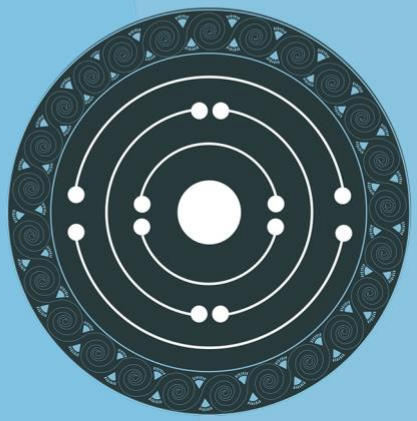

PARTHENOS

Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization and Synergies

Foresight Study and Interdisciplinary Research Agenda

PARTNER(s) KCL, AA, PIN, TCD & SISMEL.

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FORESIGHT STUDY AND INTERDISCIPLINARY RESEARCH AGENDA

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1. Executive Summary

1.1. Introduction

In recent years there has been rapid growth both in the development of digital methods and tools and in their application across a wide range of disciplines within humanities and cultural heritage studies. The future development of this landscape depends on a complex and dynamic ecosystem of interactions between a range of factors: changing scholarly priorities, questions and methods; technological advances and new tool development; and the broader social, cultural and economic contexts within which both scholars and infrastructures are situated.

This foresight study investigates how digital research methods, technologies and infrastructures in digital humanities and cultural heritage may develop over the next 5-10 years, and provides some recommendations for future interventions to optimize this development.

1.2. Foresight

Foresight research is a key mechanism for the development and implementation of research and innovation policy in the medium to long term, enabling policy-making bodies to set research priorities and influence the progress of research.

Foresight research is not simply ‘future gazing’, nor is it just about forecasting by experts, rather it is a way of facilitating structured thinking and debate about long-term issues and developments, and of broadening participation in this process, by involving different stakeholders, to create a shared understanding about possible futures and to enable them to be shaped or influenced.

Engaging a representative range of relevant and informed stakeholders in the dialogue brings several benefits: it extends the breadth and depth of the knowledge base created by the foresight process by drawing on distributed knowledge; it increases the ‘democratic basis and legitimacy’ of the study report by avoiding a top-down, expert-driven analysis; and it helps to spread the message about foresight activities and to embed it within participating

organisations, thus improving sustainability. Foresight studies draw upon existing knowledge networks and stimulate new ones – in addition to any reports produced, these embedded networks are an important output of foresight activities, facilitating a longer-term thinking process that extends beyond the period of the study itself.

1.3. PARTHENOS Foresight Methodology

A foresight study may utilize a range of different information gathering methods in the construction of its knowledge base. Specifically, the PARTHENOS foresight study commenced with an initial *literature review* and landscape *scanning*, to set the context for the study. This was followed by a series of structured, interactive events that combined *expert panels* with *interactive workshops* to obtain input for the study's foresight knowledge base, by curating multi-polar discussions among both experts from relevant backgrounds and a broader range of actual or potential stakeholders in research infrastructures, including (but not restricted to) users/researchers. These events then fed in turn into a series of *interviews* with targeted stakeholders.

Within this overall framework, the study followed a thematic approach, structuring its investigations around a two-dimensional matrix of questions that addressed, firstly, the different aspects of the foresight process:

- current trends – what is happening, and what impact is it having?
- potentialities and opportunities – what may happen?
- requirements – what do we want to happen?
- obstacles, constraints, risks and threats – what might prevent this from happening?
- what activities and interventions (e.g. funding programmes, strategic research, service provision) might serve to 'optimize' outcomes?

and, secondly, the different contexts to which those aspects relate:

- technology (e.g. new tools or methods);
- scholarly or professional practice (e.g. emerging research areas, changes in career structures);
- the broader 'environment' (e.g. social, cultural, economic, political, policy).

1.4. Findings

This study has found a dynamic field with a host of opportunities offered by new technologies, but requiring additional skills and infrastructure if full use is to be made of the opportunities. The main findings of the foresight study are summarized below, grouped according to identified trends, obstacles, potentialities and requirements.

1.4.1. Trends

The adoption of digital research methods is increasingly widespread in the humanities and cultural heritage sector, with the development of new data sources, technologies, and expanding collaborations creating a dynamic and innovative environment.

The development of the digital humanities has been characterized by the explosion in data available for analysis: **digitized collections**; **open data**; **born-digital content.** There are limitations and issues in relation to these, however: there is still a need for further digitization, in particular of collections relating to marginalized groups; significant concerns have emerged about potential infringement of IPR and the GDPR; and big technology companies are raising barriers to access to their data.

There is also a wide range of tools for analysing these data: **open source software**; **natural language processing, machine learning, and artificial intelligence tools and libraries**. Open source software enables the broad adoption of new tools and facilitates sustainability beyond a single project, while the development of software libraries for computational analysis offers the potential for widespread automated analysis. There is an important difference however, between placing software on GitHub and ensuring it is sustainable in the long term, and there is a risk that artificial intelligence may be seen as a vague panacea for all difficulties, without the community fully understanding the potentials, limitations and biases of the tools.

There has also been an increase in the number and variety of collaborations: **interdisciplinary collaboration; intersectoral collaboration; and international collaboration**. Collaborations between the humanities and other fields, universities and other sectors of society, and across national borders, are increasingly common and bring new perspectives and ideas to projects and data sets. This may be hindered, however, by

humanists who are reluctant to embrace digital methodologies, a suspicion of the commercial sector, and certain restrictions on international funding.

These trends towards increased data, tools and collaboration are all expected to continue into the near future, albeit with the potential for some restrictions on access to data due to concerns about IPR and the GDPR, and more limitations imposed by the big technology companies. The rate of increased adoption of data, tools and collaboration is liable to be constrained by funding limitations.

