Artificial Intelligence: a digital heritage leadership briefing

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We commissioned Dr Mathilde Pavis to produce a snapshot of what innovation in Artificial Intelligence (AI) looks like across the UK heritage sector. It can help you decide whether to, how and when to use AI.

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Executive summary

- AI refers to advanced computer programs capable of performing tasks usually associated with human intelligence like understanding speech or recognising images.
- Many heritage organisations are thinking about whether to, how and when to use AI. As with all technology investment, the organisations' values and strategic aims should be carefully considered. Properly resourced planning should be undertaken, focusing on effective and ethical use of AI.
- Heritage organisations are using AI in three key areas of their work: heritage and collections management, use and research; visitor experience; and, business operations and management. Organisations use off-the-shelf AI tools for productivity to initiate tasks like generating new ideas for marketing content or producing transcripts of events proofread by staff before publication. Organisations have also adapted open-source AI systems to automate certain work like adding metadata tags into their catalogue to make their collections easier to find online.
- Heritage organisations with experience using AI stress the need to improve on core digital infrastructure like data management and storage as well as workforce development and volunteer training to use the technology effectively and safely.
- Experts worldwide have highlighted a range of risks associated with certain AI applications, including bias, discrimination, misinformation and rights infringement. The risks involved will vary depending on the type of AI application. For example, the risk of discrimination can be higher when AI is used to identify people in images or the risk of rights infringement may increase when AI is trained on copyright protected content.
- AI risks can be managed in different ways depending on the AI application. For example, using open-source AI systems trained on the organisation's own materials free of rights or with permissions could manage the risk of rights infringement. Reviewing information produced by AI and labelling it as AI-generated content before publication could manage the risk of misinformation.
- As trusted knowledge institutions, and as stewards of rich collections and datasets, UK heritage organisations are well positioned to contribute to AI innovation and good practice. To do this, they will need to be able to collectively understand and engage critically with legal and technical developments in AI.

Introduction

The rapid pace of Artificial Intelligence (AI) development can seem daunting to people unfamiliar with the technology. There are positive steps organisations can take to ensure they are ready to take advantage of the opportunities and identify the risks that AI brings to the ongoing digital transformation of the UK heritage sector.

AI can be used by heritage organisations for productivity to support a range of activities. Heritage organisations should decide whether, how and when to use AI according to their mission, priorities, and resources. As with any technology, the safe and efficient use of AI will require careful planning and resourcing, notably to mitigate the risks associated with certain AI applications.

This briefing can help heritage organisations think about AI in the context of their institution, by covering:

- **ongoing developments and practical uses** of AI in the UK heritage sector
- **potential benefits, opportunities and risks** of using AI
- **current regulatory approaches** to AI in the UK and abroad
- **strategic areas of investment and focus** as the use of AI becomes mainstream

What is heritage?

The National Lottery Heritage Fund's approach to heritage is broad and inclusive, adapting to contemporary and future uses and challenges. From the historic and natural environment to our museums, libraries and archives. From our industrial legacy to cultural traditions, stories, memories, celebrations and more: “anything from the past that you value and want to pass on to future generations”. The Heritage Fund’s strategy, Heritage 2033, sets out the vision for heritage to be valued, cared for and sustained for everyone, now and in the future.

The UK heritage sector is composed of diverse stakeholders and communities ranging from well-resourced organisations to projects managed by small groups of volunteers.

What is Artificial Intelligence?

There is no single definition of AI. For this briefing, AI is understood as computer programs capable of performing tasks usually associated with human intelligence like the ability to understand language, recognise pictures and learn from experience. This briefing refers to these computer programs as 'AI systems'.

As early as 1997, heritage organisations worldwide began using AI for tasks such as generating text descriptions for digitised images, although these instances remained relatively isolated. As the technology improved to perform more complex tasks and be operable by people without technical expertise its application has increased. In the June 2023 UK Heritage Pulse survey, 24% of participants reported that their heritage organisation was already using AI.

How does AI operate?

- AI uses algorithms to analyse large datasets from which they detect patterns and correlations, enabling the system to ‘learn’ how to interpret new data or anticipate future events. To ‘learn’ how to complete a task, AI systems need to be trained on machine-readable datasets. These datasets can be ‘structured’, like the field entries in collections catalogues, or ‘unstructured’, like videos of visitors walking around a museum.

