our surveys, the diversity of our survey responses, and the extent of what our project could reasonably cover. We collected 97 high-quality in-person survey responses, and we note that most of them (75%) came from overseas tourists rather than domestic visitors. This did not represent the standard population of visitors, since during the 2023/24 fiscal year, only about 50% of visitors were from overseas tourists (Museum of New Zealand - Te Papa Tongarewa, 2024b). We can potentially attribute this to the summer attracting many tourists. With a longer time frame, we may have collected enough surveys to include more local responses.

Chapter 5: **Recommendations & Conclusion**

We presented and reviewed the following recommendations with Te Papa to advise on feasible implementations of AI for storytelling at the museum. These recommendations are the culmination of the analysis of our participant observation, survey data analysis, and interviews from the previous chapter. They provided us with a comprehensive understanding of the concerns of AI implementation, visitor perspectives, and principles for meaningful engagement.

5.1 Recommendations

Recommendation 1.
Curate an exhibition that tells the story of AI in the context of Aotearoa

Justification:

We recommend that Te Papa create and install an exhibition to share the story of AI in the context of Aotearoa, as several results support the opportunity for this curation. Since there is a correlation between low familiarity and more negative overall feelings toward AI, we perceive an opportunity to interact with the community directly about AI, especially with AI's dramatic growth. Lastly, informal discussions about archival and survey data analysis with Adrian Kingston revealed that respondents are conservative in response to open-ended questions meant to provoke new ideas. We believe the exhibition–an open, creative, thought-provoking environment–could help future visitors learn and reflect on the potential benefits and concerns about AI.

Action:

The exhibition has an opportunity to tell the story of AI from its current implementations to future implications. An exhibition of this nature could use AI examples to demonstrate the negative and positive outcomes such as hallucinations or the benefits of personalization or accessibility. It could present both limitations and opportunities of AI with a specific focus on Aotearoa New Zealand's Māori and Pasifika perspectives. The exhibition could begin with eye-catching and positive uses of AI. This section would provide visitors with a basic understanding of AI and would include interactive examples of AI's positive uses. Then, the exhibition could segue into the associated risks of these AI uses in Aotearoa. For example, our results indicated Māori concerns about altered language creation through AI usage that non-Māori visitors may not have considered previously. Te Papa could invite multiple groups to tell their story of AI usage or AI hesitance in this exhibition. Through this exploration Te Papa could highlight a wide array of perspectives and elements of AI application, allowing visitors to build their own views about AI interactively and responsibly. This goal aligns with Te Papa's values of working collaboratively to share diverse perspectives, as expressed by both Courtney Johnston, Chief Executive, and Carolyn Roberts Thompson, Director Ngā Manu Atarau. The exhibition could

conclude with insight into how implementing frameworks and working collaboratively can allow for safe and respectful AI usage.

This exhibition may raise questions and cause reflection on ownership, accessibility, technology, bias, and responsible innovation. We also highly recommend including a space to share ideas about AI. Given the exhibition's human-focused storytelling approach to educating about AI, we believe the exhibition would best work in a small area on level 4, as this level already houses exhibits and stories about the people of Aotearoa. Finally, interchangeable discussion questions throughout the exhibition may allow Te Papa to collect creative ideas and opinions on Te Papa's use of AI, acting as a continuation of our research. We completed an Audience Impact Model to demonstrate the focus and intended impact of this AI exhibition (see Figure 5.1 and Appendix M).

	Attention	Reaction	Connection	
	1	2	3	4
	Attention caught	Immediate reaction	Personal connection	Simple learning
Goal 1: Understand the benefits/see opportunity	Feature AI tools and implementations.	Intrigued by the potential of AI applications. Excited about how they could use AI in their lives. Surprised Te Papa is so advanced in technology + hot topics.	Help the visitor understand how AI is used in their everyday life. People have used AI in their own lives	Helping the visitor realize all the capabilities of these applications of AI. Learn something new about AI.
Examples	"Look at that that looks new!"	"Wow Te Papa has AI displays?!?!" "Oh I want to know more about AI." "I wonder how Te Papa feels about AI."	"Oh I didn't know AI was used there/wow I already use AI." "Ooo I want to try some more of this AI!" "I used AI once for a university paper."	"Oh wow, I didn't realize AI could draw basic connections between pieces of information for me." "I didn't know you could use AI to do that."

Figure 5.1: Screenshot of Te Papa's Audience Impact Model for future AI exhibition, reprinted and adapted with permission (Museum of New Zealand - Te Papa Tongarewa, 2020).

Overall, an exhibition that educates the public about AI and tells the story of AI in Aotearoa would increase community and visitor familiarity with various perspectives relevant to AI usage. The exhibition would help visitors understand data sovereignty in Aotearoa, and allow Te Papa to spark discussion of AI in the context of Aotearoa.

Recommendation 2. Use AI to create personalized in-person tour experiences

Justification:

Our in-person visitor survey contained several responses indicating the desire for a personalized tour experience created by AI. We also noted the opportunity for this type of implementation in our participant observation study due to the expansiveness of Te Papa. Guided tours that take visitors through the entire museum already exist. However, Te Papa has multiple levels containing large amounts of items, meaning that creating a personalized tour experience without the use of AI would be a huge task. Using AI to facilitate this process can help reduce logistic complexity.

Action:

From our interview with Craig Le Quesne, Chief Technology Officer, we learned that Te Papa trained an AI model on the museum's collections and it was able to successfully describe items. Thus, specifically training an AI model on Te Papa's map/directory and the exhibitions page contents is feasible and would serve as a good starting point for planning a personalized tour. Additionally, Dr. Taiuru provided the idea that a sovereign AI model can help mitigate bias and misinformation concerns pertaining to AI implementations. Hence, Te Papa should also consider this strategy if it moves forward with the implementation of this personalized tour.

Implementing the personalized tour creator would require dedicating space on Te Papa's website where users could interact with it. The developer team could implement a clickable menu option that would display at the top of the home page (see Figure 5.2).

