



**The  
Alan Turing  
Institute**

---

# Towards a National Research Software Engineering Capability in Arts and Humanities Research: a Roadmap

Funded by:



Arts and  
Humanities  
Research Council

---

# Towards a National Research Software Engineering Capability in Arts and Humanities Research: a Roadmap

DOI: 10.5281/zenodo.15083396

---

## Authors

David Beavan,  
The Alan Turing Institute

Sarah Dietz,  
The National Archives

Mark Parsons,  
University of Edinburgh

André Piza,  
The Alan Turing Institute

Stephanie Fagan,  
The Alan Turing Institute

Michael Pidd,  
University of Sheffield

Stuart Gillespie

Pieter Francois,  
The Alan Turing Institute  
/University of Oxford

Clementina Ramirez Marengo,  
The Alan Turing Institute

Cyara Buchuck-Wilsenach,  
The Alan Turing Institute

Eirini Goudarouli,  
The National Archives

Emma Rowlands,  
The Alan Turing Institute

Claire Bailey-Ross,  
University of Portsmouth

Neil Grindley, Jisc

Oscar Seip,  
University of Manchester

Jake Bickford,  
The National Archives

Felicity Guest,  
University of Exeter

Anna-Maria Sichani,  
School of Advanced Study,  
University of London

Ed Chalstrey,  
The Alan Turing Institute

Timothy Hobson,  
The Alan Turing Institute

Tom Storrar,  
The National Archives

Mary Chester-Kadwell,  
King's College London

Natasha Kitcher,  
The National Archives

Melissa Terras,  
University of Edinburgh

Neil Chue Hong,  
University of Edinburgh

Paola Marchionni, Jisc

Charlotte Tupman,  
University of Exeter

Arianna Ciula,  
King's College London

Katherine McDonough,  
Lancaster University

Marion Weinzierl,  
University of Cambridge

Jonathan Cooper,  
Advanced Research Computing  
Centre, University College  
London

Pamela Mellen,  
King's College London

Nicola Osborne,  
University of Edinburgh

Kalle Westerling,  
The Alan Turing Institute

Tom Couch,  
Advanced Research Computing  
Centre, University College  
London

Lisa Otty,  
University of Edinburgh

**Authors of this work retain copyright and release the work under a Creative Commons Attribution 4.0 International License (CC BY 4.0).**

---

# Contents

<b>Executive Summary</b>	<b>4</b>
<b>Glossary and Key Terms</b>	<b>6</b>
<b>Introduction</b>	<b>7</b>
<b>Vision, Aims, and Objectives</b>	<b>10</b>
<b>Challenges and Limitations</b>	<b>11</b>
<b>Programme of Work</b>	<b>11</b>
Work Package 1: Ecosystem Development	13
— The RSE Directory	13
— Skills and Training	14
— Outreach	17
Work Package 2: Research Development	17
Work Package 3: Monitoring and Strategic Development	20
<b>Delivery Approach</b>	<b>22</b>
Governance and Staffing	22
Year 1	22
Year 2	23
Year 3	24
Level of Investment	24
<b>Conclusion</b>	<b>27</b>
<b>Acknowledgements</b>	<b>28</b>
Contributor Roles Taxonomy (CRediT)	28
<b>Reference List</b>	<b>29</b>

---

## Executive Summary

The increasing importance of digital methods in Arts and Humanities (A&H) research presents exciting opportunities and significant challenges. As ideas become more ambitious and projects grow in complexity – leveraging software development, large-scale data analysis, visualisation tools, and new technologies such as artificial intelligence (AI) – the need for dedicated research software engineering expertise has never been greater. However, Research Software Engineers (RSEs) remain in short supply, are unevenly distributed across institutions, and often lack the skills and training necessary to address A&H-specific research challenges. Meanwhile, many A&H researchers struggle to access the collaborative technical expertise required to innovate effectively and exploit the potential of digital methods.

This Roadmap outlines a strategic plan to **establish a national, people-centred A&H RSE Capability**, ensuring that digital expertise is accessible and sustainable within A&H research. It proposes:

- a UK-wide **Directory and community of RSEs**
- a programme of new and existing **skills and training initiatives**
- **matchmaking mechanisms** to facilitate collaboration
- an **outreach and community-building programme** to promote the networking, open-practice collaboration and knowledge exchange that will be crucial for the Capability's effectiveness
- an **Incubator to drive innovation** in reusable research methods and tools
- **continuous monitoring and evaluation** to ensure the Capability's long-term success.

The expected **outcomes of the Capability** include:

- **increased access to RSE expertise**, unlocking new digital research opportunities in A&H
- **skills and career development** for both researchers and RSEs
- **sustainable infrastructure**, supporting long-term growth and innovation
- **greater cross-disciplinary impact** as A&H digital research methods and knowledge benefit STEM and other domains
- a more **robustly interconnected ecosystem and community** that is easier to navigate and collaborate within.

Beyond infrastructural improvements, the Capability will foster concrete advancements in A&H research by creating the conditions for innovative, high-impact scholarship. By facilitating non-consumptive computational research on collections such as those held by The National Archives, UK, it will connect curators and researchers with essential technical expertise, enabling new forms of large-scale analysis and interpretation. Additionally, the Capability's Research Development Work Package will stimulate tools and methods with clear, long-term benefits to the A&H digital research community, helping promising ideas transition from prototypes to fully realised solutions. Collaboration with initiatives such as King's Digital Lab will allow the Capability to refine and scale flexible, modular approaches to research software development, making digital research infrastructure more sustainable and responsive to evolving scholarly needs.

By embedding efforts like these within a national framework, the Capability will not only enhance technical capacity but also enrich A&H disciplines with new methodologies, insights, and interdisciplinary opportunities, ensuring that digital methods drive meaningful intellectual and cultural discoveries. It will also ensure that A&H research fully leverages the UK's investments in high-performance computing (HPC), keeping the sector at the forefront of technological advancements and enabling cutting-edge research methodologies that push the boundaries of scholarly inquiry. That leverage will come, in part, from developing and employing more A&H-skilled RSEs to capitalise on existing investments. Not only that, but A&H researchers will bring crucial alternative perspectives to these new and advanced technologies, from understanding behaviours and power dynamics to the impact of technologies on society.

Funders, government, and industry will also benefit from the Monitoring and Strategic Development Work Package. This is designed to continuously produce key insights about the applied computational research ecosystem and provide crucial advice for decision-making in an era of increasing demand for computational methods, rapid technological change, and strong international competition - not least regarding advancements in AI.

There are economic benefits, too, of investing in digital A&H in this way. One paper, [The Value of Digitising Natural History Collections](#) (Popov *et al.*, 2021), estimates that digitising the collections of London's Natural History Museum will create economic benefits – including returns on investment and efficiency savings – of more than £2 billion over 30 years. And, as Professor Christopher Smith, Executive Chair of the Arts and Humanities Research Council (AHRC), emphasised in a recent [article for Research Professional on transforming A&H research](#), “the cost of investment is always less than the price of missed opportunities” (Smith, C., 2025).

Investment in this Capability will help the UK reinforce its global leadership in A&H research by fostering the thriving, empowered, community-focused research ecosystem necessary to drive innovation and produce breakthroughs in the digital age. This initiative will establish a highly skilled RSE profession capable of addressing uncertainty, navigating bias, and working effectively with heterogeneous data. By embedding these advanced digital skills within A&H research, the Capability will not only drive innovation in the humanities but also create methodologies that benefit a wide range of disciplines.

---

## Glossary and Key Terms

In this Roadmap we make frequent use of the term RSE. An RSE is a professional who, to quote the Society of Research Software Engineering, “combines professional software engineering expertise with an intimate understanding of research”. They work at the intersection of research and software engineering, developing and maintaining the skills, software, and infrastructure to deliver cutting-edge digital research.

We recognise, however, that there is a broader group of Digital Research Technical Professionals (dRTPs) who support and collaborate with researchers in A&H and beyond, working in critical areas such as data management, high-performance computing, authorship and publishing, and more. References to RSEs should therefore be taken as shorthand for this wider range of technical and infrastructural roles and activities.

Similarly, we talk about “digital” research as a catch-all term to encompass the full range of computational approaches, tools, methods, and technologies. And we have used the term “researcher” to refer to someone at any stage of their career or with any type of contract, working in a scholarly role or on scholarly projects at a university or an organisation such as a research institute, library, or museum.