1.4.2. Obstacles

The opportunities offered by recent technological advances in the humanities have not yet reached their full potential, a situation that has been heavily influenced by environmental obstacles. The three most often raised obstacles were: funding, the digital divide, and concerns about IPR and the GDPR.

The lack of sufficient funding for the digital humanities and cultural heritage sectors, especially since the financial crisis of 2008 and the growing emphasis on the funding of STEM subjects, has had significant consequences for the capability of the sector to meet the challenges of the 21st century:

- **Distortion of research interests**: Insufficient funds drives researchers to focus on those areas where funding is available, with an accompanying lack of freedom to explore other areas that they consider important.
- **Loss of people from the sector**: Restricted budgets inevitably lead to a lack of job security, and the loss of team members has ramifications for the sustainability of projects and the loss of vital skills from the sector.

The lack of funding also feeds into the digital divide within the digital humanities and cultural sectors. This digital divide can take many forms, including:

- **International digital divide**: There continues to be significant differences between the research infrastructures available to researchers and research institutes in different countries.

- **Interdisciplinary digital divide**: There are significant differences between the research infrastructures that are available to the digital humanities compared with STEM disciplines that have been prioritized for funding. This, in turn, has contributed to the digital divide in technical skills.
- **Intradisciplinary digital divide**: There continues to be a significant and ongoing divide within the humanities between those who embrace the potential of digital methodologies and those who do not.

There are also concerns about **IPR** and the **GDPR**. The GDPR, in particular, is seen as blocking avenues of research, and preventing humanists researching some of the most important emerging issues affecting the EU, including fake news, populism, and nationalism.

1.4.3. Potentialities

The potential of digital research methods in the humanities and cultural heritage sectors is reliant not on the emergence of new technologies or discoveries, but rather on the application of existing technologies.

The new digital technologies and primary sources offer a host of new possibilities, but a decade of underfunding has left much of the potential unrealized. Particular interest was noted in those technologies that potentially offer a technological solution to overcoming the problem of a lack of growth in the humanities:

- **Crowdsourcing**: Crowdsourcing offers the opportunity both to outsource certain tasks to the wider community, thus scaling up certain types of activity, and to engage the public more deeply with humanities research.
- **Artificial Intelligence**: Artificial Intelligence offers the potential to contribute to a wide range of research in the digital humanities, but it is important that humanities researchers are willing to investigate the black box of these technologies more fully.

Neither is a panacea to the underfunding of the humanities, however. While they may offer the opportunity to increase the scale of projects, they nonetheless require expert guidance and a fuller understanding on the part of those researchers employing them.

New technologies and publication models also offer the potential for greater public impact:

- **Augmented Reality, Virtual Reality, and Mobile Applications**: The near-ubiquitous mobile smartphone, and the growing potential of augmented reality and virtual reality technologies, offer numerous opportunities for promoting research and collections in new ways. Not all will be successful, however, and there needs to be room for experimentation and failure, which is increasingly difficult given the importance accorded to impact and metrics in research evaluation.
- **Open Research**: Open research is seen as having potential not only for improving research access and quality, but also for reaching out to the wider public. For this to be achieved, however, there is a need for funding to ensure that open access policies can be followed.

From a technological perspective, the typical view was the expectation of more of the same. However, the impact of these technologies on the structure of the humanities, or the potential of the humanities for culture more broadly, is much less clear.

1.4.4. Requirements

There is a fundamental need for growth in the funding of the humanities and cultural heritage sector to ensure that it can meet the challenges of the 21st century and our increasingly technology-mediated society.

This is not simply a request for unlimited funds to support blue-sky thinking, but reflects the need for a discussion about the “fundamental questions” and “inspirational goals” that the community has to offer society. It is not just a matter of technologies, but rather about finding the questions.

At a European level there is a need for a stronger European lead, with a more explicit European Commission strategy on cultural heritage, and more visible public institutions offering leadership on research infrastructure and standards. It was suggested that cultural heritage institutes may contribute to the building of a European identity in the same way that 18th and 19th century cultural heritage institutes contributed to nation building. Europe is not a single homogenous region, however, and there is a need for segmentation in future digital humanities strategy, with different regions requiring different answers, and so there is an

important role for national governments in ensuring sustainable levels of support for the humanities and cultural heritage sector.

There is a need for a suitable information regulation framework that supports rather than hinders humanities research; this framework should distinguish between the work of academic or public sector researchers and those from private corporations, and should recognize that the protection required when handling personal health records differs from the protection required when analysing political commentary that is already in the public arena.

Finally, as more than one contributor noted, there is a need for more projects similar to the PARTHENOS Foresight Study (or indeed a sustainment or continuation of this study), that engage with professionals in culture and heritage to ask them what they see happening and what their needs and issues are. The digital humanities and cultural heritage sectors form a diverse community, without a single voice, and it needs to find that voice if it is to meet some of the challenges of the 21st century.

1.5. Research Agenda

From the foresight study, five broad themes emerge that should form the basis of a research agenda in the digital humanities: public engagement; research infrastructures; development of the digital commons; artificial intelligence; and impact and evaluation methods and metrics.

1.5.1. Public Engagement

Public engagement is an essential part of ending the underfunding of the humanities and cultural heritage sectors. The contribution of STEM research to society is widely recognised in a way that the contribution of the humanities is not, and there is a need for humanists to make case for their work more forcibly with a combined voice.

There are many ways that the new technologies can be used by humanists and cultural heritage sector to ensure research outputs are as widely accessible as possible: open access, open data (following good data practice), social media, augmented reality, virtual reality, and mobile apps. Crowdsourcing platforms can also be used for soliciting

contributions from the public. Engagement, however, is not just about promotion of research or extracting free labour, but about engaging with the public to ensure the humanities are meeting the challenges society faces at the beginning of the twenty-first century, whether that is fake news, nationalism, populism, or climate change, and demonstrating the contribution humanities research is making to these grand challenges.