- AI systems can only perform the tasks encoded into their design or learned from the datasets it analysed. As such, AI systems cannot improvise or perform tasks with complete autonomy.
- AI systems need to be prompted to perform a task by uploading materials to process, typing or speaking a command into a computer.
- The quality of the datasets on which AI systems are trained and used impacts on the accuracy of the information they produce. Organisations with large digital collections adhering to good data management standards will be better positioned to take advantage of AI for this reason.

What can AI do?

AI capabilities might assist heritage organisations to work more efficiently, inform decisions, produce new knowledge provided that staff and volunteers carefully select the content the technology is used on and review the AI-generated information for accuracy before using or sharing it.

AI can perform two key tasks known as ‘AI capabilities’:

- **Generating content like text, images or sound** (eg: to produce marketing content, new tags for cataloguing or summarise text). This is also known as ‘generative AI’. You can prompt an AI system to generate new text, image or sound by typing or speaking your command as you would when using an online search engine. For example, you may type in a paragraph and request the AI system to generate an audio narration of the text.
- **Analysing large or complex bodies of information** (eg: digitised images or numbers on a spreadsheet). You can instruct an AI system to analyse machine-readable content uploaded onto its system. For example, you may upload satellite images of natural reserves to identify wildlife and its movement patterns over a chosen period using an AI system pre-trained to perform this type of analysis.

An AI system can be designed to perform either or both capabilities.

However, AI cannot perform certain tasks like self-reflecting, contextualising and critically engaging with information. Any results AI produces need to be checked by a human to ensure relevance and accuracy.

What content can AI be trained or used on?

There is a growing consensus among experts that AI should be trained or used on content that is legal and ethical for the relevant AI application.

Content legal for AI use refers to materials which:

- are free of rights like copyright or used with appropriate permissions granted by the law or the rightsholders like materials shared with a public domain mark
- do not contain confidential or privileged information

It should be noted that what constitutes the lawful use of protected content in the context of AI training is under review by courts and legislators in the UK, as described below.

Content ethical for AI use should be determined on a case-by-case basis, and may exclude sensitive materials like:

- images or contributions by children, young people and vulnerable adults
- items or knowledge of cultural significance to communities of origin

- ancestral remains, spiritual works or funerary objects

Where can heritage organisations find AI tools?

UK heritage organisations can gain access to AI in two main ways:

Using bespoke AI systems tailored to their needs and datasets. With resources, this can be done by adapting open-source AI systems or acquiring proprietary technology from a third-party supplier. Most open-source AI systems need to be downloaded onto the users' computer or network and require computer science skills to operate. While some organisations may have their own in-house development teams, there will be benefits to collaborating with researchers and computer scientists from their local university to prepare collections, adapt and train an open-source AI system.

Using off-the-shelf tools produced by the private or third sector. AI tools can be accessed online or downloaded onto a local computer or network. There are many off-the-shelf AI tools available, for example:

- ChatGPT and Bard generate human-like answers to a wide range of questions
- Anniff automatically generates metadata tags in documents uploaded onto its system
- Transkribus transcribes text from digital images of handwritten manuscripts
- Signapse AI generates British Sign Language video translations from text and audio
- DALL-E 3, Midjourney and Stable Diffusion generate images from text
- ElevenLabs generates speech from text
- Otter.ai transcribes conversations and meetings in real time

Before using off-the-shelf or open-source AI tools, organisations should: ask the provider of the tool to confirm that the tool was developed using content free of rights or with the appropriate permissions and check that the provider's terms of use comply with the organisation's privacy and data management duties, where relevant.

Focus on: AI training, copyright and open licensing

AI raises many new legal questions. For example, it is unclear whether training AI on content protected by rights like copyright or privacy is lawful. Similarly, it is also unclear whether it is legal to train AI on openly licensed digital material where attribution is required. In the UK and the US, there are pending lawsuits against the developers of AI tools, including ChatGPT or Stable Diffusion, seeking answers to these questions. The UK government is also expected to publish a voluntary code of practice on copyright and AI by 2024, and may consider reforming this area of the law if required.

In the meantime, this legal uncertainty could be managed by prioritising the use of AI systems trained on materials known to be free of rights or with permissions until clear guidance from the UK government or courts becomes available.