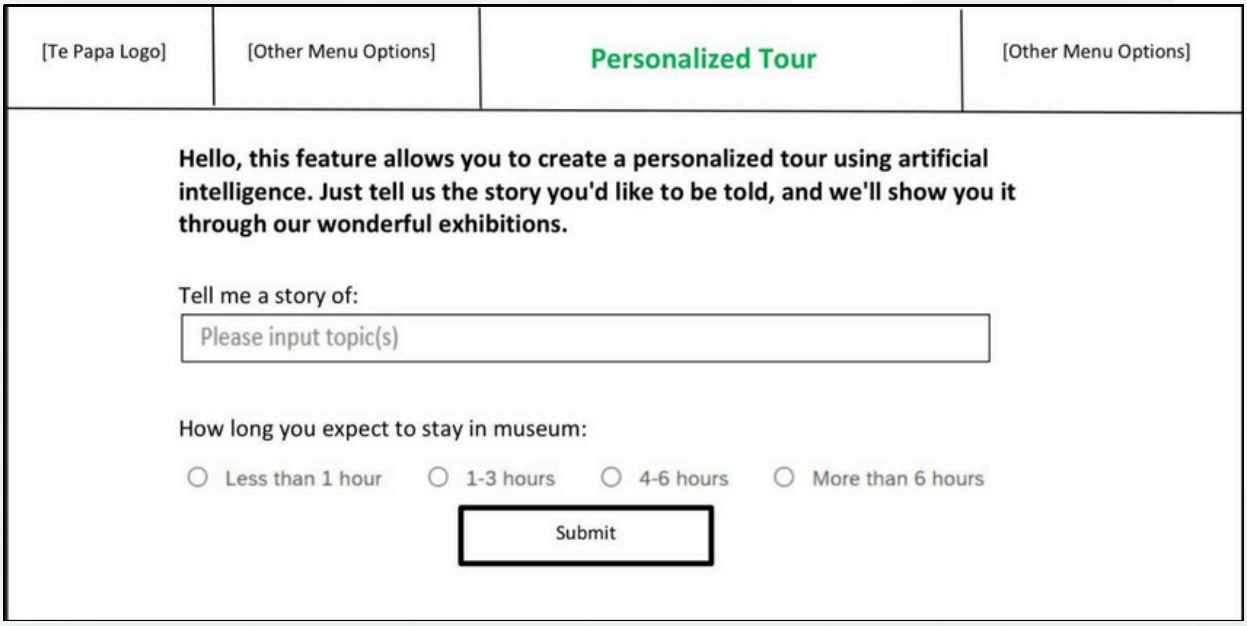


Figure 5.2: Mock-up of the personalized tour form.

Clicking the menu option would take users to another page that contains two text input boxes. The phrase “Tell me a story of: …” would precede the first text input box and allow the user to enter a variety of topics, such as climate change or animals in Aotearoa. The second text input box would allow the user to enter how many hours they expect to stay in the museum. Website visitors may also utilize accessibility features built into their keyboard or browser. Based on these inputs, the AI model would compile an ordered set of instructions to take the user through the specific exhibits that would fulfill this story (see Figure 5.3). The time constraint would control the number of suggested exhibits based on how long it would take the average visitor to look at a display. To improve accessibility, a visual map and accessibility options will accompany these written instructions to give the visitor a better idea of where they would have to walk once they are inside the museum.

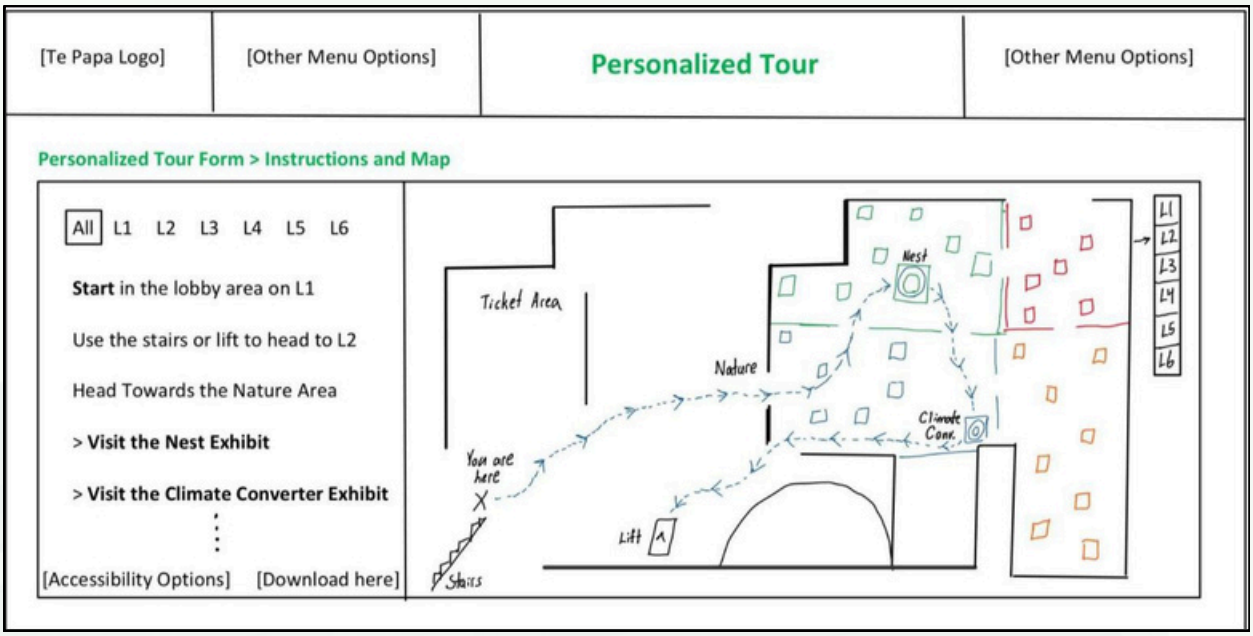


Figure 5.3: Mock-up of the instructions and map page of personalized tour (Museum of New Zealand - Te Papa Tongarewa, 2024a).

Providing Te Papa’s visitors with the ability to plan a personalized tour using AI allows them to make efficient use of their time. Developing this tool would eliminate the need for visitors to go through the entire museum to try and find what interests them. In other words, this serves as an opportunity for Te Papa to attract people who may need assistance navigating its expansive collection.

Recommendation 3. Apply AI in Collections Online to draw connections between artifacts and enhance search functionality

Justification:

The results from our web surveys and analysis of archival data indicate that many visitors to Te Papa's Collections Online database would like to see more information about the artifacts available on the website and see greater connections between artifacts and topics. Collections Online contains vast amounts of data relating to artifacts, but it can be difficult to find that information given the current search functionality on the website, as well as the many artifacts that are missing descriptions due to the large quantity. There are few connections between artifacts on Collections Online currently, which can make it difficult for some users to understand a broader picture of a specific topic. Developing a function for this supports our results, which indicate that drawing connections between artifacts is one of the main use cases people imagine for AI and using storytelling to draw connections is the core of impactful audience experiences. Moreover, many users of Collections Online indicated they had difficulty finding specific information, with the current search tool possibly contributing to this feedback. Te Papa can use AI to continue to improve these searches and information accessibility, while drawing connections between existing artifacts.

Action:

Using an AI-based search engine that can account for natural language can enhance access to information on the Collections Online. Natural language processing for search engines understands queries in a more conversational and human tone (Rissman, 2023). This will allow for improved ease of use and personalization in searches from the website user, as well as greater access to artifacts or information. In this case, the AI model would have access to the entirety of the artifacts used currently in Collections Online, as long as the data owners approve the use of their data in the model.

In addition to providing support for natural-language search queries, searching the collections would provide a summary based on the results. For example, if a person were to search "moa" in the search box, artifacts related to the moa would appear with a summary based on the results and their descriptions (see Figure 5.4).