**A&H:** Arts and Humanities

**AHRC:** Arts and Humanities Research Council

**Capability:** National Research Software Engineering Capability in Arts and Humanities Research

**Directory:** a national Directory of Research Software Engineers as part of the Capability

**dRTP:** Digital Research Technical Professional

**GLAM:** Galleries, Libraries, Archives, and Museums

**HEI:** Higher Education Institution

**HPC:** High-performance Computing

**iDAH:** Infrastructure for Digital Innovation and Curation for Arts and Humanities

**IRO:** Independent Research Organisation

**KDL:** King’s Digital Lab

**PRISM:** Professional Research Investment Strategy Manager

**RSE:** Research Software Engineer

**SSI:** Software Sustainability Institute

**The Turing:** The Alan Turing Institute

**UKRI:** UK Research and Innovation

---

## Introduction

A&H research is undergoing a profound transformation. Digital approaches are increasingly driving project methodologies, from the handling and analysis of large, varied datasets to the development of visualisation platforms, mapping software, and modelling tools.

As research proposals grow more complex in the era of AI and machine learning, the role of the RSE is becoming ever more essential. A survey, [Evidencing the Impact of Research Software Engineers on Arts & Humanities Scholarship](#) (Beavan *et al.*, 2025), conducted by [The Turing](#) alongside the preparation of this Roadmap, collected data on the impact of RSEs on the quality, scalability, reliability, and reproducibility of A&H research outputs, as well as the scope and ambition of projects. Responses show that collaborating with RSEs allows historians, philologists, archivists, anthropologists, and researchers in many other A&H subjects to “organise, present, and find meaning in the vast and rapidly growing range of data available to them. The work of RSEs not only expands the scope of research, but also makes its findings digestible to a non-specialist audience [...] As these survey responses show, RSEs are already demonstrating their potential to accelerate and expand A&H research. Recognising the role that these technically skilled professionals play as facilitators of progress in A&H is an essential step towards capitalising on this potential.”

There remain, however, significant gaps in capacity, awareness, resources, and pathways for collaboration and career development. Many A&H researchers lack sufficient support to pursue data or software-driven projects within their own institutions, while RSEs themselves are both in short supply and distributed unevenly across the country, often working in isolation. Moreover, RSEs may not be adequately skilled to tackle A&H research challenges.

Previous work has brought these and related issues into sharp focus. For example, the 2023 [iDAH RSE Steering Group Working Paper](#) (Sichani *et al.*, 2023) – in large part the genesis of this Roadmap – notes that while the A&H RSE community has “matured significantly” in the past five years, thanks to national initiatives and an increased commitment to interdisciplinarity and cultural change, there remain “inconsistencies in funding, capacity and career pathways”. The paper calls for a “step-change” in infrastructure development to provide the foundations for advanced digital research across a broad and converging range of domains in order for the UK to retain its “enviable world position” in A&H research. An increased awareness of RSEs’ roles and additional investment to build their capacity will, argues the report, produce “significant short and long-term rewards”.

The Turing’s 2020 white paper, [The challenges and prospects of the intersection of humanities and data science](#) (McGillivray *et al.*, 2020), paints a similar picture, with additional emphasis on the “bidirectional” benefits of greater engagement between A&H and data science. The paper presents a series of recommendations, including – most pertinently to the content of this Roadmap – a call for shared infrastructures, open and reproducible research, and training for A&H researchers in digital methods. A 2024 report titled [Infrastructure Futures for Digital Cultural Heritage](#) (Ross *et al.*, 2024), commissioned by Creative Informatics with [AHRC](#) funding, focused on the GLAM sector and called for “flexible, adaptable approaches to infrastructure design”. Issues identified included “sustainability challenges due to short-term funding” and “difficulties in sharing knowledge across diverse disciplinary and operational contexts”.

Data and software requirements, meanwhile, have been mapped extensively in two recent SSI reports for the AHRC: [Report on the AHRC Digital/ Software Requirements Survey 2021: Where](#)

[Is Investment Needed?](#) (Sufi, Bell, and Sichani, 2023) and [Shaping Data and Software Policy in the Arts and Humanities Research Community: a Study for the AHRC](#) (Taylor *et al.*, 2022). These reports have already been instrumental in guiding AHRC investments in digital skills and infrastructure within A&H – for example, the [Digital Skills Network in Arts and Humanities](#) (DISKAH), [Research Infrastructure for Conservation and Heritage Science](#) (RICHeS), [Convergent Screen Technologies and Performance in Realtime](#) (CoSTAR), and [Towards a National Collection](#).

Similarly, wider UKRI investments – such as the [Digital Research Technical Professional Skills NetworkPlus](#) – have prioritised the sustained development of RSE/dRTP skills and careers through network and capacity-building across research councils and disciplines. UKRI noted in its 2020 [Research Software Engineer Fellowships funding opportunity](#) that “digital and data capabilities, including high-quality research software engineering, lie at the heart of our strategy to drive transformative research and innovation across the UK”. A related initiative, [Toward a New CCP for Arts, Humanities, and Culture Research \(CCP-AHC\)](#), has recently been funded by the Science and Technology Facilities Council (STFC) Computational Science Centre for Research Communities (CoSeC) programme – long-term supporters of an RSE capability serving many STEM disciplines – to establish a new research software community focusing initially on a small number of software outputs supporting compute-intensive digital A&H research.

Despite this investment, the evidence from A&H-specific surveys and reports, including those referenced above, demonstrates that a major, dedicated A&H provision is also needed alongside this ongoing work. Bridging the identified gaps and achieving stated ambitions requires targeted investment to build a national, sustainable RSE Capability and foster a collaborative environment in which software engineering skills and expertise are accessible and encouraged to develop within A&H contexts.

This Roadmap, which outlines a path towards a national RSE Capability in A&H research, is part of the pilot phase of the Turing’s [Data/Culture](#) project. Funded by AHRC, Data/Culture aims to extend the lifespan and (re)usability of datasets and software tools in A&H research. It is a unique experiment in this field, providing extended support for digital research projects, building sustainable communities around tools and datasets, and creating an environment in which to assess the needs of digital research infrastructure.

At the heart of the Roadmap is a proposed UK-wide Directory of RSEs, accessible to A&H researchers – particularly in institutions that lack the in-house capacity to support digital research in A&H disciplines. This is underpinned by a logistical mechanism for forming collaborations between researchers and RSEs, and through which resource-rich organisations can make their RSEs available for projects elsewhere. More than simply a consultancy service or pool of freelancers, this centrally coordinated approach (delivered via a partnership model) will enable the creation of a genuine RSE Capability in UK A&H research, prioritising effective collaboration and the development of skills. It will also have a strong focus on best practices to ensure the collaborations are as meaningful and – in terms of research outputs and outcomes – as successful as they can be.

The benefits of this approach are numerous, and include:

- increased access to digital methods – including those relating to important and rapidly developing technologies such as AI and machine learning – and collaborative RSE support for A&H researchers. This will remove barriers to innovation, expand the scope of research ideas, and unlock the potential of this emerging field
- improved skills, technical literacy, and self-sufficiency for A&H researchers
- upskilling and a broader range of experiences for RSEs, improving their career prospects

- and ability to work in A&H disciplines and beyond
- greater opportunities for networking and community-building
- enabling other disciplines to learn from the ways in which digital methods are applied in A&H research (and increasing the opportunities for A&H to interact with and learn from other disciplines)
- more collaboration between researchers and RSEs, and among institutions, leading to additional research opportunities and extended lifespans for data and tools (with consequent greater return on investment)
- a clear vision for researchers and RSEs of available opportunities and of the future professional environment in which they can operate
- support for universities and other research organisations to form RSE groups, retain professionals, and be part of the national Directory.

This aspect forms part of the Roadmap's Work Package 1 – Ecosystem Development – which also covers learning pathways, training, mentorship, and outreach. Work Package 2 addresses Research Development through an Incubator programme to nurture impactful projects that develop tools and methods suitable for a wide range of A&H disciplines, while Work Package 3 – Monitoring and Strategic Development – will measure and evaluate the impact of Roadmap activities while also working as an intelligence-gathering hub for the development of the ecosystem.

Key to the sustainability and resilience of the Capability will, of course, be the community of RSEs and researchers that develops through activities such as skills training, research incubation, and other forms of networking and collaboration – both formal and informal – that this Roadmap promotes.

The Roadmap has been developed collaboratively through a series of workshops and task-and-finish subgroups involving more than 40 contributors. This is a broad and diverse group comprising RSEs, PRISMs, researchers, and funders, from those in the earlier stages of their careers to experienced leaders. The group involves a spread of research organisations from among the UK's universities and IROs (see Acknowledgements section). The co-creation process has also included presentations at conferences and other related events, with the aim of gathering feedback from a wider pool of interested parties.