1.5.2. Research infrastructures

The value of recent initiatives in the development of research infrastructures were widely recognized in the foresight study, as they provide a certain amount of sustainability to research projects, and more development of research infrastructures for the humanities and cultural heritage sector was seen as necessary.

At a time when projects are often short and the competition for funding is fierce, research infrastructures need to facilitate collaboration and sustainability, establishing communities around the infrastructures that are developed. It is important that research infrastructures do not simply perpetuate or exacerbate existing inequalities but help to bridge the digital divide. New research infrastructures, or enhancements to existing ones, should:

- bring to the fore marginalised collections.
- ensure access and analysis is not only possible by the technologically literate
- provide data services and tools as well as data.

Importantly, research infrastructures should feed into the public engagement by being visible, and findable, and should be used to establish authority in the development of standards and best practice.

1.5.3. Development of the digital commons

New data sets and new technologies offer the potential for a host of new research questions to be addressed, but the humanities must be more critical in both the application of digital methodologies and the data that is available. The digital humanities should not be reduced to the application of trendy technologies and data sources looking for research questions, but rather answering the big questions, while at the same time enhancing the digital commons and other digital resources. There is significant work to be done in:

- making new collections freely available online, especially those from marginalised communities.
- integrating diverse data sets.
- building context and provenance for online resources.

These issues are particularly important in the context of the widely recognised potential for artificial intelligence.

1.5.4. Artificial intelligence

The potential for artificial intelligence, machine learning, and other large-scale computational methodologies are as prevalent in the humanities and cultural heritage sector as the sciences. It is essential, however, that these technologies are not simply applied in an *ad hoc* manner, but are applied critically with attention to sustainability and ethical considerations. There is in particular a need to focus on:

- the ethical implications of the application of AI technologies.
- real world applications that are reusable.
- ensuring the technologies are used to help close rather than extend the digital divide.

1.5.5. Impact and evaluation

Impact and evaluation are important parts of the research process, especially when ensuring that limited funds are used in the best way possible, and it is essential that new methodologies and metrics are developed for measuring impact and evaluation that reflect the specific needs of the humanities and cultural heritage sector. These methodologies and metrics should incentivize innovation, sustainability, and public engagement. They should also recognize a far wider range of outputs and applications, and contribute to the development of standards and best practices in research evaluation.

2. Introduction

2.1. Background and Context

In recent years there has been rapid growth both in the development of digital methods and tools and in their application across a wide range of disciplines within the humanities and cultural heritage studies. In parallel to these developments, there have been numerous initiatives and projects at both national and international levels dedicated to the creation of more coordinated research infrastructures at different levels of subject specificity. These projects have been marshalling and integrating tools, services, technologies, policies and human resources in support of advanced research in universities, cultural heritage institutions, and other organisations.

The future development of this landscape depends on a complex and dynamic ecosystem of interactions between: changing scholarly priorities, questions and methods; technological advances and new tool development; and the broader social, cultural and economic contexts within which both scholars and infrastructures are situated. A sound knowledge base is required if policy-making bodies are to 'optimize' outcomes through implementing appropriate research and innovation policies, setting research priorities, and influencing the progress of research through funding programmes and other interventions.

2.2. Objectives and Nature of the Study

To address this, the PARTHENOS project has carried out a foresight study, as Task T3.4, which has been investigating how (digital) research methods, technologies and infrastructures in digital humanities and cultural heritage may develop over the next 5-10 years. It is important to understand that foresight research is not simply 'future gazing', nor is it about forecasting by experts (although experts may, and indeed should, participate). Rather, it is a way of facilitating structured thinking and debate about long-term issues and developments, and of broadening participation in this process of thinking and debate, to create a shared understanding about possible futures and to enable them to be shaped or influenced.

A key component is the participative aspect. The vision is not that of a small number of experts, but is based on engagement with and involvement of a broad range of key stakeholders, including decision- and policy-makers, but also members of the broader community, including scholars, potential users of research infrastructures, and practitioner stakeholders such as infrastructure providers, data curators, and archivists. The PARTHENOS project organized a series of structured, interactive events during 2018 and 2019, with the aim of obtaining input for its foresight study by curating a multi-polar discussion among a range of actual or potential stakeholders in research infrastructures, including (but not restricted to) user/researchers. Engaging a representative range of relevant and informed stakeholders in the dialogue extends the breadth and depth of the knowledge base created by the foresight process, by drawing on distributed knowledge (different stakeholders having access to different information), and thus enriches and improves the decisions that will ultimately be made on the basis of our work.

The aim of this study was thus not *simply* to identify trends and to predict future evolution within the sector, but rather to enable the community to inform and influence this evolution by identifying research and funding strategies and interventions that can be taken forward by the various stakeholders active in the (digital) humanities landscape, including universities, research institutions, funding agencies, and research infrastructure providers. The study will thus feed into strategic R&D thinking within the European Commission, other funding bodies, and research organisations, and gives stakeholders who participated in the process the opportunity to make their opinions known and to influence these strategic developments over the coming years, and thus to maximize the innovative potential of digital research in the humanities.

3. Frameworks for Foresight Studies

3.1. Overview

Foresight research is a key mechanism for the development and implementation of research and innovation policy in the medium to long term, enabling policy-making bodies (such as government agencies) to set research priorities and influence the progress of research. It is important to understand that foresight research is not simply 'future gazing', nor is it about forecasting by experts (although experts may, and should, participate). Rather, it is a way of facilitating structured thinking and debate about long-term issues and developments, and of broadening participation in this process of thinking and debate, for example through networks involving different stakeholders, to create a shared understanding about possible futures and to enable them to be shaped or influenced.