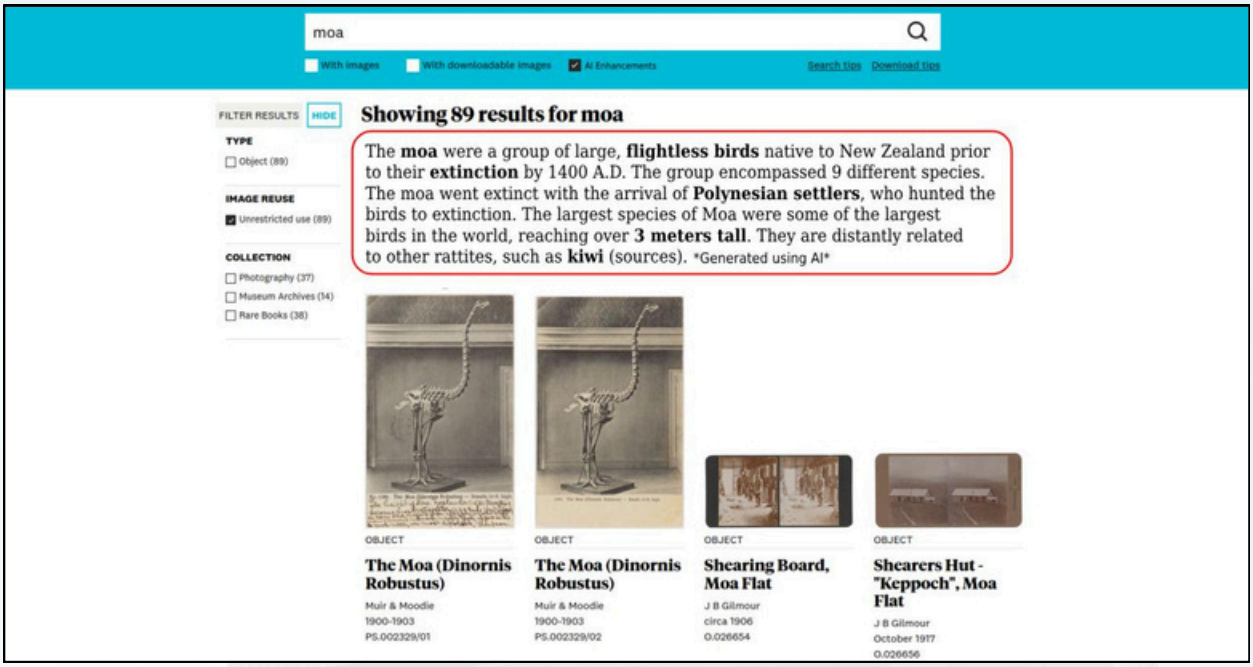


Figure 5.4: Mock-up of a possible AI-generated summary for search queries, reprinted with permission (Museum of New Zealand - Te Papa Tongarewa, n.d.-c).

This summary would draw connections between search results and provide broad themes and stories related to the query. An AI tool that searches through the results and finds any meaningful information would generate the summary. This AI implementation would advance the Collections Online to not only be a database for artifacts but also be a location to learn more generally about Aotearoa New Zealand.

An AI application like Te Papa Collections United could also function as an additional page on the Collections Online website where the user can type in a topic or range of topics that interest them (see Figure 5.5). An AI model would search through the database to find three to four artifacts related to those topics. Finally, the application would give the reader an AI-generated explanation for how these artifacts, or the stories they tell, are related.

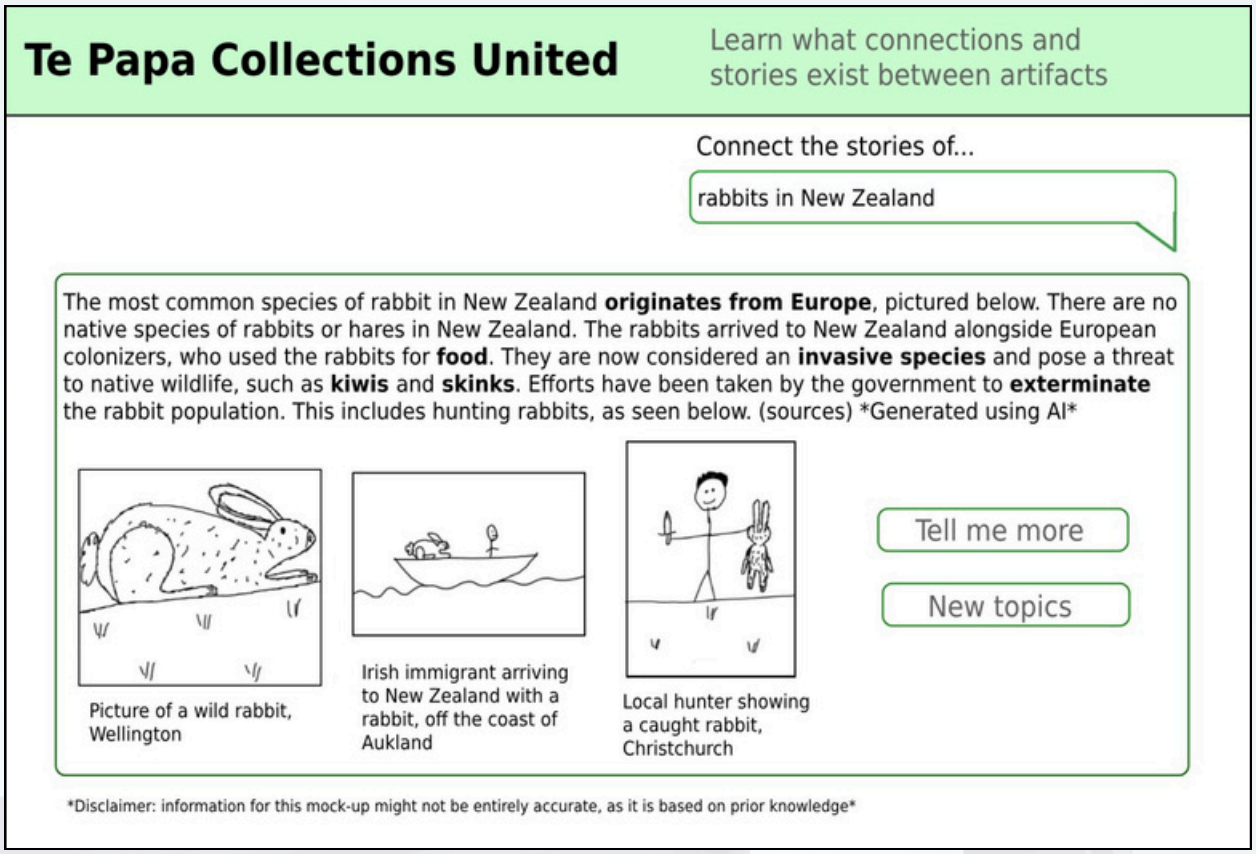


Figure 5.5: Mock-up of an AI tool to connect stories of artifacts.

The tool could also allow the user to dive deeper into the same topic or suggest related topics that might be of interest. Drawing connections between artifacts in this way can enhance the storytelling capabilities of Collections Online by bringing together themes and information from individual artifacts to create a larger, more interdisciplinary story. It could also expose the user to new stories or topics of interest to them.

Even with fact-based AI-generated information, there is a risk of hallucination as sometimes there is no data on a topic for AI to reference. Thus, a mitigation strategy similar to that in the second recommendation is important to consider. The AI tool should rely on information available on Collections Online in order to avoid online sources that may be inaccurate. The website should also be transparent as to what text AI generates and provide a disclaimer stating that the information might not be completely accurate. The website should also allow the user to disable AI functionality if they prefer not to have AI assistance, given concerns about privacy and trust. These features can help Te Papa maintain visitors' trust and the museum's integrity as a knowledge source. It is also essential to ask data owners for permission to use their data in these AI tools, including iwis and Pasifika communities.