This plan takes into account existing provision (particularly in the areas of skills and training and research development) through UK-based institutions such as [SSI](#), the [Society of Research Software Engineering](#), and the [UK-Ireland Digital Humanities Association](#), highlighting where proposed Roadmap activities can complement, support, and build on their work based on the clear need for increased capacity in this area. This additionality is central to the model, which is intended – with cost-effectiveness and flexibility among the key priorities – to maximise and strengthen existing and future work, resources, and activities rather than to replicate or compete. And while we focus on A&H in this Roadmap, it is undoubtedly the case that the proposed Capability can meet a much broader need, enhancing research skills and technology across the UKRI remit.

By investing in this vision, we can equip A&H researchers with the tools necessary to address contemporary questions in new and impactful ways, ensuring these disciplines remain at the forefront of scholarly innovation in the digital age. At the same time, we can facilitate – via the UK's pool of skilled RSEs – the exchange of knowledge and the sharing of A&H digital methods with other disciplines, creating an ecosystem in which everyone can benefit.

---

## Vision, Aims, and Objectives

Our vision is an environment for A&H research in the UK in which the only limitation on project design is a researcher's imagination; in which researchers and RSEs understand each other, can work collaboratively without barriers, and are placed together based on complementary skills, expertise, and interest.

Our overall aims are to increase the UK's capability and capacity for carrying out cutting-edge digital research in A&H, and to help facilitate that research.

### Objectives

1. Provide access to RSE collaboration in A&H for researchers who need or would benefit from it.
  - 1a. Create a virtual group of RSEs ready to work on A&H research projects.
  - 1b. Develop a plan to support and complement the work of existing RSE groups.
  - 1c. Champion the professionalisation of RSE careers and career pathways.
  
2. Increase levels of digital literacy among A&H researchers towards a critical mass.
  - 2a. Develop talent through a training and skills offer.
  - 2b. Lead the national conversation about cutting-edge digital developments in A&H.
  
3. Spark growth in the number of digital A&H research projects in the UK.
  - 3a. Work with funding bodies to design funding calls and proposal assessments with RSE expertise in mind, and with institutions to help them enhance their researchers' knowledge and capabilities.
  - 3b. Devise a method of measuring growth against defined benchmarks.
  
4. Advocate for increased collaboration between A&H researchers (and researchers in other disciplines) and RSEs.
  - 4a. Demonstrate the value for RSEs of working with A&H researchers.
  - 4b. Demonstrate where digital approaches in A&H can be translated to other disciplines, fostering knowledge exchange and the development of enhanced research technology across all domains.
  - 4c. Showcase standout collaborative projects to drive greater engagement with digital approaches among A&H researchers.
  - 4d. Recognise the overlap between A&H researchers and RSEs, championing this intersectional area.
  - 4e. Provide networking experience and build a community of RSEs.

---

## Challenges and Limitations

There are a number of challenges and limitations to this work towards a national Capability that must be taken into account or addressed as part of strategic planning. For example:

- Funding for A&H research tends to be significantly lower than funding for scientific disciplines and usually covers short-term periods (which can limit the planning horizon).
- The diversity of A&H disciplines makes scalability a challenge, increasing the importance of networking, community-building, and open-practice collaboration efforts to build a critical mass that is less dependent on central coordination.
- Recruitment and retention can be a problem when research funding is short-term and similar opportunities in other disciplines or the private sector can offer higher salaries and benefits. An appropriate level of funding, a distributed set-up, and the potential of working across a major network/ecosystem can bring significant incentives that this Roadmap aims to establish.
- The RSE Directory and ecosystem mapping work at the centre of this initiative will require careful design and high levels of coordination to ensure they are kept up-to-date, retain a positive reputation, and provide continued benefit to the community. Hence, there is the need for a core team working across delivery of collaborations while also researching and producing data about the ecosystem on an ongoing basis.
- While there has been a significant improvement in openness to collaboration, academic and research management culture is still dominated by fragmented departments working in silos. The design of collaborations and the mechanics of sharing resources must be addressed early in the process, and in consultation with a sample of potential partners, to maximise the chance of reducing barriers to engagement. This essential work is planned for the early stages of the Capability (see Delivery Approach section) and should address both the formalisation of partnerships via fair and reasonable agreements, and guidance and support for research collaboration best practice.
- Developing robust metrics and evaluation frameworks will be essential in the first year of the Roadmap but must also be continually updated based on new data, experiences, and changes in the ecosystem. For this reason, the Capability establishes a continuous Work Package dedicated to this aim, serving not only this programme but the whole field by openly publishing its findings.

## Programme of Work

We have identified three main strategic channels through which to achieve our vision and objectives for this Roadmap and Capability:

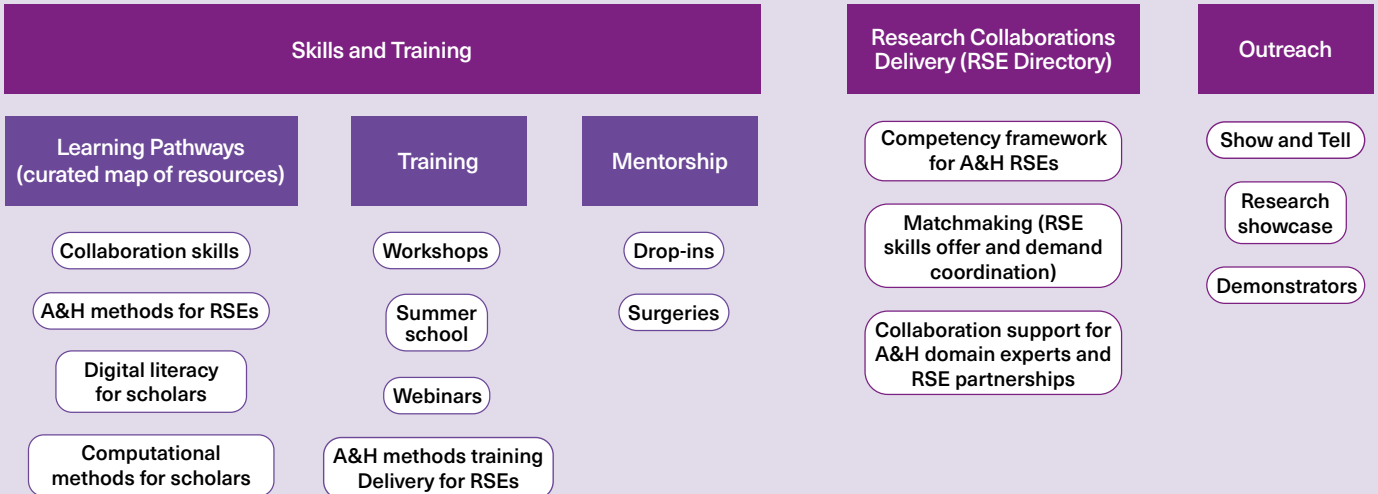
1. Capitalising on the existing research environment by increasing capacity and supporting ideas and initiatives that arise from current resources and infrastructure.
2. Driving innovation through a purposeful research agenda that creates methods and tools for the benefit of large sections of the ecosystem.
3. Committing to best practices and an evidence-based approach by producing intelligence about – and strategic direction for – both the Capability's impact and developments within the sector.

From these channels, three specific Work Packages have emerged.

# A&H RSE Capability

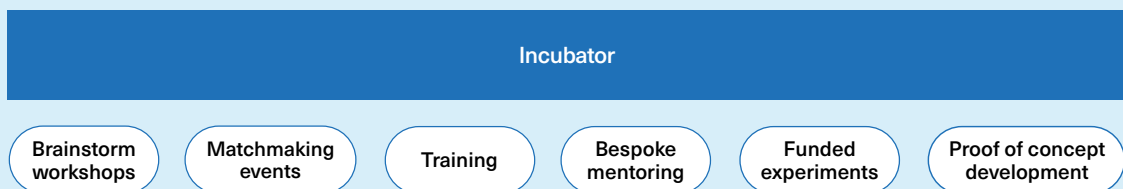
## Responsive

### Ecosystem Development



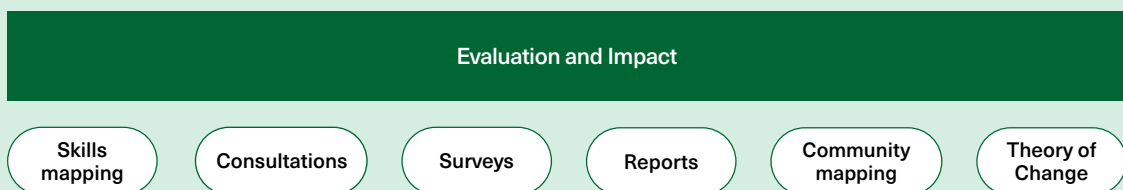
## Active

### Research Development



## Strategic

### Monitoring and Strategic Development



---

## Work Package 1: Ecosystem Development

Central to a thriving digital research ecosystem in A&H is addressing some of the most pressing bottlenecks and obstacles. These barriers include the lack of clear learning pathways for skills development, an often confusing research development environment, and the under-supply of people with research software engineering skills who can work on A&H problems, questions, and methods.