To this end, systematic frameworks, instruments and tools have been developed for carrying out foresight research – here we are following Georghiou et al. (2009), in particular Chapters 1-3. This framework is a generic one, addressing foresight studies in different domains and contexts, so the terminology needs in some cases to be reinterpreted for our particular context.

3.2. What is 'Foresight'?

There are multiple definitions in the literature – this is one that captures the key aspects:

> *"[Foresight is] a process which involves intense iterative periods of open reflection, networking, consultation and discussion, leading to the joint refining of future visions and the common ownership of strategies ... It is the discovery of a common space for open thinking on the future and the incubation of strategic approaches."* (Cassinga Harper, 2003, cited Popper, 2008, p. 45)

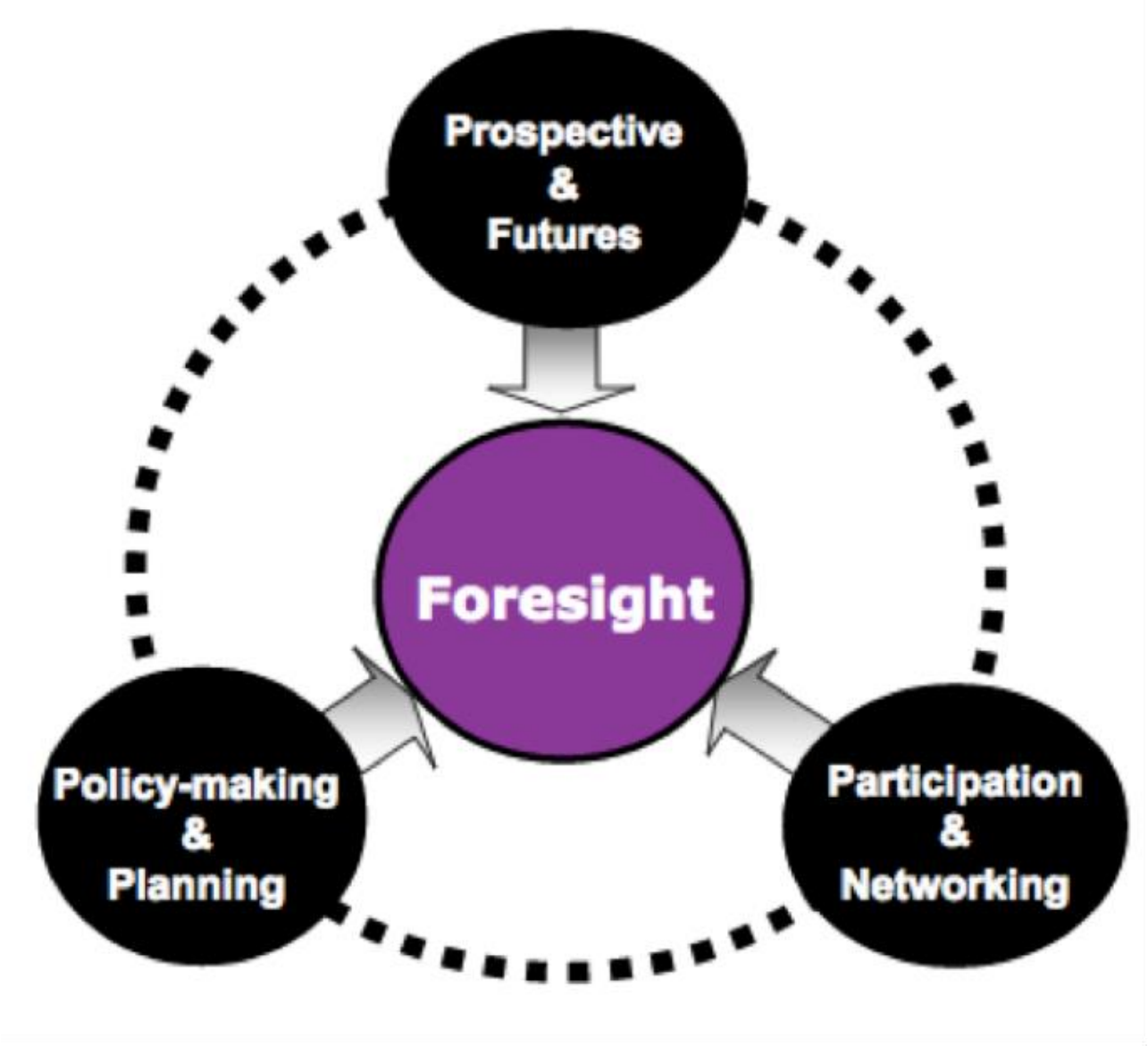

Figure 1. What is foresight? (Popper, 2008)

The central aim is to develop an understanding of the future – or more precisely of prospects, that is to say potential futures – but this is essentially a shared vision. A key component is the participative aspect. The vision is not that of a small number of experts, but is based on engagement with and involvement of a broad range of key stakeholders, including decision- and policy-makers, but also 'citizens' (in the terminology of the framework) of the community in question, which in our case would include both potential users of infrastructure, and other stakeholders (such as infrastructure providers, data curators).

Engaging a representative range of relevant and informed stakeholders in the dialogue brings several benefits: it extends the breadth and depth of the knowledge base created by the foresight process, by drawing on distributed knowledge (different stakeholders have

access to different information), and thus enriches and improves decision making; it increases the 'democratic basis and legitimacy' of the study report by avoiding a top-down, expert-driven analysis; and it helps to spread the message about foresight activities and to embed it within participating organisations, thus improving sustainability.

