

2020

Digital Strategy Rautaki Matihiko



NGĀ TAONGA
SOUND & VISION



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INTRODUCTION

This Digital Strategy (the ‘Strategy’) provides a framework and guiding principles for the way we explore, review and adopt technology to help deliver our strategic vision for Ngā Taonga Sound & Vision (‘the Archive’). The Strategy acts as a supporting document to the long-term vision for the Archive and the core elements of our Strategic Plan. It describes how we will leverage digital opportunities to support the Archive on its strategic journey.

The Strategy outlines the digital opportunities for the Archive, defines our digital priorities and will guide delivery of the Digital Transformation Programme and other technology-related projects and activities over the next five years, to 2024.

This will be a living document, evolving to adapt to the environment in which the Archive operates. The last five years have seen change occur at a rapid rate – over the next five years change is likely to continue at an even faster pace, so accepting change and adapting to it is necessary to the Archive’s successful delivery of its strategic vision.

This Digital Strategy aims to support Ngā Taonga in its aspiration to be a sustainable world-class audiovisual archive, ensuring New Zealand’s audiovisual heritage is protected in the long term, regardless of its format.

Why do we need a Digital Strategy?

The proliferation of the internet, smartphones, social media, information sharing, and e-commerce has made 'digital' a real opportunity for the Archive. Digital technology has changed the way we live our lives from finding jobs and homes to choosing how we consume online content. It has enabled entirely new channels for service delivery, business process improvement, client engagement and innovation.

We need to ensure that we do not pursue technology for its own sake, but to utilise technology solutions as tools to help us deliver what we are already working to achieve. This Strategy will govern the way we use those tools, focusing on the reason we are using them, keeping our strategic vision firmly in sight.

We will focus not only on the efficiencies to be gained from using technology to automate existing processes (and thereby transforming physical information into digital formats) but also assess how we can use digital technologies to change our business model. This includes creating new or improved ways of delivering services; and improving the quality of what is delivered.

The Digital Strategy will shape how we work internally, how we provide services to our users and how we engage with our partners. Over time, we will increase our ability to leverage existing, emerging and future digital technologies to move towards our goal of being a world-class archive.

Key is understanding that technology alone will not achieve our vision, but that lasting cultural and behavioural change will be essential to embed a new way of working. We will encourage a culture of continuous learning and innovation, supported by new technologies and engagement with our partners.

Our goals

This Strategy will be the catalyst for significant changes in thinking and working within the Archive. When writing this Strategy, we had some key goals in mind:

- to set out a clear case for digital and provide a mandate for digital service design and transformation to be initiated within the Archive
- to inspire and initiate conversations across the Archive about our digital ambitions, learning from our partners, other institutions and our customers
- to outline how we will ensure the Strategy is delivered and sustained over the coming years. For the Strategy to succeed, it must be a living document that is regularly reviewed and refreshed.



Supporting our strategic vision

Our Strategic Plan 2019 – 2024 outlines our desired outcomes as we move through the next five years:

- The Archive is clearly established as a sustainable organisation with a credible professional identity.
- Collections are representative of our national identity.
- Collection items are stored in best-practice conditions.
- At-risk formats are prioritised for digital preservation and migration pathways are in line with international practices.
- We have strong relationships that grow the collections and access to them.
- We have enabled more New Zealanders to discover and engage with the collection in both English and te reo Māori.

This Strategy will provide the framework for us to incorporate new technologies and new ways of working into our organisation as we work towards achieving these outcomes.

The Strategy goes beyond our aspirations – it also outlines what must change in our current working environment to make our Strategy successful.

“Even as we push the envelope and we are bold in our vision, we also have to be rooted in reality...”¹

¹Former US President Barack Obama, Washington DC, 15 November 2019



HOW WE WILL EMBRACE DIGITAL IN THE ARCHIVE

The Strategy will allow us to harness technology and innovation better, to deliver more and improve results in the areas where we work. This Strategy will also enable us to understand the potential of digital technologies, articulate their use and value, and readily apply them to develop closer working relationships with our partners. Importantly, it will also allow us to understand the risks and trade-offs that come with these technologies, weighing these factors as we examine and test new technological solutions.

Guiding principles

Our Strategy will be underpinned by the following principles. These principles will guide the way we work and help us deliver the changes we make as an organisation.

Principle One

Putting our customers² at the centre of digital change

- We will put our customers at the centre of our service design.
- We will re-imagine services around our customers, using digital tools to make their experience of interacting with us easier and quicker.
- We will engage with our customers to ensure we understand their behaviours and preferences and make it easy for them to provide open and honest feedback.
- We will develop our digital services to align with the way our customers access services from across their digital ecosystem.

Principle Two

Promoting the discovery of our collections and service

- We will target appropriate digital content-sharing channels to expand our audience reach.
- We will make our digital content available through third party websites and apps, to engage with new audiences.
- We will develop strategic partnerships with those who can use and extend the reach of our content to additional platforms.
- We will engage with partners who can support us in connecting with new areas of expertise and resources.
- We will use effective marketing strategies and activities to optimise the number of people who know about and value our collections and services.
- We will develop a user-centric interface on our website that will make it easy for visitors to discover and explore our collections and services in more depth.

Principle Three

Ensuring our digital change remains inclusive

- As we change the way we work, we will ensure that our customers are not left behind and unable to access our services.
- We recognise that some communities may need extra support to take advantage of our digital change.
- By doing things more efficiently using digital tools, we can make best use of our time and expertise, reinvesting it into supporting all users to access our services.
- We will support our staff to move through the change and acquire the skills they need in this new way of working.

Principle Four

Maintaining our commitment as a kaupapa-centred organisation

- We have made a commitment to biculturalism as a kaupapa-centred organisation, consciously reflecting and validating Māori knowledge, perspectives and aspirations in our values, plans and actions.
- Our commitment, in this Strategy, is to ensure that this is reflected in our work.