### **The Ecosystem Development Work Package will:**

- deliver training for RSEs to engage effectively in A&H research
- curate skills resources through clear learning pathways that address demand from researchers and RSEs working, or willing to work, in A&H research. These will include both digital skills and soft skills such as collaboration practices. We expect that AI and HPC will be particular areas of demand and focus, given both are gaining mainstream traction and having an increasing effect on A&H research practice
- produce a Directory of A&H-skilled RSEs (including those who have gone through the training offer)
- devise a mechanism for coordinating and resourcing offer-and-demand matching of RSEs with A&H researchers – especially in institutions without established RSE groups or RSE groups working in A&H research. This will facilitate collaborations and ensure ideas and projects come to fruition
- create an outreach programme to support engagement with the Capability, showcase digital A&H research and impact, and help researchers navigate the ecosystem (for example, by finding collaborators, being made aware of funding calls, understanding career development opportunities, and engaging with organisations that offer support)
- offer advice and/or mentorship to researchers already engaged in digital research projects and those in the early stages of formulating such projects.

## The RSE Directory

- A network and best practice framework for delivering collaborations with RSEs skilled in A&H research who can be deployed across projects and regions.

### **How it works**

- Structured as a partnership or association of organisations that work together to link their existing RSE offering in A&H research to the wider sector – in particular towards institutions that lack in-house capacity. This pipeline of access to RSE collaboration will take into account the important role played by institutions' research offices.
- Functions in part as a catalogue of skills, so that A&H researchers can be matched with the most appropriate RSEs for the project – either through self-service or facilitated access, depending on experience and need.
- Brokers collaborations where required by offering expert advice on aspects of projects including feasibility, necessary skills, and timeframes. The Capability will not only give A&H researchers with a digital project somewhere to turn in the first instance, but can help them navigate their research problems through carefully developed processes.
- Based at one of the Capability's partner institutions, with a Capability infrastructure team responsible for its coordination and promotion.
- Project collaboration plans will be co-developed among partners and will outline any contracts/agreements in place (based on flexible and agile mechanisms), or which may need to be put in place when funding is secured, and the 'rules of engagement' (that is,

how collaborating partners will work together and what they will aim to achieve and deliver together). A number of collaboration plan formats, processes, and legal instruments shall be designed for the types of partnerships the Capability should enter into. These suitable mechanisms for effective delivery should be developed and tested in detail as part of the Capability's implementation, in consultation with a sample of potential partner organisations (see Delivery Approach).

- The Directory will learn from similar structures and frameworks already in place at UK institutions and initiatives (for example, the [King's Digital Lab](#) at King's College London or the [ARCHER2 eCSE](#) supercomputing software development programme) and in other countries (for example, the [eScience Center](#) in the Netherlands). The Roadmap project group contains members with broad experience in the area of collaboration agreements who can help shape the nature and content of these documents ahead of implementation.

### **Benefits for participating institutions**

- Upskilling and opportunities for professional development for employed RSEs (both technical and soft skills, along with a broader range of experience) and consequent enhanced ability to retain RSE staff.
- Source of income through the external hiring of RSEs (and/or salary cost savings through outbound secondments).
- Fostering future collaboration and research projects (including more funding calls that require RSE involvement).
- Can bolster existing in-house capacity with external RSEs who have different skillsets. This will increase the range of research projects available to carry out and may also provide resilience against, for example, periods of leave or recruitment.
- Working with A&H data develops skills and experience that can be applied across other disciplines.
- Drives up RSE standards through mentorship, collaborative working, and increased peer review and scrutiny.

## **Skills and Training**

- A suite of learning pathways, resources, and activities to enhance the ability of RSEs to work in A&H research, and to expand the digital skills of A&H researchers.

### **How it works**

The Skills and Training strand of Work Package 1 (Ecosystem Development) will include the following activities for both RSEs and A&H researchers:

- Learning pathways: curated sets of training resources to guide participants through to a particular learning goal. These pathways may include: collaboration skills; A&H methods for RSEs; and digital literacy and digital methods for A&H researchers.
- Training opportunities in person and online: for example, summer schools, workshops, and webinars (themes and topics to be developed during the first year, informed by the ecosystem mapping exercise – see Delivery Approach section).
- Mentorship: this will include mentoring in a range of settings, from formal drop-in surgeries and mentor-mentee relationships to informal learning from colleagues.

To avoid the need for commissioning new activities, where possible this offering will be delivered through collaborations with organisations that already provide training in relevant areas (for example, the [HPC-UK](#) network, the [Digital Humanities Research Software Engineering Summer School](#) workshops, or DISKAH).

The first step towards a Skills and Training programme as part of the Capability will be to identify and map, through a mixture of desk research (including a review of existing literature on the subject), workshops, surveys, and interviews:

1. the currently available technical skills and expertise of RSEs and A&H researchers, with a particular focus on A&H domain-specific skills among RSEs. This will include geographical spread, to help inform areas of focus and investment (such as where to prioritise outreach, engagement, and training events)
2. the skills needs of these communities – that is, the upskilling required to produce more A&H domain-comfortable RSEs, and the skills most required by A&H researchers to help them carry out impactful research projects. This element of the mapping exercise will include the development of a competency framework for A&H-specific RSE skills based on a series of professional personas, making use of existing or ongoing work in this area as far as possible to avoid duplication. Such work includes:
  - a. the Turing's AI Skills for Business competency framework (which may provide a template)
  - b. the soon-to-be-launched DisCourSE initiative, funded through UKRI's Digital Research Technical Professional Skills NetworkPlus, which is developing a community of dRTP leaders, including the development of a broader dRTP competencies framework
  - c. the CHARTED dRTP NetworkPlus, which is developing learning pathways and enabling a FAIR (Findable, Accessible, Interoperable, and Reusable) training ecosystem for RSEs and RSE-adjacent roles
3. the gaps between skills needs and availability, in which the findings of 1. and 2. above come together to reveal strategic areas of focus for the Capability's Skills and Training programme, ensuring that skills are closely linked to demand and to the needs of contemporary A&H research questions and challenges.

This activity will take place as part of a wider ecosystem mapping and mechanism investigation exercise (outlined in more detail in Work Package 3: Monitoring and Strategic Development). Crucially, to remain up to date this skills map must be regularly refreshed to reflect changes in personnel and infrastructure at institutions around the UK, and developments in technology and methods.

Alongside and informed by this mapping work, Capability staff and members of the wider community will work together to:

- produce and publish defined learning pathways arising from the findings of the mapping exercise
- build an online platform to host the curated learning pathways. This may take the form of a collaborative, community-updated guide such as The Turing Way
- outline a plan for organising and administering the more formal elements of the Skills and Training programme (that is, in-person and online events)
- collate helpful online resources such as repositories of data and code that address shared digital challenges.

All of this will be designed with relevance, accessibility, and ease of use in mind. As well as enhancing individuals' skills, the Capability's training offer aims to reduce the time required to identify needs and demand, and to find and navigate resources. The group of experts informing

the Capability and Roadmap is well-placed to steer this work, and discussions around the detail of the training programme are already under way.

### **The benefits**

An [SSI report on the AHRC's 2021 survey of researchers' digital practices](#) (Sufi, Bell, and Sichani, 2023) describes a “clear demand and need” for software skills and training in A&H. For example, only 29% of respondents who developed software in their research felt they had received sufficient training to do so. Only 56% worked in groups that hired software developers to collaborate on projects, and more than 40% felt their institution’s support for software development was either “acceptable” or “poor”. Eighty-eight percent, meanwhile, said institutional RSE provision would be a “perfect” or “suitable” solution to the problem.