It thus draws upon existing knowledge networks and stimulates new ones – in addition to any reports produced, these embedded networks are an important output of foresight activities, facilitating a longer-term thinking process that extends beyond the period of the study itself.

Finally, bringing longer term considerations into decision-making facilitates higher-level policy making and strategic planning. Here we draw together the various threads that we identify in our activities, and make recommendations to our audience – this corresponds to the 'research agenda' aspect of T3.4, which complements the 'foresight' aspect.

3.3. Foresight as a Process

It must be emphasized that foresight is a process, which in the model that we are following is analysed into five broad stages, as illustrated in Figure 2. The process is iterative and cyclical, both within individual stages and as a whole.

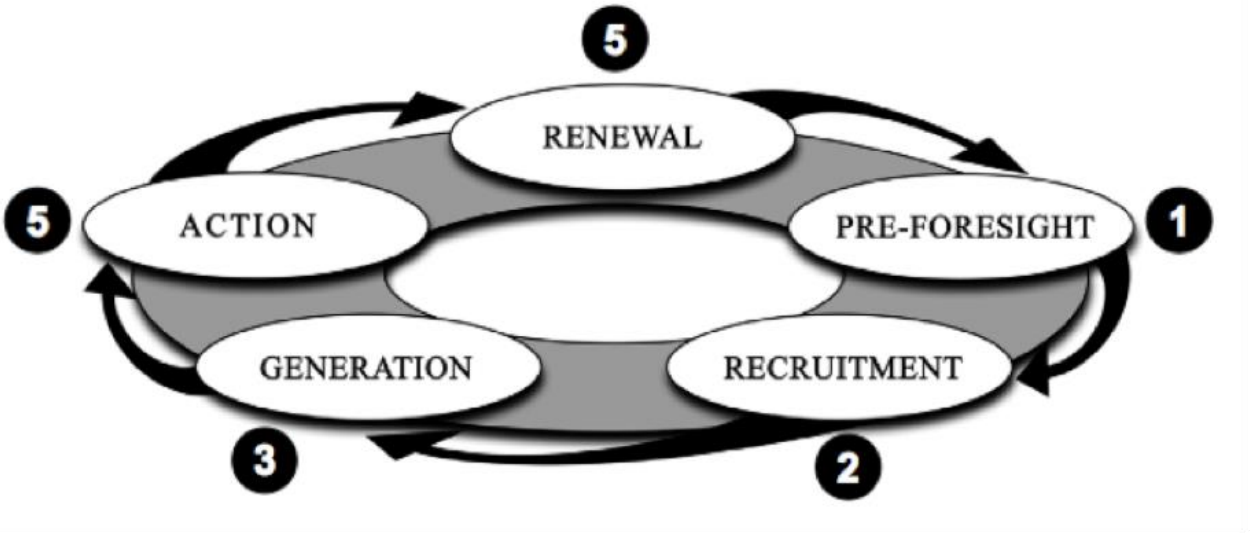

Figure 2. The Foresight Process (Popper, 2008)

The nature of these stages is shown in more detail in Figure 3. To examine these in the context of the PARTHENOS study:

Pre-foresight: this stage was already been carried out to some extent, at least in draft form, prior to the start of the project. The rationale and objectives of the activity had been identified in outline in the grant agreement, and were further refined by the project team; the team was assembled and the methodology defined; and the work to be carried out was scoped, through the research areas identified by the team, and an initial analysis of literature.

Recruitment: This stage involves identifying and engaging with key stakeholders or 'citizens' of relevant communities (as discussed above, not just 'experts'), through workshops, panels and interviews.

Generation: This is the heart of the foresight process, in which the knowledge base is constructed ('generated') by 'exploration, analysis, anticipation of the possible futures'. Existing knowledge (including opinion) is collected together, analysed and synthesised; tacit knowledge is identified and made concrete; and new ideas about where we are going are developed. The task has developed this knowledge base, through its information gathering activities and subsequent analysis, as defined in Section 4.

Action: This is the stage in which the knowledge base developed is used as the basis for decisions and for planning change and innovation. In the case of our task, the initial phase of this is a matter of drawing conclusions and making recommendations, as in Section 7 of the current report; subsequent phases – in which decision-makers address and perhaps act upon our recommendations – take place after the project is complete.

Renewal: The Renewal stage covers follow-on activities, including sustainability issues, embedding foresight in organisations (so that it continues as a process), and the evaluation and potential modification of what the study produces during the project, as the landscape continues to develop. Preparations for this have already been started, and will continue during the extension period, and after the project is complete.