Principle Five

Putting digital ways of working at the heart of our organisational culture

- We will embed digital ways of working at all levels of our organisation.
- Our senior managers will continually encourage the growth of our digital capability by investing in our infrastructure and the skills of our workforce.
- Wherever possible we will make digital ways of working part of everyone's jobs and cultivate an environment of digital self-confidence and capability.
- We will provide a digital infrastructure that staff can rely on to make their jobs easier.

² See Glossary for how we define 'customers'





Principle Six

Committing to continuously improve our services

- We will take an iterative approach to maintaining and improving our services by regularly reviewing their effectiveness.
- We will regularly check in with our customers and obtain feedback so we can continuously improve our services.
- We will use data to understand our service users and focus on being proactive rather than reactive.
- We will base our decision making on evidence gathered continuously from a range of sources, making best use of the data available to us.
- We recognise and will plan for ongoing investment and upgrading of our digital infrastructure and equipment to ensure it remains fit-for-purpose.
- We will embed flexibility in our approach to new technology by ensuring our systems will be designed and implemented on a modular basis, capable of performing several discrete activities. This approach will maximise our operational efficiency.

Principle Seven

Ensuring there is no compromise in privacy or confidentiality commitments

- Our depositors entrust us with sensitive and personal material. We will show respect for all our customers and provide a safe and secure digital environment for these precious items.
- Digital techniques will advance the practices and value of content management, sharing, and curation for the Archive and for all New Zealanders, promoting openness without breaching confidentiality or copyright restrictions.
- We will ensure content that we have permission to share will be made publicly available.

Principle Eight

Future-proofing the changes we are making

- Changes to our operating model and supporting systems need to be scalable and able to grow with our business.
- Our process design will be future-focused, taking into account the rapidly changing digital and technology landscape in which we operate.
- We will allow for the integration of future technologies and additional capacity for storage and operations in any technology solution we put in place.
- We will adopt new and emerging technologies such as artificial intelligence and predictive analytics to create compelling customer experiences and informed decision making.
- New technologies may require new skillsets, to enable Ngā Taonga to realise its strategic vision. We will work proactively to supplement any capability gaps we may identify within the Archive.
- We recognise that we also have an obligation to maintain legacy systems enabling ongoing preservation of analogue formats.



A customer-centric approach to transformation

Creating this Digital Strategy is an exciting opportunity for us, which will support us to meet our strategic objectives. It will help to inform our activities and work priorities and to design and deliver our services in a modern and efficient way. We will be able to provide greater customer and staff satisfaction by designing services around customer needs and preferences.

As the national repository for audiovisual archives, we must be able to cater for the needs of a large variety of customers and stakeholders. We must be able to accommodate the public, the film, television and radio industries, our key partners and organisations for whom we provide archiving services.

To make digital work for everyone, we need to entirely rethink the way we work. To be truly digital we must redesign our processes before we digitise, rather than creating an online replica of existing inefficient paper and manual processes. Importantly, we also need to ensure that our services are designed from a customer perspective, serving both internal and external users.

We will offer staff the support they need to adapt to a changing digital workplace by providing training, tools, infrastructure and organisational support. We will encourage staff to work collaboratively with partners outside the Archive who are based in digital-forward organisations, to expose our staff to new ways of working. We will also explore other ways we can support staff to change their perspective by encouraging activities such as short-term secondments to different agencies, engagement in collaborative projects and mentoring support from outside the Archive.



PUTTING THE DIGITAL STRATEGY INTO PRACTICE

Where are we now?

The legacy systems we have in place present the biggest hurdle to embracing a digital norm, as they currently define both our archival practice as well as our business processes. Our business applications do not support modern online services, and our mindsets have been focused on the content of our collections as representing the legacy organisations which came to form Ngā Taonga. We have an opportunity to define a way of working and a culture that is uniquely of and about Ngā Taonga.

We have built up extensive expertise, equipment and procedures that allow us to preserve and provide access to our audiovisual collections. However, in the last five years moving image production and distribution has changed from being almost entirely analogue to being predominantly digital. Ngā Taonga, along with other archives around the world, is now faced with the challenge of collecting, cataloguing, preserving and giving access to these digital collections in an environment where stakeholders will expect quicker, easier service supply.

This is in addition to continuing to maintain legacy systems enabling ongoing preservation of analogue formats for the foreseeable future whilst we digitally preserve these. There will also be continuing migration challenges that will require active lifecycle management.

How will archives change in the short-term?

Audiovisual items will be as much a part of the future fabric of information as text-based materials are today. The creation of these items will only continue to expand, meaning archives will be storing and managing increasingly large collections of assets. Archives operate within a dynamic and multifaceted context. They will grow to become the connections in a network of communities along with other content providers and a variety of stakeholders from various industries ranging from education and research to creative industries (such as publishing and broadcasting).

Recent studies indicate that by 2025 analogue carriers for magnetic media will need to have been digitised. After that date it will be impossible to transfer the carriers, either due to technical obsolescence of the playback devices or due to the state of the physical carriers. Without doubt, other analogue carriers will also become obsolete and will need to be prioritised for digital preservation.

For many archives, managing born-digital is already the norm, with analogue collections only growing through donations or acquisitions. The future of audiovisual archives is digital. Multiple formats will need to be supported, from the highest industry standards to emerging formats.

Content, in various formats, will continue to be managed through specialised asset management systems. Metadata will be fine-grained, allowing access at shot or scene level. Standards will be adopted to allow interchange between collections and to maintain the record of origin or metadata records as content is distributed online. Easy and user-centric navigation across the combination of different data and a diverse range of media types is essential.

The position of archives in their environment and the roles of archive staff will continue to evolve. Already today, the transformation of the traditional role of archivists has evolved. The future archivist plays a role as a media manager, that is managing assets from their inception all the way through to online access and long-term storage.

Future audiovisual archives will be smart, connected and open, using smart technologies to optimise workflows and to continuously improve business processes. Collaborating with third parties and other sector agencies to design and develop new technologies, enabling collaborating partners to be leaders rather than followers, will be essential if Ngā Taonga is to be the archive of choice.