5.2 **Conclusion**

Artificial intelligence has become a feature of everyday life and consequently, it is important for institutions like museums to prepare a stance on how they want to use this technology. This includes developing a protocol on how to gauge and monitor its ethical implications.

We were grateful for the opportunity to investigate the feasibility of new AI implementations for informative storytelling at Te Papa. We see this project contributing to public understanding in an important museum setting and also falling in alignment with the UN Sustainable Development Goals that deal with Quality Education (see Figure 5.6) (United Nations, n.d.). Additionally, we believe there are opportunities for future groups to build on our work and to collaborate with Te Papa to create prototypes for the museum. As the national museum of Aotearoa, Te Papa is a leader for museums and educational institutions across New Zealand. We hope that these recommendations would not only enhance the storytelling abilities of Te Papa, but potentially serve as a model for other institutions. Additionally, since a primary focus of this project included cultural sensitivity, our recommendations suggest more Māori and Pasifika voices when collecting and understanding cultural data. By creating meaningful experiences with AI responsibly and respectfully, Te Papa can teach visitors about New Zealand's treasures–its stories.

Figure 5.6: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." (United Nations, n.d.).

We believe Te Papa has the opportunity to represent a technological advancement for educational institutions that is inclusive of technical and cultural concerns by following these recommendations. We had a wonderful experience while working with Te Papa Tongarewa!

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Appendices

Appendix A: Cultural Interview Questions

This appendix contains the set of questions that we used during interviews with cultural experts on Māori/Pasifika data concerns.

A - Cultural Experts on Māori/Pasifika Data Sovereignty and General Concerns

A1. How long have you been working at Te Papa? What is your job title and area of expertise?

A2. What is your involvement with Māori and/or Pasifika communities?

A2a. Are you associated with an iwi? If so, what iwi do you belong to?

A3. What are some important Māori/Pasifika principals for us to understand to properly consider and respect the diverse perspectives in Aotearoa?

A4. How has Te Papa dealt with Māori/Pasifika data sovereignty issues in the past?

A5. What are the current concerns the Māori and/or Pasifika communities have with the concept of AI implementations using their data? Are any of these concerns community specific?

A6. Do you know of any AI techniques used by Māori and/or Pasifika communities? Can you elaborate on these techniques and how were they implemented?

A7. What is your perception on AI implementations with regards to language translation, conversational tools, virtual artifacts and people?

A8. Do you have any advice for how we can involve the Māori and/or Pasifika communities in the process of coming up with potential AI implementations?

A9. Do you have any concerns about the use of Māori and/or Pasifika data in potential AI implementations?

Appendix B: Technical Interview Questions

This appendix contains sample questions that we asked during interviews with technical experts in the field of AI.

B - Industry Experts and/or Museum Technical Staff

B1. Which industry are you a part of, and how long have you been in it?

> B1a. For Museum Technical Staff Member: How long have you been working at Te Papa?

B2. What is your area of expertise in AI? How long have you been in this area of AI for?

B3. What are some of the main privacy and bias concerns regarding AI that you have encountered?

B4. What are some of the directions AI has taken, either in projects you are personally involved in or those taking place at Te Papa?

> B4a. If these projects have been completed, which have been successful? How so? Why do you think that was the result?

B5. Have you encountered any backlash or negative responses to AI implementations or other technological advancements? What were the reasons, in your opinion, for these reactions? Do you believe they were justified?

B6. What would it take to minimize bias and misinformation from an AI system? Is it possible to completely eliminate these things?

B7. Are there any other limitations or standards to implementing AI that we have not yet discussed, or that may be fundamental to an AI implementation?

B8. Do you have any opinions or advice on implementing AI in a museum setting?

Appendix C: Table of Interviews

Table C.1 contains a list of eight interviews we conducted for the project. It includes the date that we conducted the interview, the name of the interviewee, the interviewee's area of expertise or title, method of contact, and their interviewee category.

Table C.1 - Information for the eight people interviewed for technical, cultural, and developer insight.

Date (mm/ dd/yy)	Name	Area of Expertise/Title	Method of Contact	Category	Interview Medium
1/28/25	Dr. Karaitiana Taiuru	Recognized Māori Intellectual Property expert, knowledgeable on AI	LinkedIn Message	Technical/Cultural	Zoom
2/10/25	Courtney Johnston	Chief Executive of Te Papa, head of AI Guidance Group	Partner's Contact	Exhibition and Platform Developer	In-Person
2/11/25	Ivan Tava	Chairperson of Pacific Data Sovereignty, knowledgeable on AI	LinkedIn Message	Technical/Cultural	Zoom
2/11/25	Craig Le Quesne	Chief Technology Officer at Te Papa	Partner's Contact	Technical	In-Person
2/11/25	Carolyn Roberts-Thompson	Head of the Ngā Manu Atarau Directorate at Te Papa	Partner's Contact	Cultural	In-Person
2/12/25	Murphy Peoples	Exhibition Experience Developer at Te Papa	Partner's Contact	Exhibition and Platform Developer	In-Person
2/13/25	Robin Marshall	External advisor and AI expert for Te Papa	Partner's Contact	Technical	In-Person
2/13/25	Adrian Kingston	Head of Digital Communications at Te Papa	Partner	Exhibition and Platform Developer	In-Person

Appendix D: Consent Agreement for Interview Participants

We described the consent agreement to participants before interviews using the following script.

Informed Consent Agreement for Interviews

Kia Ora [Interviewee]
We are a group of students from Worcester Polytechnic Institute (WPI), a university in the United States. We are interested in your perceptions of Artificial Intelligence (AI). Would you be willing to share your thoughts? We would like to record this interview and your words, name, and photo, may be published through our university.

Do I have your consent to proceed with the interview?

Appendix E: Participant Observation

This appendix contains a sample of our note-collecting format for our participant observation study in Objective 2. We will follow this standard for each exhibit we observe.

E - Exhibit Note Sheet

Note Taker: _____

Date: __ / __ / __

Exhibit Name: _____

Location in Museum: _____

Exhibit Topic:

_____

_____

_____

What story does the exhibit tell?

_____

_____

_____

_____

List any interactive components you identified at the exhibit:

- _____
- _____
- _____

Does the exhibit use AI? Y/N

Does the exhibit use any data sets? Y/N

If so, what data is used? _____

How immersed were you in the exhibit?