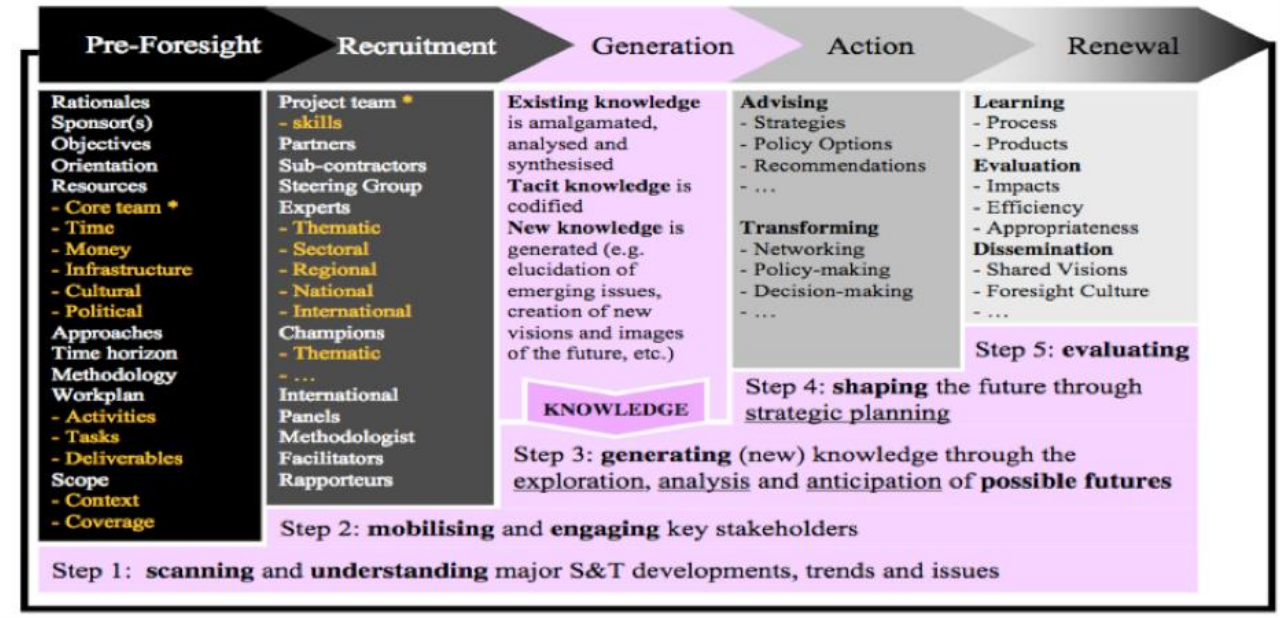

Figure 3. The Stages of Foresight (Popper, 2008)

3.4. Methods for Foresight: The Foresight Diamond

Another aspect of this framework is the selection of specific methods for constructing the knowledge base, during the 'Generation' stage. Figure 4 shows the 'foresight diamond', a representation of the most relevant methods (the framework identifies substantially more) in terms of what the framework calls 'knowledge source': 'creativity'-based methods require more original, imaginative and open-ended thinking; 'expertise'-based methods make use of the skill and knowledge of people expert in specific areas; 'interaction'-based methods bring together knowledge from multiple people (not necessarily experts); 'evidence'-based methods are those based more on relatively 'hard' data, such as literature reviews, statistics, etc.

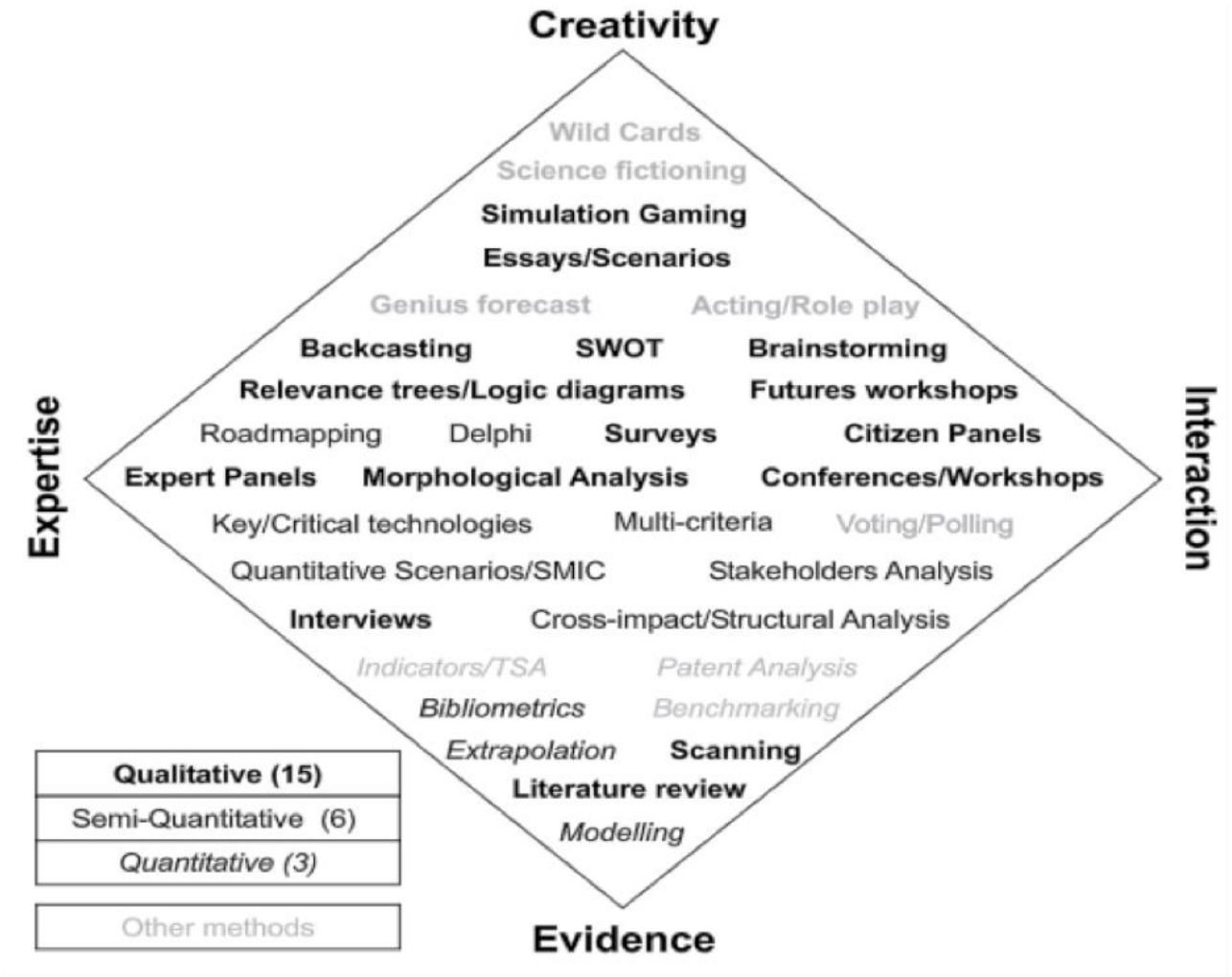

Figure 4. The Foresight Diamond (Popper, 2008)