Our focus to 2024

Over the next five years, we will start to turn our Strategy into real change within the Archive. Specifically, we aim to:

- develop comprehensive policies and procedures to support the Digital Strategy and Digital Asset Management activities
- upgrade the Archive's technology and equipment to facilitate digital activities
- develop specialist digital management and preservation skills in the organisation, through training and upskilling
- follow international examples of best practice relating to digitisation, file formats, metadata standards, storage and access technology
- create and maintain ongoing partnerships with sector specialists, peer organisations and expert groups to ensure that we are up to date as technology and standards develop.

We face several challenges when reviewing our digital capability, but there are three main areas of risk that will require constant monitoring:

Technical obsolescence: Digital technologies are constantly evolving and therefore it is essential that Ngā Taonga keeps abreast of changing formats and industry developments, re-evaluating our preservation solutions to ensure they remain valid.



Lack of Standards: The lack of internationally agreed digital preservation standards means there is a level of uncertainty attached to any preservation approach or technological solution the Archive may choose. Continuous research is essential in addition to maintaining ongoing partnerships with technology specialists, peer organisations and expert groups as standards develop.

Cost: Purchasing and maintaining technologies, equipment and skill sets in an ever-changing digital archive will be an ongoing, costly and resource-heavy activity, but it is vital to ensure the availability of the audiovisual collections to future generations. An efficient Digital Strategy cannot be achieved without consistent investment and must be supported by regular and predictable funding.

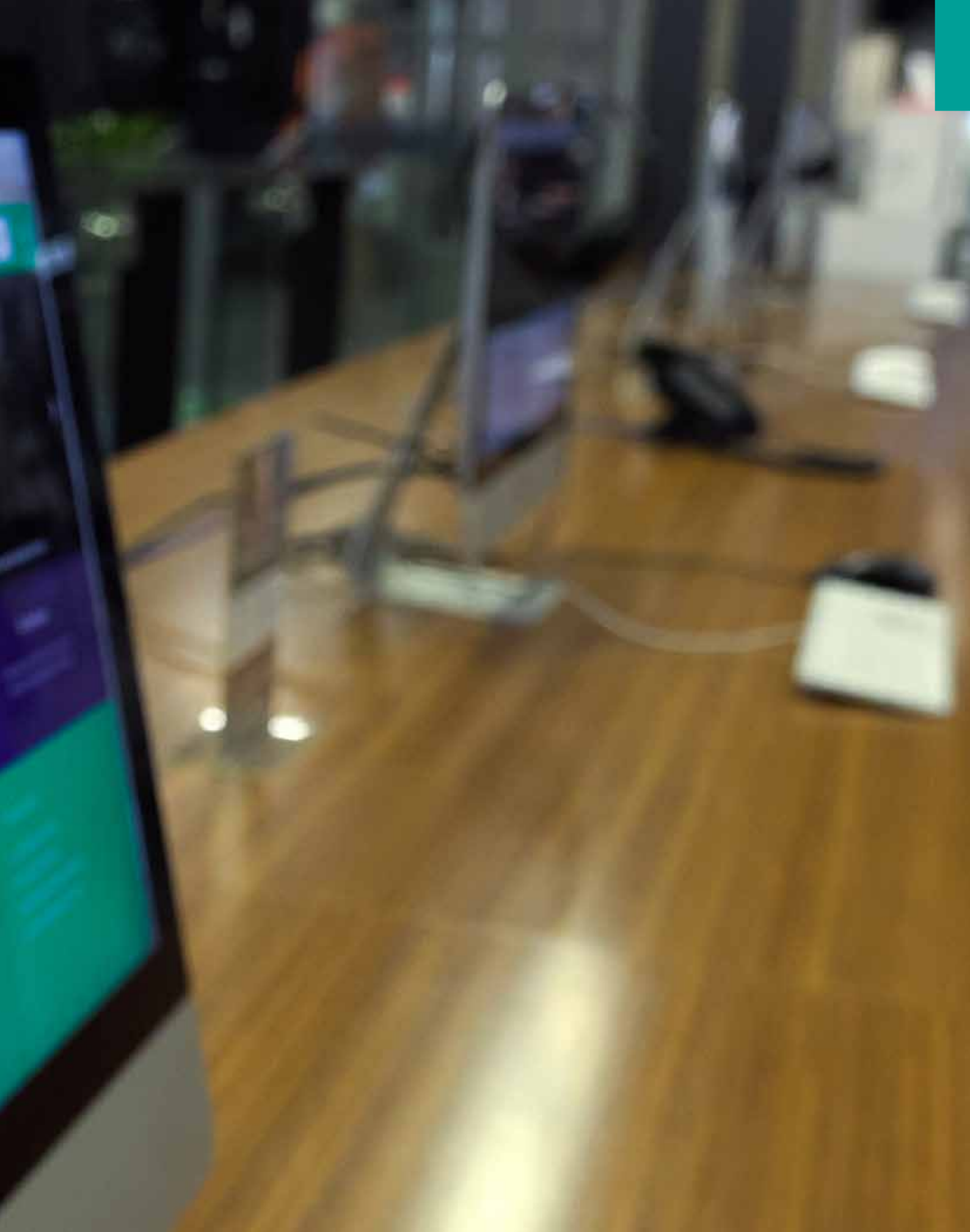
Turning our aspirations into reality

The Digital Strategy is not designed to stand alone. It stands in support of the Archive's Strategic Plan, and the Strategy itself will be supplemented by a roadmap, implementation plan and other procedural documents that will guide how we turn our strategic aspirations into reality. This Strategy will be an essential tool in assisting the organisation to achieve its ambition to become a Digital Archive that meets internationally recognised standards of excellence.

Although the Digital Strategy takes a long-term strategic view of the Archive's digital needs, it is also a live document that will be reviewed annually, to ensure that it still supports the Archive's strategic objectives. It will also take into consideration any changes in technology, policy, budgets and funding.