[ ]	[ ]	[ ]
Not Immersed	Somewhat Immersed	Very Immersed

How was the information presented? (select all that apply)

[ ] Text	[ ] Video	[ ] Images	[ ] Diagram/chart
[ ] Physical model	[ ] Museum staff	[ ] Website	

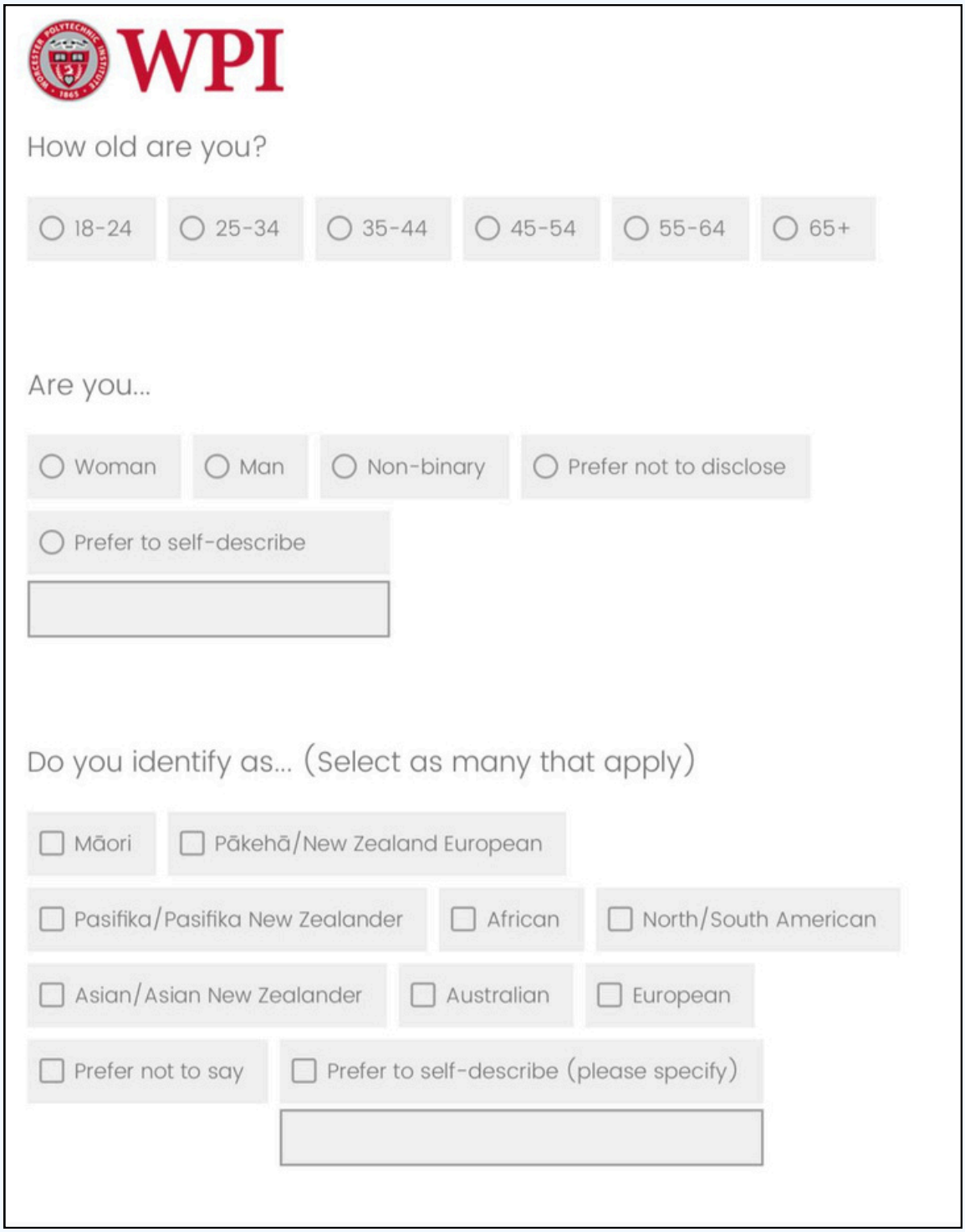
Other Notes:

_____
_____
_____

Appendix F: In-Person Visitor Survey Questions

This appendix contains sample questions for in-person visitor surveys. Words within * denote a code for the conditions that when met cause the question following the symbol to appear.

F - In-Person Visitor Survey Questions



Where are you from?

- ◯ Wellington City
- ◯ Wellington Region (Kāpiti, Hutt City, Upper Hutt, Porirua)
- ◯ Rest of New Zealand (including Wairarapa)
- ◯ Overseas (not in New Zealand)

How many times have you visited Te Papa?

- ◯ This is my first time
- ◯ I've been here 2-4 times
- ◯ I've been here more than 4 times

How many hours did you spend at the museum during this visit?

- ◯ Less than 1 hour
- ◯ 1-3 hours
- ◯ 4-6 hours
- ◯ More than 6 hours
- ◯ I'm still exploring

How many children are visiting with you today? (< 18 years old)

How old are the children?

- [ ] 0-4
- [ ] 5-8
- [ ] 9-12
- [ ] 13-17

→

WPI

What information display were the children most engaged with?

- [ ] Reading
- [ ] Pictures
- [ ] Videos
- [ ] Artifacts Not to Touch
- [ ] Artifacts to Touch
- [ ] Simulation of Surrounding Environments
- [ ] Touch Screen Information
- [ ] Touch Screen Games
- [ ] Physical Toys or Games
- [ ] Museum Guide/Teacher
- [ ] Other

Are you interested in seeing interactive exhibits for children that use artificial intelligence?

- ◯ 1 - Not interested at all
- ◯ 2 - Slightly interested
- ◯ 3 - Moderately interested
- ◯ 4 - Very interested
- ◯ 5 - Extremely interested

How would you rate your overall experience with Te Papa's interactive exhibits?

- ◯ 1 - Poor
- ◯ 2 - Fair
- ◯ 3 - Average
- ◯ 4 - Good
- ◯ 5 - Excellent

How effective were the interactive exhibits in improving your learning at the museum?

- ◯ 1 - Not effective at all
- ◯ 2 - Slightly effective
- ◯ 3 - Moderately effective
- ◯ 4 - Very effective
- ◯ 5 - Extremely effective

What information display engaged you the most?

- ☐ Reading
- ☐ Pictures
- ☐ Videos
- ☐ Artifacts Not to Touch
- ☐ Artifacts to Touch
- ☐ Simulation of Surrounding Environments
- ☐ Touch Screen Information
- ☐ Touch Screen Games
- ☐ Physical Toys or Games
- ☐ Museum Guide/Teacher
- ☐ Other

How familiar are you with Artificial Intelligence (AI)?

- ◯ 1 - Not familiar at all
- ◯ 2 - Slightly familiar
- ◯ 3 - Moderately familiar
- ◯ 4 - Very familiar
- ◯ 5 - Extremely familiar

What are your overall feelings about AI?

- ◯ 1 - Strongly Negative
- ◯ 2 - Slightly Negative
- ◯ 3 - Neutral
- ◯ 4 - Slightly Positive
- ◯ 5 - Strongly Positive

How interested are you in experiencing exhibits enhanced by AI in museums?

- ◯ 1 - Not interested at all
- ◯ 2 - Slightly interested
- ◯ 3 - Moderately interested
- ◯ 4 - Very interested
- ◯ 5 - Extremely interested

How do you imagine AI could be used at Te Papa?

Would you like to see AI used to help tell stories within Te Papa?

- ○ Not at all
- ○ A little
- ○ Somewhat
- ○ Much
- ○ A great deal

Do you have any concerns about using AI in museums? Please select all that apply.

- ☐ Data Sourcing
- ☐ Data Sovereignty
- ☐ Security
- ☐ Inaccuracy
- ☐ Malicious Use
- ☐ None
- ☐ Other

Do you have any additional comments or suggestions?

→

Protected by reCAPTCHA: Privacy & Terms

Powered by Qualtrics

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix G: General AI Pop-Up Web Survey Questions

We asked questions in a collapsible pop-up web survey on Te Papa's website. Additionally, the respondent could skip any question or portion of a question (except for age). These questions attempt to capture visitors' perspectives on AI and its potential applications at Te Papa.