Amid this need for both A&H skills training and increased RSE provision, the Capability will:

- enable A&H researchers to develop and use more advanced and impactful digital tools in their work; improve the efficiency of their data-based research; and drive greater and more effective collaboration with researchers in other disciplines (in particular STEM subjects, and including the transfer of techniques to other disciplines)
- increase the ability of RSEs to collaborate on the unique and varied data and software challenges in A&H research; broaden their career and collaboration opportunities through development of new skills and experiences; and showcase the value of RSE expertise in traditionally non-technical disciplines
- ensure the UK remains a leader in A&H research and digital humanities by building a community of digitally skilled A&H researchers and RSEs adept at working with A&H disciplines and methods; increasing the scope, volume, sustainability, and accessibility of digital research in A&H; strengthening the competitiveness of UK-based bids for international funding.

The Capability’s skills training programme will therefore enable significant strides towards empowering researchers, enhancing collaboration, and maintaining the UK’s leadership in both A&H research and digital innovation.

#### **Case Study — Working with the GLAM sector: The National Archives, UK**

[The National Archives, UK](#) (TNA) is the official archive and publisher for the UK government and for England and Wales. It is the guardian of some of the country’s most iconic documents and collections, dating back over 1,000 years and including items published on the web by UK government departments and bodies. Among those collections is the [UK Government Web Archive](#) (UKGWA) – a vast resource of government websites and social media content spanning six billion records, and an important source of recent national history. It is one of the most heavily used digital archives in the world.

UKGWA’s size and complexity makes the discoverability of its content challenging to users and therefore puts significant pressure on the built-in search function to meet the needs of those users. Through a national RSE Capability, there is huge potential to create a space for RSE and curatorial expertise to come together to explore how to provide access to UKGWA beyond keyword search. While TNA benefits from a skilled in-house team, those staff members are mainly focused on day-to-day service delivery, and therefore maximising the research potential and opportunities of resources such as UKGWA may require external support.

The Capability will also create greater opportunities for wider non-consumptive, computational research projects involving TNA collections by connecting TNA curators with essential technical know-how and providing the required collaborative environment for the work to take place. Tools and learnings (for example, around ethical and legal matters) developed through this work could also be incorporated into the Capability's resource maps and training offering, and made available for broader use by other researchers, organisations, and communities of practice.

TNA is just one potential partnership being explored as part of preparations for the proposed Capability, which is already attracting support and demand from across the university and GLAM sectors.

## Outreach

While the need for a national Capability is clear, and the concept already has strong support from a broad group of leaders and experts in the field, essential to its success will be a programme of outreach to ensure widespread buy-in and utilisation from the organisations and individuals who could take part and benefit.

This outreach programme will be led by Capability staff, including an employee with responsibility for communications and engagement, but it will also require the participation of RSEs and A&H researchers at all career stages. RSEs and A&H researchers – in particular those with experience of digital research methods or of the Capability directly – will act as champions and advocates for the Capability and its offerings, helping to raise its profile and reputation nationally among universities and IROs (including those in the GLAM sector).

The outreach programme will involve a mixture of virtual and in-person activities. It will:

- highlight the benefits of, and support engagement with, the Capability
- showcase strong examples of digital A&H research and impact
- help researchers navigate the ecosystem (including finding collaborators, accessing funding calls, understanding career development and opportunities, and engaging with organisations that offer support)
- include a communications/advocacy toolkit for use by partner organisations and individuals to help raise the profile and reputation of the Capability.

## Work Package 2: Research Development

Stimulating and supporting impactful projects will be critical to capitalising on the opportunities created by an enhanced digital research ecosystem.

Where Work Package 1 (Ecosystem Development) addresses demand and opportunity for collaboration between RSEs and A&H researchers, this Work Package creates an Incubator to drive research development in directions that bring the biggest impact to the whole ecosystem. It will produce stronger, more robust ideas and proposals, underpinned by the right partnerships. Work Package 2 therefore addresses gaps that cannot be addressed solely by supporting existing demand or enhancing the existing ecosystem – that is, without a purposeful research agenda. The Incubator model makes sure we are giving the community the opportunity to

develop ideas to address identified challenges and opportunities; to form the best partnerships; and to think pragmatically, through experimentation, about how best to deliver on those needs. By drawing on the expertise of the community to come up with the answers, we will ensure there is a sense of ownership and motivation behind the research proposals and that those proposals serve the needs identified through the ongoing ecosystem mapping outlined in Work Package 3 later in this Roadmap.

### How it works

The Incubator will prioritise nurturing ambitious projects that develop reproducible or adaptable methods and tools in areas – spanning themes and disciplines – with the greatest need (as well as answering specific scholarly research questions where appropriate).

This research agenda will be identified and developed through a mapping exercise involving close engagement with the RSE and A&H researcher communities, and carried out by members of the core Capability team.

Incubator activities may include:

- national-scale idea-generating workshops
- matchmaking events that will:
  - bring together RSEs and A&H researchers with common interests
  - expand and broaden the overall community
  - allow institutions that wish to employ RSEs to learn from more experienced organisations – institutional mentorship – with the aim of facilitating the hiring and retention of RSEs
- pots of funding for experimental projects with the aim of developing and testing impactful methods and tools. These would be pilot projects that could subsequently receive full funding from other sources, having demonstrated their feasibility and potential impact.

Existing, successful examples of similar activities (some involving members of the Roadmap stakeholder group) include:

- The University of Edinburgh Centre for Data, Culture and Society's [Rapid Prototyping Sandpit](#), which helps researchers create preliminary models of digital products
- matchmaking events carried out through [Neuromatch](#), which aims to speed up scientific innovation by facilitating inclusive, collaborative, and global participation in the computational sciences
- The Turing's [Data Study Groups](#) (DSGs), which function as collaborative hackathons and bring together organisations from industry, government, and the third sector with multi-disciplinary data science and AI researchers from academia to work on a particular problem or challenge. Examples of successful collaborations arising from DSGs outside A&H include [a strategic partnership with the healthcare company Roche](#) and [Putting the AI in Air Traffic Control](#)
- The Turing's Accelerating AI for Arts & Humanities programme, which fostered new collaborations between researchers and RSEs. The programme focused on ensuring the impact and legacy of software, expanding communities of practice, and providing a confident codebase for future research
- Innovate UK's [Bridge AI](#) programme, which helps UK businesses harness the potential of AI.
- King's College London's internal funding for collaborations with King's Digital Lab through [Digital Futures Institute](#) pilot projects (such as the Encyclopedia Britannica [Exploratory Prototypes](#)), the King's Together interdisciplinary scheme (such as [Taming the Complexity](#)

[of the Law](#)) and representation in the [KCL AI Institute](#) supporting cross-faculty fellows and outreach activities including the yearly AI festival.

Examples such as these will be studied to inform the research development activities of Work Package 2.

### **The benefits**

- Enhancing innovation in A&H research by supporting risky, ambitious, experimental projects that focus on the testing and creation of new (reproducible and adaptable) methods and tools.
- Increasing the likelihood of pilot projects receiving full funding from other sources. This will tie in with the Capability's outreach programme, which will provide examples of best practice, and accelerate the pilot projects' own journey to impact (including impact beyond A&H).
- Fostering greater collaboration between communities of RSEs, A&H researchers, and institutions themselves (reducing siloing).
- Increasing the visibility of digital methods in A&H research by expanding the community and showcasing success stories on a national scale.
- Avoiding duplication by learning from and working with existing initiatives.
- Helping realise the overall benefits of the Capability approach and enhanced research ecosystem by ensuring tangible, community-driven outputs.

### **Case Study — Stimulating new research: the Edinburgh Sandpit model**

The University of Edinburgh Centre for Data, Culture and Society's Rapid Prototyping Sandpit helps A&H (and Social Sciences) researchers create preliminary models of digital products – from databases and analysis tools to online exhibitions, apps, and interactive maps. The programme brings together researchers with RSEs and other technical experts, building capacity for data-led research and supporting digital research projects.

Five iterations of the Sandpit so far have led to two successful bids for UKRI funding, with others in the pipeline. One example is the AHRC Catalyst Grant, won by Dr Rochelle Rowe, whose bid was strengthened by having worked with the team to scope technical requirements and design an appropriate data architecture, and by being able to continue that working relationship into the project delivery phase. Dr Rowe's project, Performative Blackness and Black Histories in Scotland, 1839-1939, will develop an online archive of historical representations of blackness in performance, including textual data, high-resolution images, and maps. Among the other successes of the initiative has been a stronger connection between RSEs and the research community (moving from a focus on delivery to increased collaboration), with a consequent mutual benefit: researchers with little prior technical knowledge are able to develop complex digital research project proposals, while RSEs experience a greater variety of topics, tasks, and interactions in their work.