The Archive has committed to establishing a Digital Transformation Programme, to start the move towards achieving the goals outlined above. While the Digital Transformation Programme will put in place the foundational capabilities needed to take the Archive into the future, it is also possible that the annual review of the Strategy will identify additional areas where the Archive needs to make change. To ensure that we can demonstrate progress is being achieved towards our digital goals, the Digital Transformation Programme will also define metrics by which our progress can be measured.

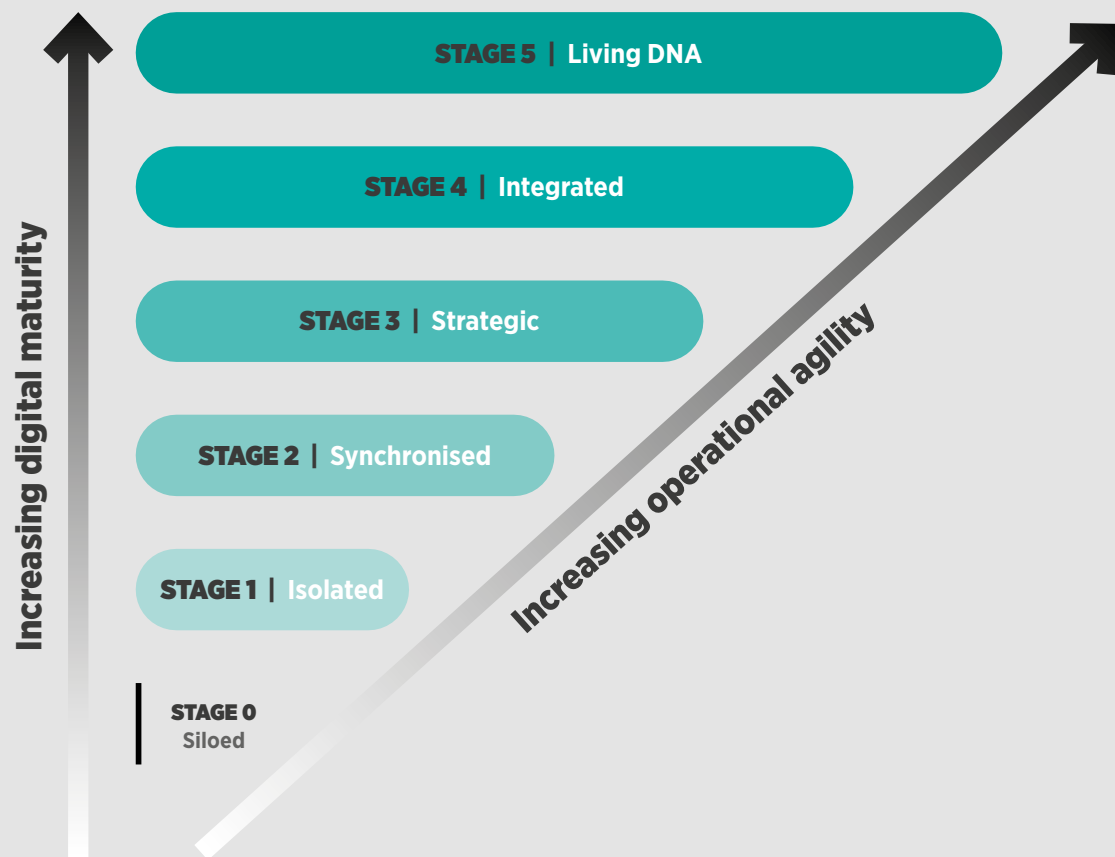




OUR PRIORITY AREAS

Digital Maturity³

The journey of digital transformation can be described as being in five stages, as shown in the diagram below.



³ The 5 Stages of Digital Transformation Maturity in Mid-Sized Businesses:
<https://www.xuviate.com/blog/5-stages-of-digital-transformation-maturity-in-mid-sized-businesses>



Stage 5 | Living DNA

Digital and non-digital practices merge, creating an organisation that can respond rapidly and convincingly to any changes in the external environment. Their success is due to three core capabilities: i) highly attuned to changes in the environment, ii) adept at leveraging data to informed decision-making, iii) able to rapidly execute new changes needed to the organisation.

Stage 4 | Integrated

To speed the change in momentum a team is created with the sole focus of driving digital re-organisation across the business. Dedicated resources and funding make a significant difference to the way the change is viewed, and the transformation now becomes 'the way we do things here'.

Stage 3 | Strategic

This group (see Stage 2 below) and its digital improvement agenda are recognised at a strategic level. The digital change becomes an important business priority as the need for better and faster decision making and execution continues. The CEO assumes responsibility for the digital transformation journey.

Stage 2 | Synchronised

Ad hoc arrangements in Stage 1 are formalised as leaders see results and want to leverage technology and speed the digital change. They establish a group to assume responsibility for prioritising and synchronising improvement initiatives and use of resources.

Stage 1 | Isolated

Some ad hoc digital change occurring, but within discrete functions. These areas slowly start to collaborate with other functions. While more than one business team is involved, they remain isolated examples at an enterprise level.

Every organisation starts at Stage 0 ('business as usual') where technology essentially plays a supporting role across many siloed business functions. Moving through the stages requires increasing digital and organisational maturity.

Ngā Taonga is currently operating within Stage 1 of this digital maturity model. To stay relevant Ngā Taonga needs to implement a Digital Transformation Programme to ensure our organisation is operating in a digitally mature way.

As with so many organisations, we want to deliver great customer experiences, take advantage of new technologies to cut costs, improve quality and transparency and build value. This will mean committing to reviewing the organisation's operating model to develop a model that combines digital technologies and operations capabilities in an integrated, well-sequenced way to achieve significant improvements in operational efficiencies, customer experience and staff capabilities.

Ngā Taonga aims to do this by focusing on these key areas:

Operational Efficiency

A key component of modernising processes will be to make sure our staff have the best business and productivity tools for the job. We need to streamline the applications used and re-engineer our processes to ensure the most efficient handling of tasks.