G - General AI Perceptions Web Survey Questions

How familiar are you with Artificial Intelligence (AI)?

(1 = Not Familiar) (2 = Slightly Familiar) (3 = Moderately Familiar) (4 = Very Familiar) (5 = Extremely Familiar)

What are your overall feelings about AI?

(1 = Strongly Negative) (2 = Slightly Negative) (3 = Neutral) (4 = Slightly Positive) (5 = Strongly Positive)

How interested are you in experiencing exhibits enhanced by AI in museums?

(1 = Not Interested at all) (2 = Slightly Interested) (3 = Moderately Interested) (4 = Very Interested) (5 = Extremely Interested)

How interested are you in experiencing Te Papa websites enhanced by AI online?

(1 = Not Interested) (2 = Slightly Interested) (3 = Somewhat Interested) (4 = Interested) (5 = Very Interested)

How do you imagine AI could be used at Te Papa?

Do you have any concerns about using AI in museums?

To better capture diverse perspectives on AI, we'd appreciate it if you answered a few optional questions about yourself and your museum visits:

How many times have you visited Te Papa?

(Never) (Once before) (I've been there 2-4 times) (I've been there several times)

How old are you?

(<18) (18-24) (25-34) (35-44) (45-54) (55-64) (65+)

Do you identify as… (Select as many that apply)

(Māori) (Pākehā/New Zealand European) (Pasifika/Pasifika New Zealander) (African) (North/South American) (Asian/Asian New Zealander) (Australian) (European) (Prefer not to say) (Prefer to self-describe (please specify))

Please leave any additional comments or suggestions below:

Appendix H: Consent Agreement for Survey Participants

We displayed the consent agreement on the first page of the survey before visitors could proceed.

Informed Consent Agreement for Participation in a Research Study

Investigators and Contact Information

Hello, we are a group of students from Worcester Polytechnic Institute in the United States conducting a project in collaboration with Te Papa Tongarewa. By completing this survey, you are consenting to participate in our research and helping us learn about your experience to inform Te Papa on the feasibility of AI in storytelling at the museum. You are free to respond to any level you feel comfortable disclosing.

- Investigator: Bailey Allmon | beallmon@wpi.edu
- Investigator: Klaudio Fusha | kfusha@wpi.edu
- Investigator: Ethan Shanbaum | esshanbaum@wpi.edu
- Investigator: Aditri Thakur | athakur1@wpi.edu

Purpose

The purpose of this study is to understand visitor perception of Artificial Intelligence (AI) and interactivity at Te Papa.

Procedures

This survey will ask you to reflect on your experience at Te Papa and your perceptions of AI.

Record Keeping and Confidentiality

Your responses will be anonymous. Although we may have a general sense of who completed the survey, we will not tie the data back to specific participants. We will share this information anonymously with our advisors for evaluation purposes. We will not look at any personal information (like email addresses or names) if it were to be collected.

This survey is entirely voluntary, and your consent is given freely. Any publication or presentation of the data will not identify you.

Additional Information

If you have questions or would like more information about this research, please contact the investigators using the email addresses listed above. Once the project is completed, you can request to view the final results by emailing us at gr-tepapa-c25@wpi.edu.

Voluntary Participation

Your participation in this research is voluntary. By completing this survey, you acknowledge that you have been informed about the study and consent to participate. You have the opportunity to withdraw consent after completing the survey.

Appendix I: Te Papa Exhibition and Platform Developer Interview Questions

Interview guide for museum staff responsible for curation and exhibit development on various platforms, as well as AI projects.

I - Museum Exhibition and Platform Developer Questions

I1. How long have you been working at Te Papa?

I2. What is the focus of your department?

I3. What kind of technology/tools does your team use for development?

I3a. Do any of these technologies/tools use AI?

I4. What is the general process for developing the platforms associated with your department?

I5. What kind of data does your department typically work with?

F5a. Is this data owned by the museum or is it publicly available?

I6. How do the platforms you develop contribute to the storytelling at the museum?

I6a. What stories have your projects told?

I6b. Do you think AI could be used to enhance your department's storytelling capabilities?

I7. What makes your platforms engaging and immersive?

I7a. What principles are applied in designing exhibits to be both engaging and educational?

I7b. Do you believe AI could be used to enhance this engagement or immersion?

I8. Has your team ever used AI as a main component in any of your projects?

I8a. How was AI used for this project?

I9. During an interview with [technical/cultural expert], we discussed [topic] and they had mentioned [opinion/feedback/concern]. Do you agree with this?

I9a. How could the museum address this concern/feedback?

I10. Some feedback we received from visitors about AI is [feedback from surveys]. Do you agree with this?

I10a. How could the museum address this feedback?

Appendix J: Engagement Pop-Up Web Survey Questions

We asked questions in a collapsible pop-up web survey on Te Papa's website. Additionally, the respondent could skip any question or portion of a question (except for age). These questions aimed to measure engagement, learning outcomes, and the potential of AI in Te Papa's online educational aspects, such as the collections.

J - Engagement Web Survey Questions

How interested are you in experiencing Te Papa websites enhanced by AI online?

(1 = Not Interested) (2 = Slightly Interested) (3 = Somewhat Interested) (4 = Interested) (5 = Very Interested)

How engaging is this page?

(1 = Not Engaging) (2 = Slightly Engaging) (3 = Somewhat Engaging) (4 = Engaging) (5 = Very Engaging)

Would you prefer more interactivity on this webpage?

(1 = Not at All) (2 = A little) (3 = Somewhat) (4 = Quite a bit) (5 = A great deal)

How do you imagine AI being used on Te Papa's website?

What do you value the most about Te Papa's website?

To better capture diverse perspectives on AI, we'd appreciate it if you answered a few optional questions about yourself and your museum visits:

How many times have you visited Te Papa?

(Never) (Once before) (I've been there 2-4 times) (I've been there several times)

How old are you?

(<18) (18-24) (25-34) (35-44) (45-54) (55-64) (65+)

Do you identify as… (Select as many that apply)

(Māori) (Pākehā/New Zealand European) (Pasifika/Pasifika New Zealander) (African) (North/South American) (Asian/Asian New Zealander) (Australian) (European) (Prefer not to say) (Prefer to self-describe (please specify))

Please leave any additional comments or suggestions below:

Appendix K: Technical and Cultural Transcript Highlights

This appendix contains highlights from the technical/cultural interviews we conducted.

Technical and Cultural Interview Quotes

Technical and Cultural Interview with Dr. Karaitiana Taiuru:

- “So probably the most common well-known community use of an AI is Te Hiku Media in the far north. They're using AI for language revitalization and preservation.”
- “Now we're seeing…ChatGPT for example can speak Māori as good as an average speaker of Māori language. So that's creating concerns…The language experts…are saying that the AI is creating its own dialect so they can actually see the change in the language from a human.”
- “...people feel…like they've been betrayed by having their data input into the GPT.”
- “I think you should be aware of hallucinations and have something in place for that.”
- About potential ways to reduce bias and misinformation: “If different countries can have their own sovereign AI, then I think, yes, they could do it.”
- “...[AI] allows us…[to use]...data [in ways] which we could never kind of figure out by ourselves using human brains.”
- “So as part of the AI lifecycle, the very first step should involve diverse communities, including Māori.”