We envisage that the new Capability will work with (or take inspiration from) the Edinburgh Sandpit model as part of its Research Development Work Package, designed to stimulate impactful new research, tools, and methods. While the Sandpit provides a valuable space for experimentation and exploration (especially at an early stage), the Capability's focus is likely to be on ideas and prototypes that have a clear potential benefit to the wider A&H digital research community, and which have a strong chance of receiving further funding. This activity may be organised through a cohort-based approach to maximise the opportunity for collaboration and community-building.

### Case Study — The value of experimentation to scale: the King's Digital Lab model

Home to a stable team of dRTPs with longstanding and diverse expertise, King's Digital Lab (KDL) is a research software engineering team in the Faculty of Arts and Humanities at King's College London with decades of experience in designing, developing, and maintaining software and other digital research products in the arts, humanities, cultural heritage, and social sciences domains.

Since its founding, the lab has embraced the value of experimental approaches to specific research questions and contexts. When coupled with seed funding, these collaborations have increased the chances of ambitious ideas and larger projects becoming viable and, crucially, leading to more robust products. Typically, seed funding has led to the collaborative design and development of prototypes or proofs-of-concept on a variety of multimodal datasets. A recent example is the ongoing series of experiments around [computational methods applied to the analysis of cinematic time](#), which enabled the team to lay the foundations for a larger project (supported by the BFI Innovation Challenge Fund and made possible with National Lottery funding) to develop the [critical and technical exploration of AI in the screen sector](#), focusing on moving image archives in the UK.

Underpinned by an open, responsible, and sustainable software building ethos, the Capability could work with KDL to scale its model nationally and offer its agile, flexible approach to software development lifecycles to future modular digital research infrastructure design. In collaboration with King's College London's central e-research infrastructure provision and a distributed RSE Capability across HEIs and IROs, this partnership could deliver innovative experimental solutions for the exploitation of cultural and science heritage datasets for analysis and presentation in alignment with solid research software engineering best practices such as requirements analysis, code reusability, and open sourcing.

## Work Package 3: Monitoring and Strategic Development

Technology and policy evolve rapidly. This Work Package will monitor not only the performance of the Capability through a range of quantitative and qualitative measurement and evaluation techniques, but wider developments in and around the digital research ecosystem to ensure the Capability continues to support it in the most effective way. Understanding these developments – whether new methods that necessitate demand for different skills, changes in technology and infrastructure, or changes in the research investment landscape – will be key to identifying challenges and opportunities within the field.

Given the breadth of challenges that the Capability will address, it is imperative to build a framework from which to strategically develop its programme. One effective methodology that combines sharp diagnosis with designing routes and indicators of success through which to measure performance is the Theory of Change. Employing such methodology alongside a systematic mapping of the digital A&H ecosystem will allow us to identify and analyse (visually) how the proposed activities and interventions will create the desired positive impact. The Capability thus proposes to employ a specialist consultant to develop this methodology as part of Work Package 3, producing a Theory of Change for the ecosystem that informs the Capability's metrics, programme of activities, and ongoing strategic development.

## How it works

This Work Package will keep a constant dialogue with the A&H researchers and RSE communities, conducting activities including surveys, data gathering, skills mapping, horizon scanning, and consultations to produce the insights needed to continuously evaluate both the Capability's own impact and the evolving needs of the sector.

Those insights will focus on key areas such as skills (availability and demand), convergence with technical developments beyond A&H, computing facilities (use and demand), and changes in research practice (for example, in response to rapid developments in AI and related technologies, and associated challenges to the responsible design and use of AI models for analysis of cultural and science heritage datasets). Metrics and benchmarks developed to help measure progress may include, at a broad level, the number of RSEs employed across institutions and inclusion of RSEs within projects, and, at a more granular level, rates of data preservation, reuse of data and code, accessibility of data and code, documentation quality and standards, and rates of translation into industry. However, the priority will be to develop metrics that relate clearly to the Capability's objectives, are feasible to capture, can be acted upon for the improvement of the Capability, and are complemented by quantitative methods that delve deeply into impact and cross-Work Package outcomes.

The centrepiece of Work Package 3 will be a regularly updated ecosystem map along similar lines to the Turing's [Environment and Sustainability Grand Challenge Community Stakeholder Map](#) (Gould van Praag, C., 2024). Data in this environment and sustainability stakeholder map includes individuals, organisations, and projects carrying out relevant work in this area – the Capability's mapping exercise will also feature (as outlined in the Governance and Staffing section) a strong focus on available skills and methods, as well as their application and demand. Linked to the map's production and maintenance will be opportunities for set-piece outputs such as an annual state of the nation report based on the results of a survey of digital research practices.

The activities in this Work Package will variously involve measurement, evaluation, monitoring, strategic planning, and report writing, and will be carried out collaboratively by the core Capability team (with external assistance where necessary) given the range of skills and experience required to deliver this Work Package. The initial mapping element will be led by at least one member of the Capability's core team.

In keeping with the Capability's ethos of fostering the wider development of the digital A&H research community, this Work Package will make its data, thinking, and outputs publicly accessible. Governance structures will be designed that provide clear accountability for these openly published outputs.

## The benefits

As well as the self-evident need to measure and evaluate the Capability and its activities in order to maximise impact, the monitoring and strategic development aspects of Work Package 3 will have a number of benefits for stakeholders, including:

- helping funding bodies make investment decisions by identifying gaps and keeping on top of technological change and progress
- highlighting development pathways for RSEs and advancing the professionalisation of the field by identifying future skills needs and, as a consequence, influencing training programmes

- working with key potential partners in this area (for example, SSI, the Society of Research Software Engineering, the Open Data Institute, and the Hidden REF) to help shape policies around research software and digital methodologies based on insights gained from activities such as horizon scanning. We will seek and explore strategic relationships and partnerships with organisations wherever there is potential benefit to the ecosystem (in addition to the organisations we are already in dialogue with or those specifically named in this Roadmap)
- steering A&H researchers towards emerging methodologies and encouraging new investment from funders, thereby increasing opportunities for cutting-edge research and the impact of that research.

## Delivery Approach

### Governance and Staffing

As a major initiative aiming to make a significant impact on future digital A&H research, the Capability will require investment in a core delivery team to carry out its set-up and operation.

The core team will only be as big as is required to coordinate activities that will, as outlined elsewhere in the Roadmap, make use of existing resources and be delivered with partner organisations where possible. This operating model will provide value for money while ensuring the Capability is properly resourced to achieve its desired results for the sector – results that can only be achieved through this new, evidence-backed, skills and collaboration-focused way of working. Proposed roles are outlined as part of the delivery timeline below. The staffing plan is predicated on the Capability being based at an institution that can provide in-house support (through chargeable overheads) for key high-level functions such as legal, finance, personnel, and data protection.

Providing oversight of the Capability and its activities (including advice and steering) will be an Advisory Board comprising RSEs, A&H researchers, representatives of funding bodies, and other professionals with relevant experience, at various career stages and from a range of organisations. In addition, Capability leadership will design a mechanism to allow partner organisations to contribute towards decision-making.

### ● Year 1

#### 1. Appoint:

- Capability Lead/Director (1 FTE; permanent): a senior role with a strong existing network to oversee the Capability's strategic vision, drive its implementation, and advocate for policy
- Senior PRISM (1 FTE; permanent) to establish and support governance structure (in liaison with lead/director) and lead on:
  - implementation of the delivery plan
  - ecosystem mapping and Theory of Change with help of a specialist consultant if required
  - designing contract templates (with support of institutional legal office) that allow organisations to partner with the Capability in an agile fashion
  - establishing the first partnerships leading to the start of activities

- Project Manager (1 FTE; permanent)
- Skills Officer, based in a skills team, to deliver skills analysis and mapping (0.5 FTE; 12 months, possibly on secondment)
- Communications and Engagement Officer (0.5 FTE; permanent).
- Postdoctoral Researcher (1 FTE; permanent) to lead on an Annual Digital Research Practice Survey and co-deliver ecosystem mapping with the Senior PRISM role
- Advisory Board.