When considering how an existing service can include digital processes and tools we will not be bound by existing technologies and applications. We will audit our existing systems to gain a clear understanding of the capabilities of the system and if it is being used to its fullest potential.

We will review any processes that incorporate use of systems to see where there is waste or duplication. If this review concludes that we can phase out and decommission some of our back office systems and processes, we expect to be able to realise financial savings. Equally, the introduction of alternative systems could bring about resource efficiencies, and free staff from rote tasks. A pilot approach to introducing digital services will be supported. This is a phased roll-out of a change with a small group of users, so the project can be amended iteratively before being rolled out across the entire Archive.

Business intelligence and analytics will enable us to work smarter and make better decisions. We already collate customer data in some form and by making better use of data analytics tools we can gain a greater insight into customer need. We can see what information people access through our website, what people are looking for when using a search engine, if a desktop or smart device is used, if they are a new or returning customer.

For any digital service improvement introduced the collation and analysis of data is crucial for successful customer take-up. Using intelligence collated from the website, social media, surveys or feedback can enable us to better



commission services our customers want and support continuous improvement in service delivery. Where we do not collate comprehensive data it is important to determine exactly what information on the customer base would help manage future service demand and put measures in place to collect, manage and share these data insights.

We can apply these same disciplines internally, collating and analysing data on our outcomes reporting areas or on throughput, to understand how we can put continuous improvement activities in place. For those customers who contact us to gain access to our collection materials, we will ensure that we capture data in a customer relationship management system (CRM); and use this data to understand service requirements, volumes and themes.

Many data silos exist in the Archive. We want to be a high performing organisation, getting the best value and making the best global use of our data so we will investigate mechanisms that will enable us to extract, analyse, share and store data securely.

We will standardise and automate common processes to simplify transactions for our customers and create streamlined cross-functional processes. These efficiencies will ensure that we can prioritise our resources to deliver our core services.

We will know we have been successful when:

- All our core systems⁴ are fit for purpose and our service providers are those known for being not only solid service providers but also innovators.
- All our core systems can easily 'talk' to each other; and ideally to our business partners' systems so that information can be shared securely in a truly accessible fashion.
- Our systems are focused on our customers' needs and meet their expectations in an increasingly digital world; while also enabling us to collect data and gain deeper insights on our access customers (for example, from a fit-for-purpose CRM system).
- Our processes are automated as much as possible and we strive to ensure we are continuously improving and able to embrace new technologies that are being developed, adapted and/or become more accessible.
- Our preservation systems and processes are considered best practice in digital and archive circles.
- We actively look for collaboration and co-development opportunities with others.
- Our systems and processes are effective and efficient – part of a pan-archive suite of tools.
- Pan-archival collaboration is the norm.
- We look to the future just as much as the past.

Customer Experience

Redesigning our services around the customer is a key part of our digital strategy. To enable this, we will review our business processes and business applications, to better serve our customers. We currently have a high number of systems with many services having systems or processes tailored to their specific service area only.

We will create successful digital channels our customers want to use, which may require a channel shift from traditional methods of interacting with the Archive. To ensure that our digital channels are successful we need to ensure they are well-designed, as simple as possible and intuitive. Where possible we will put in place self-service options for customers, using tools such as online forms, chatbots and online payment options.

A single view of the customer is an important part of the digital change. We will use software to enable us to take a single view of the customer and collect pertinent data to enable us to respond to customer queries and requests in a joined-up manner and to take a proactive approach to engaging with existing customers. We will capture data and use analytics-based insights to understand what really matters to our customers and how best to deliver it to them. We will use our understanding of the customer experience (which in many cases cuts across multiple functions and channels) to improve our customer interactions.

A customer relationship management (CRM) system will be one way that we will improve our customer focus. A CRM system enables us to store data on an individual customer basis, to have one view of all their interactions with us and use analytical functions to understand what our customers want from us. Collecting data via a CRM system will provide invaluable customer insights which will enable us to respond to demand and make more focused decisions.

We will know we have been successful when:

- customers have their expectations met as our systems have customer centric user interfaces
- we are easy to work with as our staff have the resources to support them in all their dealings with our users – whether they are a depositor, hapu group, researcher or a member of the public
- our users actively engage with us as they enjoy their experience – whether it's delivered via personal or automated means.

⁴ Our core systems include the Collection Management System (CMS), Customer Relationship Management (CRM) system, the Digital Archive and core ICT infrastructure, and Electronic Document and Record Management System (EDRMS).



People Capability

We are committed to cultivating a digital culture and creating a sense of excitement around digital transformation in the Archive. We want everyone at all levels of the organisation to feel empowered and motivated by what we are looking to achieve. To sustain momentum around the change, we will look to each service area to identify a Digital Champion. These Champions will be a key contact with whom colleagues can discuss digital projects and approaches. They may have an interest in technology, gadgets or data. By having an informal network of Digital Champions we will be able to gauge appetite for change across the organisation and potentially any opportunities for collaborating on projects.

Our more formal approaches will be to create useful and interesting training sessions, toolkits and opportunities to share learning and knowledge across the Archive. Our first activity will be to assess what digital skills and readiness we have as an organisation and target training and support to address any skills gaps. As digital confidence in individuals and teams across the organisation grows we will look to support areas that are more hesitant, ensuring that no area gets left behind.

It will be important for us to promote our digital ambitions and culture when recruiting new people to the Archive. We want people who will embrace our approach to digital and have the skills and behaviours we need to make things happen. Our recruitment competencies and behaviours will be updated to reflect our ambition and principles and ensure we attract high calibre candidates who can see themselves taking an active role.