Technical and Cultural Interview with Ivan Tava:

- “...what we will do is to write a report to say this is the impact of AI this is what it means for Pacific people and here are some recommendations…for those that work with Pacific data and use AI…This is how to almost like what we call the protocols or the message to say actually this is what anybody that uses these rules is something that we support [and] anybody that doesn't then actually [we] would have some questions…”
- “We're really fortunate got every senior Pacific researcher and PhD professor in every major university in New Zealand. They're on our committee and our advisory panel and so working with us because those people live and breathe the care and protection of data and research using Pacific data and so I'd suggest connecting with organizations like ours [referring to the Pacific Data Sovereignty Network].”
- “...at the moment in New Zealand, there's a lack of quality Pacific data that's reliable… and usable…but we're making decisions based on that data.”
- “...indigenous people never complain about the outcome. They never say what they complain about is what is the process you got to get to there. They care about the process to get there. It's all about the process…and as long as they're involved including the process then the outcome will be fine.
- “So I think there's the bias of the data but there's also the bias of the system and the structure and the bias is that Pacific people are only viewed as data producers.”

Technical Interview with Craig Le Quesne:

- "So there's the database that describes all the metadata for the collection, and we took the API that feeds our Collections Online website...and...you can basically just go into the ChatGPT engine and...ask it any question about our collection and it seems to do a reasonable job describing it."

- “Yeah, data sovereignty comes up a lot here, so um which is often confused with um data geography. So rather than thinking about how it's governed and controlled and seen, they often think it's just about having it geographically located in New Zealand.”
- “...when you ask the same sort of question about bias and controlling it within AI, given that we've fed it with all the information and history of years and years and years of vice from the internet. I don't know how we're going to validate that and against who's moral…[and] ethical frameworks that [we] would be doing that against.
- “So, yeah, there will be hallucinations that we don't like, and some of them will be realities.”
- “[AI will] show…the history that you don't want…to see…”

Cultural Interview with Carolyn Roberts-Thompson (main takeaways):

- Te Papa aspires to be a Tiriti-based museum (in reference to the Treaty of Waitangi), but museum staff need to understand what that actually entails. People still need guidance on what the Treaty of Waitangi represents.
- The museum should present information and stories in a way that involves the owners of that information or story. This includes owners of taonga. By letting the owners tell their knowledge in their own way, it ensures they have mana over their stories while allowing visitors to experience it at the museum.
- We are not aware of what we do not know; therefore, we should consult and include the iwi. Additionally, they could provide deeper insight about certain pūrākau (myths/stories).

Technical Interview with Robin Marshall:

- “A lot of my interests lie in the use of local models. Which helps with the privacy, so running…smaller models because of the equipment we've got to run it on. But running smaller models on local hardware to do some experiments without having to worry too much about where that data is going.”
- “We also are very aware of bias and also you know part of experimenting with these LLMs is often a case of just trying to identify how that bias might emerge. There's probably most obvious when we were using the image description.”
- “I've seen a few examples of people not quite understanding where their data is going when they're using some of these tools, and I do…personally just have some concerns that people need to be more careful with their data when using these tools”
- Pertaining to limitations and standards for AI implementations: “What the training data was…Who's created it? Is it the appropriate model for the job?...What's the deployment model?...Is it inside something like AWS bedrock where there's a privacy agreement or is it…just using open…API endpoints with very little guarantee that there's any privacy. There's a lot.”
- “There's a misunderstanding about what the technology [referring to AI] is, so I think people, I'd love to see the literacy generally increase in the use of the technology…”
- “You know the reality of it is…that humans also make mistakes and say things that they possibly shouldn't say at times, and so just helping people to understand that… mistakes may happen and… it's not necessarily an authoritative voice [referring to AI].”

Appendix L: Exhibition and Platform Developer Interview Transcript Highlights

This appendix contains highlights from the interviews we conducted with exhibition and platform developers.

Exhibition and Platform Developer Interview Quotes

Exhibition and Platform Developer Interview with Courtney Johnston:

- “AI exposes that there is work to do on data sovereignty. We say the words a lot, but we haven't actually codified what that looks like in action.”
- “...I deliberately set up the exploration group to be not a decision-making group, but to seed and supercharge an AI mindset in the organisation by using the people in the room, encouraging exploration and experimentation in order to help grow the interest in the enthusiasm in the wider organisation…”
- “What strikes me about the opportunities of integrating AI technologies for collection discovery is that it’s a ‘full stack’ project. The selection of the project, the selection of the test group of objects, the selection of the particular tool that you're going to use, how you're going to train it, how you're going to make decisions about quality, how you're going to attribute that with the content management system, how you will eventually publish that and then how you will assure the public that the use of AI is responsible. It touches every step along the chain of creation.”
- “...as a museum, we don't just look after this physical item: we look after all of the history and all of the knowledge and all of the relationships that surround an object.”
- “...if we believe ourselves to hold good data, do we pour that into the well as a way of trying to improve the quality of the data or create a bias that we agree with as opposed to a bias that we disagree with…”
- “I think for me success is…not going to be around just adding another thin layer on top of things that already exist and continuing to serve current audiences with something a bit new. Real success will be when new people who haven't benefited from the collections and the research and the knowledge start to get benefit.”

Exhibition and Platform Developer Interview with Murphy Peoples:

- “...storytelling is kind of the core of exhibition making…what we do in exhibitions is really what is the story we want to tell and how do we want to tell it and who are we telling it to? But as I've been saying, what do we want them to get out of it?”
- “...our storytelling needs to be intuitive. [It] needs to have a really good understanding of visitors and who is coming to Te Papa and how they like to interact and what they want to get out of an experience.”
- Referring to using AI for storytelling capabilities: “It [referring to AI] could be potentially good for synthesis of large amounts of information and that's always the challenge with exhibition making…We want to tell everyone everything because often we know a lot about the thing [artifacts, topics, etc.], but it's how do we bring that down with it still being truthful, with it still being correct and told in an appropriate way?”

- “...I don't think we would use it [referring to AI] in any…final way without checking it… I do know I can't trust it fully…If it doesn't know or can't find the information, it might just make something up…”
- “Empowering [diverse perspectives]...is really difficult to do for museums because traditionally we are the knowledge holders…Where we try to shift to is like, we'll provide the platform. You come and tell your story. And that's what we mean by empowering. How do you want to tell your story?”
- Non-negotiable design principles: “So number one is Tikanga rua [a.k.a.] bicultural. Number two is Whakawhāiti, [a.k.a.] inclusive. Number three is Kaitiakitanga [a.k.a.] sustainable, number four Whai putanga [a.k.a.] accessible, number five is Āhurutanga [a.k.a.] comfortable. Number six is Marutau, [a.k.a.] safe, number seven is Whakawhānui [a.k.a.] holistic.”