AI applications for the heritage sector

When used legally and ethically, AI can advance three areas of work in the heritage sector, which may overlap:

- heritage and collections management, use and research
- visitor experience
- general business operations and management

Deploying AI systems in any area of work involves risks to be managed with the appropriate strategy and resources. The risks involved will vary depending on the type of AI systems used and its application. For example, the risk of bias or discrimination may be higher when AI is used to identify people in images or the risk of rights infringement may increase when AI is trained on copyright protected content. Strategies and tools to manage AI risks are in development and require further research.

AI risks for heritage organisations

Organisations and experts globally have raised concerns about the following AI risks:

Bias, discrimination and misinformation

While AI systems can be helpful in producing or summarising information, they can also generate errors in content. These errors can include prejudiced anomalies (known as 'bias') or inaccurate results which can appear plausible or truthful (known as 'hallucinations'). Biases or hallucinations can come from the design of the AI system itself or the datasets the AI system is trained on, or both. The risks of bias and discrimination could be managed by testing AI systems and reviewing training datasets for prejudiced errors or patterns. The risk of misinformation could be managed by labelling and checking AI-generated content for accuracy.

Lack of transparency and traceability

The way AI systems process and produce content is not visible or easily traceable by users due to the complexity of their algorithms and the lack of information about the training datasets. This 'black box effect' can lower the public's trust in the content and its source. This risk could be managed by prioritising the use of transparent AI systems trained on datasets with clear provenance information like an organisation's own digital collections.

Undervalued contribution

Heritage organisations who may not be familiar with thinking about their assets in the context of AI may undervalue their contribution in partnerships with external collaborators like technology suppliers**.** This can lead to organisations failing to leverage their assets (eg: their reputation, access to collections or intellectual property) in exchange for equivalent value from their collaborators. This risk could be managed by auditing and valuing assets as well as seeking external independent advice on the terms of collaboration agreements.

Privacy, copyright and other rights infringement

Heritage organisations, staff and volunteers may unintentionally infringe rights, like rights contained in the materials trained on or used by AI. Content trained on or used by AI may be protected by legal rights like copyright, confidentiality, privacy, data protection regulations or contractual rights. Content produced by AI can also infringe regulations on discrimination or misinformation if they contain errors. This risk could be managed by using legal and ethical content on AI systems as well as reviewing AI-generated content for accuracy before sharing it.

Human labour replacement

AI may reduce the need for paid or volunteer work in heritage organisations. Some experts believe the automation of tasks with AI may replace human labour by 18% in the next 10 years across the UK economy and expect this trend to

be neutralised in the long-term with AI generating new employment. It is unclear whether this risk would extend to the heritage sector because no targeted study has been carried out. Some heritage organisations report being concerned about volunteers losing their connection to heritage if their labour is replaced by AI. This risk could be managed by using AI to automate repetitive tasks while allowing staff or volunteers to focus on more substantive collections management or community engagement work.

Resources on AI applications and risk management

- In the A Museum Planning Toolkit (2020), researchers of The Museums + AI Network included case studies of AI use in museums and worksheets to help organisations plan their AI projects.
- In their Guidance to civil servants (2023), the Cabinet Office and the Central Digital & Data Office recognise that AI can improve productivity but have implemented policies requiring staff to always check and cite AI-generated content as well as avoid uploading protected content onto AI systems. Similar guidance could be helpful to heritage staff and volunteers.
- The report Examining the Black Box: tools for assessing algorithmic systems (2020) by the Ada Lovelace Institute describes key AI risks. This report can assist heritage organisations when planning for AI uses in their institution.
- Information Commissioner's Office's Guidance on AI and data protection (2023) describes how to comply with data protection laws when using AI. This guidance can assist heritage staff and volunteers in identifying content suitable for AI use.

AI for heritage and collections management, use and research

AI can be used to assist staff and volunteers with heritage and collections management by:

- making content, information and collections easier to find
- generating new insights or knowledge from existing content, information and collections
- supporting data collection, restoration and conservation work

Examples

Creating metadata: The National Library of Scotland pilots the use of an AI system called Transkribus. Transkribus automates the laborious process of entering data manually for each digitised map by generating metadata from information it detects in the images uploaded onto its system.