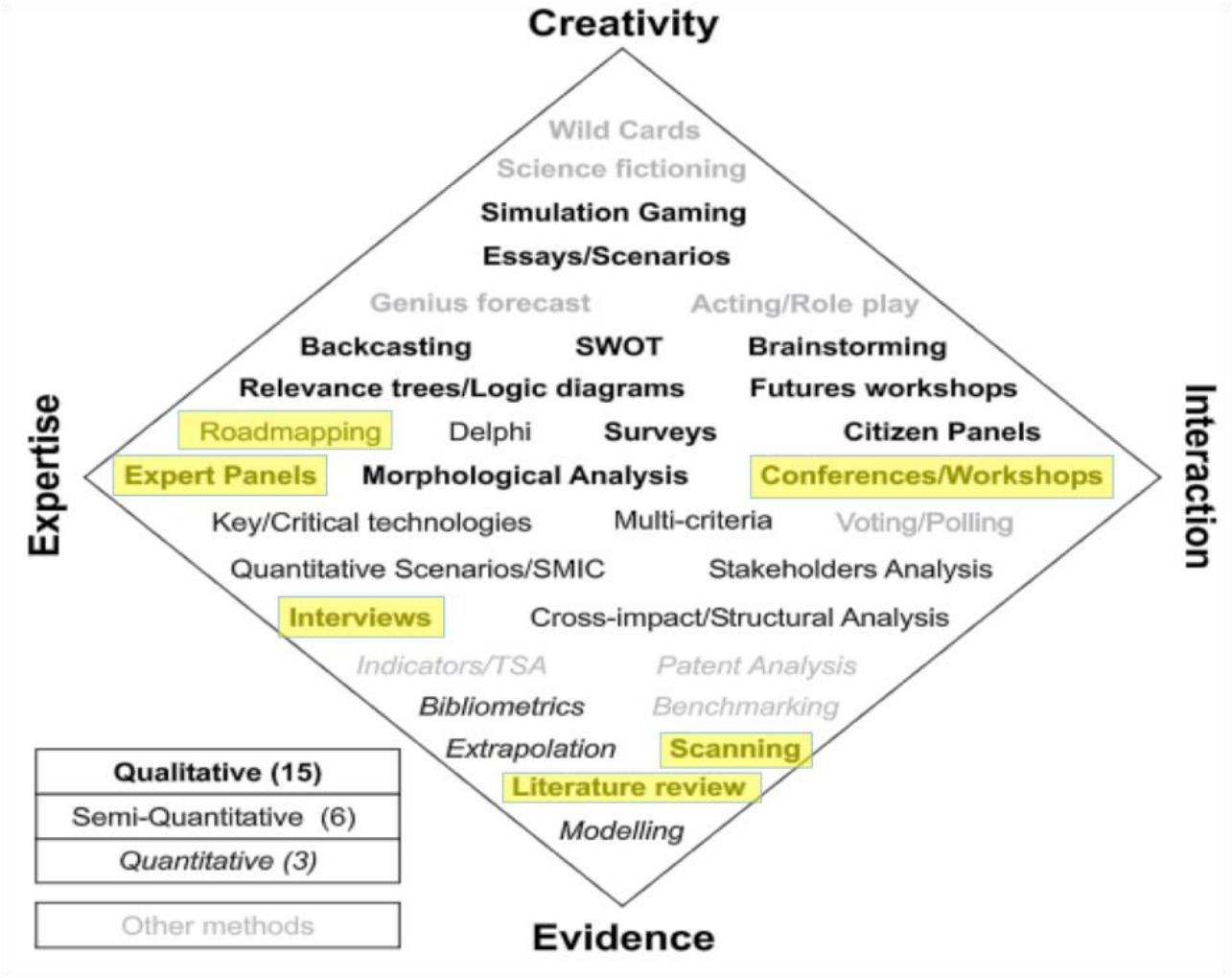

Figure 5. Foresight Methods in PARTHENOS

4. Foresight Methodology for PARTHENOS

4.1. Selection of Foresight Methods

It is important to remember that foresight research is not simply 'future gazing', nor is it about forecasting by experts. Rather, it is a way of facilitating a process of structured thinking and debate about long-term issues and developments, and of broadening participation in this process of thinking and debate, both to create a shared understanding about possible futures and to enable them to be shaped or influenced.

A key aspect of the foresight process is participation. The vision is not that of a small number of experts, but is based on engagement with and involvement of a broad range of key stakeholders, including decision- and policy-makers, but also members of the broader community – 'citizens' in foresight terminology – which in our case scholars at various levels of experience and seniority, potential users of research infrastructures, and practitioner stakeholders such as infrastructure providers, data curators, and archivists.

A foresight study may utilize a range of different information gathering methods in the construction of its knowledge base, although most use approximately 5-6 different methods (Popper, 2008) and the PARTHENOS study conformed to this pattern. These methods are represented by Popper (2008) using the *foresight diamond* (Figure 4), which maps them across two axes, according to whether the method is (a) based on hard evidence or on creativity and imagination, and (b) driven by a small number of 'experts' or the participation of a broader community. The methods that were followed in the PARTHENOS foresight study, as highlighted in Figure 5, mostly fall into the bottom half of the foresight diamond, possibly reflecting our study's relatively short timeframe, which naturally led us to eschew the more speculative approaches; the more 'creative' methods are typically used to look further forward into the future.