Exhibition and Platform Developer Interview with Adrian Kingston:

- “...the websites have been around for quite a while. So it's about…making sure the technology is stable and that we are meeting the needs of our audiences and the business. Through our main websites we reach 4.1 million people a year…So what we're always doing is watching the feedback that we're getting and making changes that we need to, but also looking for new ways to expose people to content that they're interested in or that they may not know about…Lot of content strategy and then we look at what would be the best technology way to deliver that.”
- “It's publicly available [referring to museum data]…But we also work very closely with [the] community, so we use our websites to tell their stories in their words.”
- “So like I say, 4.1 million visitors and about 78% of those visitors are visiting for digital museum content. That is the…stories, the knowledge, the collections, the media that we hold.”
- Referring to AI enhancing storytelling: “...there's lots of ethics and considerations to be covered…When we think about what the web does. A lot of it is…at a scale that we can't handcraft everything, so, and as you alluded to earlier as well, there are hidden stories between collections and I think that's really…one of the interesting places… but also accessibility.”
- “I think the connecting up of stories is…the big thing again and helping people find stuff across such a…diverse range of content and different media types. And that doesn't necessarily have to mean that we just allow AI to do it for them. It might be instead that it helps us create those content connections.”
- “The idea of getting an AI to describe a collection object based on the information on a page is…really interesting to me.”
- Pertaining to involving Māori communities in AI projects: “So Te Papa has a [way]...of doing this already…through relations. And so we're lucky that we have a lot of those relationships in place already and the team can help…guide us with those relationships and make the connections so that we can do the consultation…and have them involved in the creation.”
- “When you think about recreating historic scenes or things like that, there are different cultures [that] view that kind of stuff in different ways. We would need to consider what's appropriate for the different types of stories. Recreating a dead person is something that people talk about a lot, but some people find that idea particularly offensive. So I think we'll end up in a space probably of hybrid experiences like we will definitely have some kind of AI helper that's quite basic.”

- “...[there is] bias in our collections even before we get to AI…The way that they are described, the things that we actually hold…have tons of bias in them. So we are going to have to be really careful with not adding more bias.”
- “Not everyone can afford the…top end stuff [referring to personal devices], so we can't necessarily design for the high end. Not everyone is going to have AI built in. So how do we navigate that in the next few years in terms of making the most of…the potential without locking other people out?”

Appendix M: Audience Impact Model

Table M.1 contains the full Audience Impact Model (AIM) the team created for Recommendation 1, consisting of the 3 exhibition goals and impact of each goal, reprinted and adapted with permission (Museum of New Zealand - Te Papa Tongarewa, 2020).

M.1 - Audience Impact Model (A.I.M) demonstrating impact and visitor responses to exhibition in Recommendation 1

	Attention	Reaction	Connection	
	1	2	3	4
	Attention caught	Immediate reaction	Personal connection	Simple learning
Goal 1: Understand the benefits/see opportunity	Feature AI tools and implementations.	Intrigued by the potential of AI applications. Excited about how they could use AI in their lives. Surprised Te Papa is so advanced in technology + hot topics.	Help the visitor understand how AI is used in their everyday life. People have used AI in their own lives	Helping the visitor realize all the capabilities of these applications of AI. Learn something new about AI.
Examples	"Look at that that looks new!"	"Wow Te Papa has AI displays?!?!" "Oh I want to know more about AI." "I wonder how Te Papa feels about AI."	"Oh I didn't know AI was used there/wow I already use AI." "Ooo I want to try some more of this AI!" "I used AI once for a university paper."	"Oh wow, I didn't realize AI could draw basic connections between pieces of information for me." "I didn't know you could use AI to do that."

Insight		Action	
5	6	7	8
Applied personal Insight	Applied empathic Insight	Personal action	Group/ community action
Help visitors come to the realization that AI can be used as a useful tool in their lives. Change their mind about something.	Help visitors recognize the positive impacts of AI on humanity. Empathize with people whose lives have been improved through AI.	Look into AI tools and implementations that could improve visitor lives.	Smaller museums / businesses / community groups see how they could improve operations, accessibility or personalization with AI.
"I wonder how AI could help me do small tasks in my everyday life?" "I didn't know the summary that pops up when I google questions is AI generated"	"We could use AI to make things more accessible." "I wonder if they are using AI to make learning more personalized in schools." "Wow, it's so great that AI can work with people as a tool."	"I'm gonna ask AI some ideas for book recommendations." "I think I can train a local model to help categorize antiques for my online store!"	"My running club used AI to provide personalized route plans for our members!" "An AI software helped me transform a recording into text for my students that have hearing impairments."

	Attention	Reaction	Connection	
	1	2	3	4
	Attention caught	Immediate reaction	Personal connection	Simple learning
Goal 2: Empathize with other perspectives to understand the drawbacks	Something like a voice recreation example.	Concerned that their data could be stolen. Uneasy about exploitation of data.	Show how an average visitor's information or valuables could be taken to allow them to empathize with/ understand how indigenous taonga may be taken. People might have had their own data stolen before	Understand hallucinations in AI generation. Learn how AI is trained with data sets. Understand what it means to be sovereign over data.
Examples	"Yay I can use AI here!"	"This AI stuff is kinda scary..."	"I put my SSN into AI one time. Oh no!" "I wouldn't like it if someone stole my photo album and used it without my permission."	"Wow, I really need to be careful with my personal info." "It's like they used to tell us: don't believe everything you see online." "Where do hallucinations come from? So I guess AI can be spreading false information." "Oh wow! That's how AI works"

Insight			Action
5	6	7	8
Applied personal Insight	Applied empathic Insight	Personal action	Group/ community action
Realize considerations to their lives and usage. Question bias in their own lives. Change their mind about something.	Realize considerations to others' lives. How one person's actions impact another/the need for respecting voices when applying AI. Question how systemic bias impacts others.	Take initiative to learn more about AI concerns and policy.	Iwis may reflect on how they treat their data. Smaller museums/ businesses reflect on considerations for AI in their museums/ businesses.
"I need to be more careful about putting my own work into AI" "Maybe I should double check that paper I just had AI write for me"	"I didn't realize that AI could be trained biased data" "Wow, using AI to translate other community's languages might not be as good as I thought." "If hallucinations come from biased sources then AI might be making up more bias too."	"I'm gonna call my MP to ask about their stance on AI issues" "I should look into how I can contribute to data sovereignty networks."	"We need to have a discussion about what information we want to keep to ourselves as a community." "We need to make sure we have people's permission before we put their data into our AI, but it could help us sort through our archives."

	Attention	Reaction	Connection	
	1	2	3	4
	Attention caught	Immediate reaction	Personal connection	Simple learning
Goal 3: Understand safe and responsible usage, ownership				Reflect that any use of AI must consider the pros and cons Understand the benefit of frameworks and collaboration
Examples				"I didn't know these frameworks and guidance existed" "I learned how to safely and respectfully use or implement AI"

Insight			Action
5	6	7	8
Applied personal Insight	Applied empathic Insight	Personal action	Group/ community action
Understand pros and cons and how the visitor can consider AI use for themselves Reflect on how they've used AI in their own lives	Make the visitor realize that they should work with their community when using AI. Be conscious about how their AI use can affect other communities.	Change habits when using AI to be more responsible and informed of bias and data	
"I feel more confident in the safety of AI if they use these frameworks" "I think this field is very new so it's important to use this careful guidance"	"If we're going to use AI for this we better make sure everyone's okay with their information going into it."	"Wow maybe I should fact check this information that AI gave me" "I'm going to go learn more about how AI implementations I use, use my data and source their training data"	