Standardising catalogue data: The National Museum of the Royal Navy and the University of Southampton are piloting the use of AI to standardise catalogue data for their image collections to improve their searchability and interoperability with new computer technologies. For each image, the AI system fills in data fields such as date, location and event by extracting information from the free-text paragraph written by curators when the item was originally added to the collections.

Recognising and transcribing speech: The Gaelic Algorithmic Research Group collaborated with the University of Edinburgh and other partners to develop speech-to-text transcription in Scottish Gaelic. This technology can be used to automate captioning for videos or transcribing audio recordings in collections.

Detecting colonial bias in the collections: The Transforming Collections project led by the Tate and the University of the Arts London is developing an AI system to identify patterns of colonial bias in collections.

Mapping the geography of historical newspapers: The Living with Machines project led by The Alan Turing Institute, the British Library and universities across the UK used AI systems to combine, analyse and annotate large digitised collections. For example, researchers added the geographical location of 25,000 newspaper titles in the Library's catalogue in less than 3 hours.

Exposing gender bias in AI and datasets: The Victoria & Albert Museum recently acquired The Zizi Show, a work by artist Jake Elwes, featuring AI-generated performances of drag actors. Elwes' work exposes the AI's inability to create digital imitations of different bodies, genders and identities due to its bias.

Extracting information from photographs taken by volunteers: The Kent Wildlife Trust developed a phone application for volunteer participants to submit digital photographs of bug splatters, generating new insights about local biodiversity. The Trust is developing an AI system to count splatters in the images sent by volunteers.

Connecting collections to replant trees: The National Trust collaborated with the company ArchAI to understand where hedgerow had been lost since the 20th century. They used AI systems to mine data from contemporary and historical maps to identify where to strategically replant trees to regrow the hedgerow.

Identifying rare plants in images: Kew Gardens, the University of Southampton and UK Border Force collaborated to track illicit traffic of endangered plants online by using AI systems to identify rare plants from images shared on the internet.

AI for visitor experience

AI can be used to assist staff and volunteers to improve visitor experience by:

- producing more accessible content or events via automated transcriptions and translations
- interacting with visitors through the use of Chatbots and other conversational tools
- analysing visitor feedback in more detail by connecting different sources of information

Examples

Automating the transcription of events and videos: The National Library of Scotland uses off-the-shelf AI systems like Otter.ai and Happy Scribe to caption videos and transcribe live events in real-time, proof-read by staff before publication. These captions and transcripts make audiovisual content more accessible to a wider audience.

Answering visitors' questions: Institutions outside the UK use AI-powered chatbots to interact with visitors. For example, the Ann Frank House (Netherlands) integrated a chatbot into the social media platform Messenger to answer visitors' questions about Ann Frank's story or the museum.

Connecting emails, comment cards and online reviews: The British Museum partnered with the Alan Turing Institute to produce more insightful analyses of visitor behaviours by using AI systems to link and process information contained in emails, comment cards, online reviews and Wi-Fi access.

AI for general operations and management

AI systems can assist staff and volunteers by performing operations and management tasks, including:

- producing content to support operations, for example, summarise reports, write emails or create marketing content
- reviewing and forecasting performance, for example, ticket sales or visitor attendance to events

Example

Planning exhibitions: The National Gallery developed their own AI systems to predict the popularity of temporary exhibitions using attendance data from up to 20 years of exhibitions. This allows the museum to better manage the resources allocated to events, like room capacity. All staff are able to access the insights generated by the AI system via a dashboard which gathers key predicted performance metrics like ticket sales, attendance patterns and revenues generated.

Regulating AI systems

Experts, civil society

AI experts and representative organisations like the UK performers' union Equity describe existing laws as unfit and have called for AI regulation in the UK and worldwide.

UK and devolved governments

- In 2022, the Scottish government published The Scottish AI playbook outlining their principles to inform fair, trustworthy and ethical uses of AI as well as future regulations.
- In 2023, the Welsh government referenced AI as a tool to promote economic and social transformation in their policy paper Wales Innovate, but made no reference to the need for AI-specific regulation.
- In their 2023 White Paper on AI innovation, the UK government proposed a light-touch approach to AI regulation consisting of a non-binding framework for best practice. The UK government hosted an AI Safety Summit in November 2023 which may indicate a shift towards a more involved regulatory strategy.