We will know we have been successful when:

- Our people strategy has been successfully implemented. Our people are high performers.
- Our people actively collaborate and share their knowledge and expertise. They are routinely sought after to present as keynote speakers (in their fields of expertise) on both the domestic and world stages
- We are a kaupapa-centred leading organisation, displaying a shared, mature approach to our working life. We provide thought leadership and can educate others on our approach
- We have improved our productivity and become more efficient in all aspects of our working life.
- Our people actively embrace change – they look for solutions to any problems that exist, they drive change, they want to continuously improve.



NAVIGATING THE FUTURE LANDSCAPE

For Ngā Taonga to position itself as a world-class archive and access provider, it is important that the Archive focuses on the longer-term horizon. By anticipating what the digital landscape will look like in the future, we can ensure the organisation's strategic and operational planning includes the changes occurring in our environment. This foresight will provide the sources of competitive advantage that Ngā Taonga needs to truly establish itself as a sustainable organisation and fit for purpose Digital Archive.

The Digital Strategy focuses on the upcoming 5-10 year horizon and outlines the future trends that will come to impact the way the Archive operates and identify the opportunities these present. These trends come both from within the audiovisual archive sector and the wider technological advances that are likely to disrupt or influence the decisions we make today.

We expect to manage the disruptive impacts of artificial intelligence (especially in the areas of machine vision, big data, and speech analytics), the 5G mobile network, interoperability chatbots, and extended reality as a start. An examination of the potential the technology offers the Archive is attached in Appendix A.

Outlined below are five case studies of digital innovation which have direct bearing on developments that the Archive could consider in the future.

Example One: Machine vision

Auckland Museum holds a collection of around 7 million artefacts, specimens and documents. Like many institutions, their existing backlog would take many decades to address, before even taking into account new acquisitions or born-digital content.

In 2018, the museum ran a pilot project to explore using **machine vision** to address their backlog. The pilot used machine vision to recognise common shapes and patterns in an image and describe them, replicating the decisions that a human cataloguer might make.

The machine vision programme provided tags, captions and confidence scores for the image. Images with a confidence score of at least 60% were deemed suitable to publish using the machine-generated content; below 60% required the cataloguing staff to review the item.

The outcome of the pilot was that machine vision was suitable for less sensitive collection items. Machine-generated records are marked as such to both protect staff reputation and remain transparent with users.

The museum saw two main benefits: firstly, speeding up the process to give these collections increased accessibility in-house and online. Secondly, staff are able to focus on the more intricate and nuanced collections cataloguing that would otherwise remain in the backlog, leaving the less sensitive content to be machine-generated.

Ref: Moriarty, Adam. "A Crisis of Capacity: How can Museums use Machine Learning, the Gig Economy and the Power of the Crowd to Tackle Our Backlogs." MW19:MW 2019. Published January 15 2019.

Example Two: Language recognition

Te Hiku Media is an iwi media organisation using machine learning to develop innovative tools for **language recognition**. Their Kōrero Māori project developed the first te reo Māori automatic speech recogniser (essentially creating a te reo Māori version of voice activated systems such as Alexa, Siri, and Cortana).

The organisation has just received significant funding for further development via their Papa Reo project. The project will develop a multilingual language platform providing natural language processing tools, starting with te reo Māori. The tools will enable applications to be built that will mean users can engage with their digital devices in a variety of languages.

The development process also used crowd-sourcing to both teach the sounds and phonemes of te reo Māori to machines and act as a quality control on the language supplied. People can record themselves reading a provided sentence in te reo Māori to create a spoken word database. The public can also listen to these recordings and indicate whether they think the pronunciation is correct or not. These activities supplement the te reo Māori experts who also listen to the recordings and are used to refine the algorithms underpinning the platform.





Example Three: 5G technology

In early 2019, a surgeon in China performed the world's first remote operation using **5G technology**. The doctor in the south-eastern province of Fujian used robotic arms in a remote location 30 miles away to remove the liver of a laboratory test animal. Using the 5G connection the lag was limited to just 0.1 seconds.



Example Four: Chatbot

In 2017 the National Museum in Belarus launched a **chatbot** that is designed to enhance the museum visit. While walking through the museum you can ask the bot (through Facebook Messenger) to show you where to find an object you are looking for. The bot can also provide more information on almost every piece in the museum. The chatbot has turned visitors' mobile devices into a handheld personalised museum guide. According to the museum, the chatbot serves as a way to provide valuable information in an engaging way that is more accessible and easier to consume than exploring a website.



Example Five: Virtual reality technology

The Natural History Museum in London launched the Hold the World app in 2018. Using a headset and controller, it gives users a chance to move and manipulate virtual objects that are fragile, expensive or remote, using **virtual reality technology**.

Sir David Attenborough, who was digitally recreated as a lifelike 3D hologram for the experience, acts as host. Viewers will be able to virtually enter various rooms in the museum, and in each room Sir David Attenborough will be sat opposite the participant, inviting them to examine several rare specimens. The objects also appear to come to life, giving users a chance to learn more about their history and scientific value.

For the museum's experts, the technology offers them the opportunity to examine objects in more detail and from multiple angles, in a way that would not be possible with the physical item. The larger dinosaur skeletons, for example, are too big to pick up and manipulate, but the app provides the ability to zoom-in on the skeleton and inspect individual areas in more detail.

It also means that the virtual skeleton can be imported in digital form into computer programmes, where the mechanics of the structure can be examined. Experts in the museum have been able to engage with the museum's objects in new ways, and gain a better understanding of how they might have functioned.



APPENDIX A: TECHNOLOGY TRENDS

Artificial Intelligence

Artificial intelligence (AI) is one of the most transformative technology evolutions of our times. Organisations have started to explore how they can use AI and machine learning to improve the customer experience and streamline their business operations.

AI-related developments represent a significant shift in the type of work as well as the skills and talent that organisations will need to be successful. For the Archive this will mean a culture and capability shift which will be vital for us to remain relevant.

With AI-related technology learning being used to undertake rote tasks, staff will be able to spend more on high value tasks which may include education programmes, outreach or engaging more with users. Far from requiring our staff to be expert coders or data analysts, a digital transformation may instead see staff refocus on developing soft skills to support our strategic outcome of enabling more New Zealanders to discover and engage with the collection.