2. A more detailed implementation plan will emerge from the ecosystem mapping exercise and the Theory of Change. The delivery plan should include:

- designing measurement and evaluation KPIs tied in with the vision and objectives (including baseline and benchmarking measures) and lead indicators supporting the management and development of the provision
- defining the key ecosystem research activities and reporting for the first three years that will provide data and intelligence for the Capability and the sector (for example, the Annual Digital Research Practice survey, which will focus on skills and methods to feed into the RSE Directory and programme priorities)
- identifying organisations and projects with the potential to partner with the Capability to cover and deliver the scope of planned activities.
- designing a governance structure with well-defined decision-making pathways that incorporate the participation of partner organisations (with the aim to be operational in Year 2).

3. The RSE Directory and associated partnerships and agreements will be created while the ecosystem map is under development, bringing institutions on board as an instrument to make RSEs available for collaborations with A&H researchers.

Outputs will include:

- Theory of Change document
- delivery plan
- ecosystem map outlining stakeholders, projects, and skills availability/gaps
- online Directory of RSEs
- designed partnership mechanism, including contract templates
- first partnerships signed with organisations:
  - joining the RSE Directory
  - delivering programme activities (for example, digital literacy training for A&H domain experts)
- digital presence for the Capability
- outreach events (online and in-person).

## ● Year 2

Core team to carry out:

- updating the delivery plan
- increasing the number of partnerships to further cover the Roadmap's scope and activities
- designing a research collaboration infrastructure to support meaningful collaborative interactions between A&H domain experts and RSEs
- running the Annual Digital Research Practice Survey

- adjusting the programme according to research findings
- initiating the Incubator programme (in partnership with other organisations)
- analysing progress and performance to date with a view to the longer-term sustainability and business model of the Capability (in tandem with updating Theory of Change).

Outputs will include:

- Year 1 report – including results of the first Annual Digital Research Practice Survey
- growth of the RSE Directory
- further partnerships to help deliver the Roadmap's scope and activities
- increased number of activities delivered, according to the delivery plan and including first sandpit-like events launching the Incubator programme
- improved digital presence
- outreach events (online and in-person).

## ● Year 3

Ongoing development of Year 2 activities and outputs, plus:

- development of the Capability strategy based on the Theory of Change and published reports
- updated Theory of Change
- development of a business case for the longer-term sustainability of the Capability, based on experience to this point with partnerships, the Annual Digital Research Practice Survey, and the ecosystem mapping data. This will help kickstart preparations for the next phase of the project, which may involve putting in place new memoranda of understanding and partnership agreements, creating potential business models for a better understanding of the amount and type of resourcing required, and gathering new evidence of need
- updated delivery plan to account for any new core team members required to support the Capability and its partnerships. We estimate that the Capability will need:
  - Partnerships Lead (1 FTE; permanent) to oversee the planning and delivery of partnerships, including the scaffolding for meaningful research collaborations
  - Project Coordinator (1 FTE; permanent) to support the overall running of the Capability
- an expectation that the full scope of the Roadmap will be delivered by the end of Year 3.

## Level of Investment

Here, we provide an estimated level of investment for the Capability. This is an indicative number given the Roadmap is a strategic-level plan and detailed costs depend on variables that are not yet available to the authors (for instance, the institution[s] the Capability would be based at) and/or can only be determined once a detailed implementation plan is devised, based on the conditions imposed by those same variables.

### **Recommended investment level**

The indicative investment takes into consideration the staffing requirements detailed above, calculated using parameters for a London-based academic institution. We have only made a high-level estimate of non-staffing costs here, which would include elements such as travel expenses, costs associated with running events, access to cloud computing, development of training resources, and experimental funding for new projects as part of the Capability's research Incubator. These costs should be further scoped in liaison with the funder through

a detailed proposal addressing aspects including – but not limited to – data management, justification of resources, and the research team’s capacity to deliver. While this document is unable to provide a full investment figure, conservative estimates of non-staff costs came in the region of £260,000 to £310,000 per year. This includes delivery of a series of regional network events annually, one larger annual event, travel and dissemination costs, and specialist contractors to support delivery. It is important to understand that these costs could vary and potentially be significantly higher depending on the speed and impact of delivery expected in the first years of the Capability.

**Estimated staff costs across the first three years of the Capability: £2.2 million. When including non-staff estimates (as above): £3.13 million**

The above indication considers the fully scoped plan for the Capability, and by extension the benefits to UK research, while bearing in mind that any expenditure should provide value for money and that implementation is a complex process that should be flexible to adapt to unforeseen circumstances. Below, we indicate other possible lower levels of funding, explaining the compromises that would have to be made and the priorities that should be considered.

### **Prioritised investment level**

Computational research in A&H is diverse and benefits from a range of existing, well-established initiatives. The contributors who shaped the development of this Roadmap agreed that Ecosystem Development (Work Package 1) – that is, strengthening the existing ecosystem and initiatives – should take priority in the event that the initial level of investment is lower than required to implement the activities in full. Responding to the immediate needs of the sector would provide significant improvement towards the Roadmap’s goals more quickly than prioritising the development of a tools and methods research agenda (Work Package 2: Research Development). To ensure the effectiveness of efforts to develop the A&H RSE ecosystem, this work would need to be complemented by the ecosystem mapping and measurement and evaluation activities of Work Package 3: Monitoring and Strategic Development. It must also be mentioned that failing to pursue the research development agenda of Work Package 2 – while an effective way to reduce costs – risks impeding the UK’s progress in this area and thus the competitive advantage gained by having access to the latest methods and tools.

Delaying the start of this aspect of the Roadmap (for example, until Year 4), and potentially scaling back some of the Work Package 1 activities, would reduce the required initial investment in terms of non-staffing costs. Again, we have not attempted to calculate this cost in detail, but based on our high-level estimate, the above reduction would be in the region of £110,000 per year. Staffing costs would remain unchanged at approximately £2.2 million across the first three years of the Capability.

**Estimated total investment at this level across the first three years of the Capability: £2.8 million**

### **Minimum investment level**

A further reduction in investment would allow us to establish a minimum operation to kickstart the implementation groundwork and take the initiative off the ground. It would reduce the core staff composition to a minimum level, at which they would prioritise:

- a mechanism for engagement of potential partners (especially RSE groups)

- initiating the ecosystem mapping exercise (Work Package 3) and the RSE directory (Work Package 1)
- providing advice to researchers and research organisations (Work Package 1)
- conducting a minimum level of research activities to produce some key data about the sector (Work Package 3)
- a minimum number of partnerships to extend existing successful activities aligned with the Roadmap programme.

The core team would work on the level of connectivity necessary to produce the most easily achievable outcomes – that is, helping domain experts and dRTPs to identify potential partners and start collaborations based on best practice, and advising organisations about forming dRTP groups. As the operational infrastructure is put in place, the reduced team would be able, later, to dedicate time to producing other resources such as the digital learning pathways and other training and upskilling activities. This would result in a much slower pace of change on a much smaller scale, and should be considered only as a pilot phase alternative to a no-investment scenario. At this investment level, the Delivery Approach in relation to staffing and activities would be amended to:

Year 1

1. Appoint:

**Reduced** **Capability Lead/Director** (reduced to 0.5 FTE; permanent):

a senior role with a strong existing network to oversee the Capability’s strategic vision, drive its implementation, and advocate for policy..

**No change** **Senior PRISM** (1 FTE; permanent) to lead on:

- implementation of the delivery plan
- ecosystem stakeholder mapping
- designing contract templates (with support of institutional legal office) that allow organisations to partner with the Capability in an agile fashion
- establishing the first partnerships leading to the start of activities.

**Reduced** **Project Manager** (reduced to 0.5 FTE; permanent).

**Absent** **Skills Officer**, based in a skills team, to deliver skills analysis and mapping. This role would be either absent, provided in-kind by the institution, or absorbed by indirect costs (0.5 FTE; 12 months, possibly on secondment).

**Absent** **Communications and Engagement Officer**. This role would be either absent, provided in-kind by the institution, or absorbed by indirect costs (0.5 FTE; 12 months, possibly on secondment).

**Absent** **Postdoctoral Researcher** to lead on an Annual Digital Research Practice Survey. This role would be absent. On a much reduced scale, the PRISM could conduct some simple surveys to obtain indicative data (0.5 FTE; permanent).

**No change** **Advisory Board** (no change as these would be voluntary roles).

**Estimated staff costs across the first three years of the Capability: £998,000. Continuing with our high-level estimate rationale for non-staff costs, we consider that this reduced team would need at least 30% of the estimated non-staff costs. This would take the total estimated investment, including non-staff costs, to approximately £1.228 million.**

---

## Conclusion

This Roadmap sets out a bold and necessary vision for transforming the way A&H researchers and RSEs work together in the UK. By addressing critical gaps in capacity, skills, and infrastructure, it provides a path towards unlocking the full potential of digital methods across the field – and beyond.