Outside the UK

- Unlike the UK, the EU is introducing legally-binding regulations on AI innovation. The AI Act proposes a regulatory framework whereby legal requirements for the distribution or use of AI systems will vary based on the risks involved.
- The US government has also adopted a risk-based approach for implementation by governmental agencies. The White House has also published a Blueprint for an AI Bill of Rights providing principles to mitigate threats to civil rights.
- China adopted a different strategy by deploying binding regulations that target specific AI applications. For example, China introduced the 2021 regulations on algorithms to prevent excessive price discrimination and the 2022 rules for deep synthesis requiring the labelling of AI-generated audiovisual content.

Take away for the UK heritage sector

The absence of a harmonised regulatory approach to AI means heritage organisations may need to restrict online access to AI-generated content and AI-assisted tools in certain locations to comply with local laws. The EU regulatory developments are especially important for UK heritage organisations to follow to ensure reach to a wider audience,

compliance with new AI safety laws and the sustainability of their investment in AI.

Preparing for AI

Heritage organisations with experience using AI in their institution highlight the need to improve on the following areas of operations to use the technology effectively and safely:

- **Collections and data management**. This can involve digitising content as well as standardising metadata in digital collections and datasets to train and use with AI systems.
- **Digital infrastructure**. This can involve improving data management systems and storage as well as acquiring AI systems adapted to the needs of the organisation.
- **Workforce development**. This can involve training staff and volunteers in data management, rights compliance, AI systems and risks in all departments of the organisation.
- **Policy development**. This can involve creating a policy framework for AI use by staff and volunteers tailored to the organisations' values and strategic aims.
- **Partnership work**. This can involve building networks for knowledge-exchange and collective planning with institutions across the UK heritage sector as well as creating a space to critically reflect on AI with the public.

Glossary

AI capabilities refer to the tasks an AI system can perform.

AI systems refer to advanced computer programs capable of performing tasks associated with human intelligence.

Algorithm refers to a mathematical formula instructing a computer to perform a specific task.

Bias is the tendency of AI systems to generate prejudiced errors.

Chatbot is a computer program that simulates conversations with human users.

Collections data refers to any information about collection items or the collection itself, including digital reproductions, curatorial notes, associated materials, catalogue entries and their metadata.

Dataset is a body of information which can used and processed by a computer

Generative AI refers to AI systems capable of generating content like text, image, sound or film.

Hallucinations are errors generated by an AI system which can sometimes look plausible.

Machine-readable refers to information formatted to be understood by a computer programme like digitised images, text and sound, or values in a spreadsheet.

Metadata is information (or 'data') about other data. For example, the metadata of a digital image refers to information about the digital file itself like the date and place of its creation or its format.

Public domain materials refer to content free of rights like copyright.

Structured dataset is a dataset recording information in the form of numbers and values which can be used by a computer, like numbers in a spreadsheet.

Training dataset is a dataset an AI system is instructed to learn by imitating or analysing the information it contains

Unstructured dataset is a dataset recording information in a format other than numbers or values like sound, film or images. Unstructured datasets need to be processed before it can be analysed by a computer.

AI tools and services cited in the briefing:

Bard is an AI system created by Google able to generate human-like responses to a wide range of questions.

ChatGPT is an AI system created by OpenAI and Microsoft able to produce human-like answers to a wide range of questions.

DALL-E 3 is an AI system created by OpenAI able to generate images from text.

ElevenLabs is a company which has developed AI systems capable of generating speech from text.

Happy Scribe is a company which has developed AI systems able to transcribe speech.

Midjourney is an AI system created by Midjourney Inc capable of generating images from text.

Otter.ai is an AI model developed by Otter AI Inc able to transcribe speech.

Signapse AI is a company who has developed AI systems capable of producing British Sign Language video translation from text and sound.

StableDiffusion is an AI model developed by the companies Runway, CompVis, and Stability AI able to generate images from text.

Transkribus is a platform developed by an organisation READ-COOP and universities, integrating AI models able to transcribe text from digital images of handwritten manuscripts.

Credits

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- Contact the author by email at: mathilde@pavisconsultancy.com.



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AI could help us make archives more accessible. Pictured: Kresen Kernow.



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Minder Kaur Athwal, a trustee at the Digital Skills for Heritage-supported Heritage Trust Network. Credit: Sarah Hayes.

Digital Skills for Heritage