A number of areas with direct relevance for the Archive fall under the umbrella of artificial intelligence.

Machine vision

Machine vision is the ability for a computer to understand what it is seeing, identifying items, places, objects or people from visual images. The technology supporting machine vision has become advanced enough to detect the subject matter and objects depicted in an image and can be used to classify visual objects.

Machine vision can be used for more nuanced analysis of visual objects:

- Extracting colour composition: using machine vision to analyse an object's image, the computer can extract and output data related to its colour clusters and partitions.
- Sentiment analysis: machine vision can be used to determine the emotional state of the faces portrayed in an image by analysing the facial characteristics.
- Text/character recognition: optical character recognition enables the extraction of text from every object in the collection. While this is not a new development, it has become more accessible and faster to use via cloud APIs (refer to Glossary).
- Recognising similarity and patterns: machine vision can identify works in the collection that are very similar, not just on subject matter, but visual composition. A computer can see these relationships, draw the linkages and quantify the differences and similarities.

The net effect of these analyses is to make the collection more cohesive, more accessible, and able to be interrogated more deeply by users.

For the Archive, the obvious application of machine vision is to automate cataloguing work, not only to address the current backlog of items that require cataloguing but also to expand the amount of content available to users online. It may also enable us to present our collection in new and unexpected ways and engage with a wider audience.

Big Data

It is estimated that over 70 percent of an organisation's data is unstructured, which makes it hugely time-consuming and complex to analyse and transform into structured data that can be used as actionable information. Most unstructured data goes unanalysed leaving the information lost and unusable. Machine-based learning offers the ability to make use of this information, using its processing power and robust algorithms to make sense of the data an organisation holds.

Machines can take a 'boundary-less' view of an organisation, operating at an enterprise level, and can draw on data and analytics to build on staff's institutional knowledge. The benefits are faster decision making, reduced costs, increased efficiencies, and improved user and customer experiences.

Within an archive environment, visual recognition algorithms can unlock the potential of digital image collections by tagging, sorting, and drawing connections within and between databases. The potential to collaborate with our partners, by allowing shared analysis of our databases holds the potential to enrich all of our collections.

The Archive holds a tremendous amount of data, although the collection data is not well structured or well classified. This valuable metadata has huge potential and could offer new ways to analyse collections, objects and creators, transforming it into a valuable asset for the Archive. It has the potential to help the Archive to make new discoveries about the collection; and draw new linkages between disparate collection objects. Using a machine's analysis could aid curators in putting together collections with content that may not have been obvious. Freed of human logic and biases, the connections created by the machine could be unexpected and illuminating.

Speech analytics

Improvements in software technology have made automatic speech transcription possible. By capturing vast quantities of human speech, neural network programs can be trained to recognise spoken language with accuracy rates that in the best circumstances approach 95 percent. By means of comparison, professional human transcribers have a 5.9 percent error rate.



AI disciplines like NLP (Natural Language Processing) are creating considerable improvements in how organisations use their voice data, from speech analytics to voice-to-text transcription. This applies to all forms of spoken words, both on video and audio recordings.

The opportunities for an audiovisual archive are obvious, of being able to transcribe both audio and visual materials. It supports improved metadata and full text search capabilities across the source material, which in turn increase discoverability of the objects. The efficiencies of automating the transcription process also mean that the work can be completed faster, continuously (24/7) and without requiring human oversight.

5G data networks

The 5th generation of mobile internet connectivity (5G) will offer super-fast download and upload speeds as well as more stable connections. Super-fast data networks mean consumers will be able to stream movies and music at higher quality on the move. The greatly increased speeds will also mean that mobile networks will become more usable even than the wired networks running into homes and businesses.

When 5G starts to be rolled out in earnest, the average consumer will be able to access more bandwidth on their mobile network than they would from local wi-fi services; and will be increasingly content to rely on their mobile connection alone. The impact of this is that organisations offering virtual and augmented reality experiences will no longer be so restricted in where and how they can deploy them.

A network's augmented bandwidth capabilities will mean that any device which is able to connect to it will be able to provide the virtual or augmented reality experience. Because it is so much faster, higher-quality experiences will be offered to more people and, crucially, they should all be able to access this sort of service simultaneously. In fact, even people who are not physically present at a museum or gallery will be able to visit it in a virtual sense in future, offering the sector a whole new way to provide educational outreach to the public.

The improved resolution that will be possible with 5G networks will also enable a much more realistic virtual reality experience. This won't just make for a more entertaining experience for consumers but could be used to help archive professionals liaise with one another in ever more meaningful ways. For example, if one of the world's experts in preserving a certain artefact happens to be a professional in another institution on the other side of the world, then a virtual experience of the item in your establishment's possession could make all the difference in the way you preserve it. Archive professionals all around the globe should be able to use the technology to collaborate with one another with greater accuracy.

With the modern technologies offered by today's mobile phone network operators, even more can be done. For example, armed with a robotic arm and a virtual reality headset, an expert in one country could manipulate an

artefact in real-time with virtually no latency even though they are nowhere near the item in question. Surgeons are already looking at the possibility of conducting operations in this way, and the archive sector could leverage this kind of application when a high level of expertise is called for.