Through a nationwide Directory of A&H-skilled RSEs; a targeted training programme; a commitment to outreach; research incubation for the development of new tools and methods; evidence-based strategic development; integration with existing initiatives; and an open, collaborative, interdisciplinary, and community-focused approach and ethos, the Roadmap paves the way for a transformative and cost-effective Capability in digital A&H research for universities and GLAM organisations.

This Capability, if realised, will ensure A&H researchers have access to the tools, expertise, and collaborative networks they need to tackle today's complex, data-driven research questions in the most up-to-date ways. This is particularly pressing in the age of rapid technological advancement, when new methods such as AI are changing research practice significantly and at pace. The UK must adopt a structured approach towards supporting A&H researchers to incorporate these technologies into their work.

For RSEs, the Capability offers an unprecedented opportunity to develop new skills, expand their career horizons, and contribute meaningfully to the challenges and opportunities unique to A&H research. In turn, as RSEs gain these skills, other disciplines will benefit from their A&H-inspired digital methods and approaches.

The broader impact is clear: a more connected and dynamic research ecosystem, where interdisciplinary collaboration drives innovation, sustainability, and global leadership in digital A&H research.

The risks of not adopting this approach are significant, from failing to capitalise on investment in areas such as HPC and other infrastructures to a stagnation in cutting-edge digital research, a loss of skilled technical practitioners from the sector, an absence of those best equipped to contribute to ethical questions around new technologies such as AI, and a decline in the UK's standing in the field.

And while a number of initiatives to improve digital research skills and infrastructure are now under way, there is a clear consensus among those working in the field – and evidence from previous studies and reports – that more needs to be done to address the identified challenges and bottlenecks and to focus attention more directly on A&H research.

Investing in this Capability will help create an A&H research ecosystem and community that embodies the best of UK research, innovation, and collaboration, cements the country's leading position, and is equipped to meet the challenges of the digital age. Its impact will be far-reaching.

---

## Acknowledgements

We would like to thank all those who have contributed their time and expertise to the development of this Roadmap, making it a truly community-authored document.

Attributing credits in this Roadmap is a complex endeavour given the purposefully diverse framework established for contributions to take place. In order to capture the experiences and expertise of a large and busy group of professionals, the collaboration used open practice principles to set up contribution routes via meetings, workshops, task-and-finish subgroups, case study production, background research, recordings, surveys, and asynchronous work using whiteboard and text-based digital platforms. The framework we use is the Contributor Roles Taxonomy (CRediT, n. d.) – a high-level taxonomy comprising 14 roles that can be used to describe contributions to a research output. While the contributor role definitions can be open to interpretation, we consider that they fit well the types of contributions we have attributed to the authors.

## Contributor Roles Taxonomy (CRediT)

**Conceptualisation, Investigation, Project administration, Writing – original draft, Writing – review & editing:** André Piza, David Beavan, Cyara Buchuck-Wilsenach

**Conceptualisation, Investigation, Writing – original draft, Writing – review & editing:** Stuart Gillespie

**Conceptualisation, Investigation, Project Administration, Writing – review & editing:** Oscar Seip

**Conceptualisation, Project administration, Writing – review & editing:** Stephanie Fagan

**Supervision:** Pieter Francois, David Beavan

**Funding acquisition:** Pieter Francois

**Visualisation:** André Piza, Emma Rowlands

**Conceptualisation:** Jake Bickford, Sarah Dietz

**Writing – review & editing:** Lisa Otty

**Conceptualisation, Writing – review & editing:** Claire Bailey-Ross, Ed Chalstrey, Mary Chester-Kadwell, Neil Chue Hong, Arianna Ciula, Jonathan Cooper, Tom Couch, Eirini Goudarouli, Neil Grindley, Felicity Guest, Timothy Hobson, Natasha Kitcher, Paola Marchionni, Katherine McDonough, Pamela Mellen, Nicola Osborne, Lisa Otty, Mark Parsons, Michael Pidd, Clementina Ramirez Marengo, Anna-Maria Sichani, Tom Storrar, Melissa Terras, Charlotte Tupman, Marion Weinzierl, Kalle Westerling.



Arts and  
Humanities  
Research Council

**This work was supported by the Arts and Humanities Research Council  
[grant number AH/Y00745X/1]**

---

## Reference List

Beavan et al. (2025) Evidencing the Impact of Research Software Engineers on Arts & Humanities Scholarship. Zenodo. doi: 10.5281/zenodo.15083632.

CCP-AHC (2025) Toward a new CCP for Arts, Humanities, and Culture research. Available at: <https://www.ccpahc.ac.uk/about/> (Accessed: 27 March 2025)

Gould van Praag, C. (2024) alan-turing-institute/environment-and-sustainability-gc-community: for zenodo integration. Zenodo. doi: 10.5281/zenodo.11167969.

King's College London (n.d.) How can we live well with technology? Available at: <https://www.kcl.ac.uk/digital-futures> (Accessed: 27 March 2025)

King's College London (n.d.) Intelligent Systems for Screen Archives (ISSA). Available at: <https://www.kcl.ac.uk/research/issa> (Accessed: 27 March 2025)

King's Digital Lab (n.d.) Encyclopedia Britannica Exploratory Prototypes. Available at: <https://kingsdigitallab.github.io/kdl/projects/encyclopedia-britannica-exploratory-prototypes/> (Accessed: 27 March 2025)

King's Digital Lab (n.d.) Sculpting Time with Computers Proof of Concept. Available at: <https://kdl.kcl.ac.uk/projects/sculpting-time-with-computers/> (Accessed: 27 March 2025)

King's Digital Lab (n.d.) Taming the Complexity of the Law. Available at: <https://kdl.kcl.ac.uk/projects/taming-the-complexity-of-the-law/> (Accessed: 27 March 2025)

McGillivray, B. et al. (2020) The challenges and prospects of the intersection of humanities and data science: A White Paper from The Alan Turing Institute (Version 5). figshare. doi: 10.6084/m9.figshare.12732164.v5.

Popov, D. et al. (2021) The Value of Digitising Natural History Collections, Research Ideas and Outcomes. doi: 10.3897/rio.7.e78844.

Ross, J. et al. (2024) Infrastructure Futures for Digital Cultural Heritage. Zenodo. doi: 10.5281/zenodo.13710266.

Sichani, A.-M. et al. (2023) iDAH Research Software Engineering (RSE) Steering Group Working Paper. Zenodo. doi: 10.5281/zenodo.8177926.

Smith, C. (2025) Modern arts and humanities demand modern policy approaches, Research Professional News. Available at: <https://www.researchprofessionalnews.com/rr-news-uk-views-of-the-uk-2025-january-modern-arts-and-humanities-demand-modern-policy-approaches/> (Accessed: 31 March 2025)

Sufi, S., Bell, E. and Sichani, A.-M. (2023) Report on the AHRC Digital/ Software Requirements Survey 2021: Where is Investment Needed?. Zenodo. doi: 10.5281/zenodo.7686348.

Taylor, R. et al. (2022) Shaping Data and Software Policy in the Arts and Humanities Research Community: A Study for the AHRC. Zenodo. doi: 10.5281/zenodo.10518740.

Turing (n.d.) Building sustainable communities around Arts and Humanities datasets and tools. Available at: <https://www.turing.ac.uk/research/research-projects/dataculture-building-sustainable-communities-around-arts-and-humanities> (Accessed: 27 March 2025)

Turing (n.d.) Generating insights into disease, patient and outcome heterogeneity using advanced analytics. Available at: <https://www.turing.ac.uk/research/research-projects/alan-turing-institute-roche-strategic-partnership> (Accessed: 27 March 2025)

Turing (2020) Putting the AI in air traffic control. Available at: <https://www.turing.ac.uk/about-us/impact/putting-ai-air-traffic-control> (Accessed: 27 March 2025)

UKRI (n.d.) Bridging the gap in artificial intelligence. Available at: <https://iuk-business-connect.org.uk/programme/bridgeai/> (Accessed: 27 March 2025)

UKRI (n.d.) RICHeS is the UK's Research Infrastructure for Conservation and Heritage Science Available at: <https://www.riches.ukri.org/> (Accessed 27 March 2025)

University of Edinburgh (2023) Rapid Prototyping Sandpit. Available at: <https://www.cdcs.ed.ac.uk/cdcs-rapid-prototyping-sandpit> (Accessed 27 March 2027)



**The  
Alan Turing  
Institute**

---

**turing.ac.uk  
@turinginst**