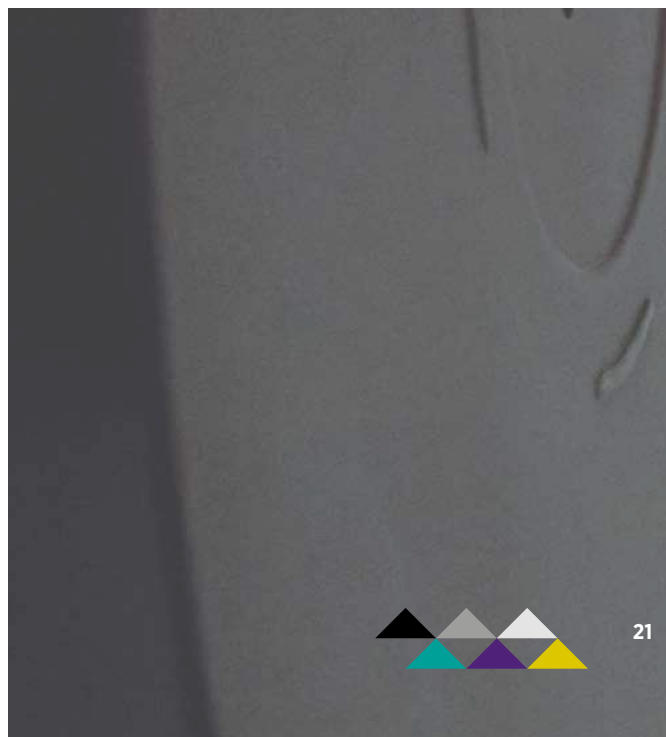
Interoperability

Archives will benefit from fostering a culture of innovation, to effectively manage ever-changing expectations of users, and at the same time make the most of new opportunities offered by technology. For this, it is essential for archives to have access to technical infrastructure that allows for the effective and efficient management of digital assets but also the ability to pursue modern objectives in line with user expectations:

- using new channels for content distribution, such as new forms of social media
- engaging with new user groups using technologies (e.g. linked open data, natural language processing) to enrich and optimise work processes
- allowing for creative ways to access collections where permissions allow.

As a result of digitisation, archives and their customers are sharing the same information space. The traditional role of the searchable catalogue may still be the main access point but should not be the only access point to the collections. On the web, content likes to travel, and needs to be embraced accordingly. For example, the Archive could provide API access to the catalogue and by adopting machine-readable copyright labels to facilitate access.

Doing these things makes it possible for third parties to 'build upon' online accessible collections. For example, publishers can integrate resources in learning environments. Adopting technologies like this leads to a new ecosystem emerging allowing archives to focus their efforts on 'super serving' niche communities (such as filmmakers, researchers and the like).



Chatbots

A chatbot is a computer program designed to simulate human conversation. They are widely used on messaging apps (such as Facebook Messenger and WhatsApp) or on retail websites. They automate the process of interacting with website visitors and social media followers to create the best user experience, providing the illusion of a 24/7 presence even when a human isn't available to respond. Developments in AI technologies are enabling computers to process language and actually converse with humans in more sophisticated ways.

Many aspects of interactions with archives are suitable to be "botified" and conversational interfaces are starting to take over parts of an organisation's website. Activities such as ticketing for exhibitions and collection search are perfectly suited for simplification through a conversational interface that hides the underlying complexities of the process.

The AI technology behind a chatbot enables the function to 'read between the lines' of a search request, in the way that traditional search functions based on taxonomies are unable to. This is particularly relevant when searching an archive collection, where the words and metadata used to describe collection objects may be academic.

For the Archive, chatbots could be used to replace the current collections search function, making it easier for users to discover and access the collection. Chatbots could also be used to automate simple requests and interactions with the Archive, freeing up staff time to deal with more complex requests.

As already noted, the introduction of the 5G network is likely to see an even greater reliance on mobile devices which is where messaging apps reside. Access and outreach activities with customers could be managed and personalised via chatbots.

Extended Reality

Extended Reality (XR) is an umbrella term that covers several new and emerging technologies being used to create more immersive digital experiences: virtual reality, augmented reality and mixed reality.

Virtual reality (VR) provides a fully digitally immersive experience where you enter a computer-generated world using headsets that blend out the real world. Augmented reality (AR) overlays digital objects onto the real world via smartphone screens or displays (such as Snapchat filters). Mixed reality (MR) is an extension of AR, that means users can interact with digital objects placed in the real world (for example, playing a holographic piano that you have placed into your room via an AR headset).

Although not new, these technologies have predominantly been confined to the world of entertainment. However, they are now being adopted by businesses, becoming increasingly prevalent for training and simulation, as well as offering new ways to interact with customers.



GLOSSARY

Term	Definition
API	Application Program Interface An API is a software intermediary that allows two applications to talk to each other. In other words, an API is the messenger that delivers your request to the provider that you're requesting it from and then delivers the response back to you.
Artificial Intelligence	Machine Learning and Artificial Intelligence are terms that tend to be used interchangeably. However, they are not the same thing. Artificial Intelligence (AI) is the overarching concept that machines can undertake tasks in a way that mimics a human's ability to solve problems by itself. Whereas Machine Learning is a subset of AI where machines use algorithms to learn from experience. Within this document Artificial Intelligence has been used as an umbrella term covering both.
Customers	Our customers are anyone who interacts with us. This can include clients (that is, those people for whom we hold contact details and with whom we have multiple contacts – including depositors) and consumers (that is, those people who access information about the Archive or its collection via social media or other interactions). Internally, we also have teams providing services to other internal teams, meaning we have internal customers to serve as well.
CRM system	Customer Relationship Management system A technology for managing all of an organisation's relationships and interactions with customers and potential customers.
Digital Archive	The Digital Archive is the term we use to describe the process of accessioning and storing digital collection items.
Digital ecosystem	A digital ecosystem is an interdependent group of enterprises, people and/or things that share standardised digital platforms for a mutually beneficial purpose, such as commercial gain, innovation or common interest.
Digital infrastructure	A broad reference to existing digital tools, capabilities and frameworks that we operate within.
Digital transaction	Any service that allows the exchange of information, money, permission, goods or services between the Archive and our customers, partners or stakeholders.
EDRMS	Electronic Document and Record Management System A type of content management system referring to the combined technologies of document management and records management systems as an integrated system.
IT Infrastructure/platforms	A broad reference to existing IT tools including hardware, software, networks and facilities that are in place in order to develop, test, deliver, monitor, control or support IT services.
Machine vision	Machine vision is the ability for a computer to understand what it is seeing, identifying items, places, objects or people from visual images.





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