Specifically, the PARTHENOS foresight study commenced with an initial *literature review* and landscape *scanning*, to set the context for the study. This was followed by a series of structured, interactive events that combined *expert panels* with *interactive workshops* to obtain input for the study's foresight knowledge base by curating multi-polar discussions among both experts from relevant backgrounds and a broader range of actual or potential

stakeholders in research infrastructures, including (but not restricted to) users/researchers. These events then fed in turn into a series of *interviews* with targeted stakeholders. Engaging a representative range of relevant and informed stakeholders in the dialogue extends the breadth and depth of the knowledge base created by the foresight process, by drawing on distributed knowledge (different stakeholders having access to different information), and thus enriches and improves the decisions that will ultimately be made on the basis of our work.

4.2. Overall Approach to the Study

Within this overall framework, the study followed a thematic approach, structuring its investigations around a two-dimensional matrix of questions that addressed, firstly, the different aspects of the foresight process, and, secondly, the different contexts to which those aspects relate. The rationale for taking this approach was that it allows for the creation of a knowledge base that is sufficiently structured to support systematic analyses, yet sufficiently flexible (and not domain-specific) to allow the interests of participants to be accommodated effectively, making the best use of their time and expertise.

Specifically, in our information gathering activities, and subsequent analysis, we are framing the discussion of 'foresight' by asking the following questions, and identifying:

- current trends – what is happening, and what impact is it having?
- potentialities and opportunities – what may happen?
- requirements – what do we want to happen?
- obstacles, constraints, risks and threats – what might prevent this from happening?
- what activities and interventions (e.g. funding programmes, strategic research, service provision) might serve to 'optimize' outcomes?

This represents the first dimension of the matrix.

These questions may relate to technology (e.g. new tools or methods), to scholarly or professional practice (e.g. emerging research areas, changes in career structures), or to the broader 'environment' (e.g. social, cultural, economic, political, policy), or some combination of the three. This represents the second dimension of the matrix.

The aim of this study is thus not simply to identify trends and to predict future evolution within the sector, but rather to enable the community to inform and influence this evolution by

identifying research and funding strategies and interventions that can be taken forward by the various stakeholders active in the (digital) humanities landscape, including universities, research institutions, funding agencies, and research infrastructure providers.

This process resulted in a structured knowledge base consisting of individual items or issues that utilized the schema in Table 1.

Table 1. Foresight Item Schema

Field	Description	Mandatory?	Repeated?
id	Unique identifier of item.	M	
description	Textual description of item.	M	
type	Type of item. Possible values are: trend; potentiality; requirement; obstacle; other.	M	
Consequences / impact	Consequences for or impact on a stakeholder's work. Possible values are: Findability; Accessibility; Interoperability; Reusability; Funding; Prior Knowledge; Impact and Outreach; Scholarly Publishing; Careers; Team Structure; Bias; Other.	M	repeated
context	technical; environment (e.g. social / cultural / economic, etc.); scholarship.	M	repeated
discipline(s)	This field uses the classification based in the groups of interest represented in the project, as described in D2.1 "Report on User Requirements" (V2.0), p.12. The four main areas are: 1. History/Studies of the Past (in a broad sense: including Medieval Studies, Recent History, Art History, Epigraphy, etc.).	M	repeated

	2. Language-related Studies (including Literature, Linguistics, Philology, Language Technology, etc.). 3. Archaeology, Heritage & Applied Disciplines (including Cultural Heritage, Archives, Libraries, Museums, Preservation / Conservation experts, Digital curation / edition / publishing, etc.). 4. Social Sciences (in a broad sense: Sociology, Political Science, Geography, Anthropology, Cultural Studies etc.).		
tags	Additional tags for classifying item, i.e. other codes that do not fall under the above categories.	O	repeated
provenance	The provenance of this item. This has two parts: 1. A fixed descriptor identifying the type of source, e.g. article, interview, workshop, etc. 2. An identifier that identifies the specific source (e.g. a specific interview or article).	M	
related items	Identifiers of any related items	O	repeated
comments	Additional comments (free text)	O	
quotation	For items derived from interviews (or other forms of direct contact), a quotation from the transcription of the interview.	O	

4.3. Literature Survey

The humanities have not, for the most part, been subject to the type of foresight study typical of the hard sciences or technology studies, although humanists have formed the basis of foresight studies that explore wider social topics such as the futures of European society (Arnaldi, Boscolo, & Stamm, 2010). There has, nonetheless, been increasing interest in recent years in incorporating the arts and humanities into foresight thinking; for example, arts and humanities have been included in the UK Research and Innovation Infrastructure Roadmap, designed to create a long-term roadmap for research and innovation infrastructure (UKRI, 2019).

Much of the most relevant literature relates to specific technologies, trends or environmental factors, or takes the perspective of a single discipline (e.g., *Grand challenges for Archaeology (*Kintigh et al., *2014)).* With such a wide range of factors affecting the digital humanities and cultural sectors, the literature review is necessarily iterative rather than exhaustive, the literature being used where necessary to support and reflect upon the issues emerging from the workshops and interviews rather than attempting to cover all the topics

4.4. Workshops

A series of six workshops was organized during the final twelve months of the project, following the structure defined in Section 4.2 [1], each of them targeting a particular community. Table 2 lists the workshops undertaken, together with the communities and disciplinary areas covered.

Table 2. Foresight Workshops

Event ID	Event	Community/area
WS1	DARIAH Event 2018	Digital Humanities (pan-disciplinary)
WS2	PARTHENOS General Assembly 2018	Pan-disciplinary (e.g. history, linguistics, CH technology providers), with a focus on issues arising from the other PARTHENOS activities.

[1] The Foresight Study team was also involved in additional workshops during the course of the project as part of gathering information on the landscape, although these did not follow this more formal structure.

WS3	CLARIN Conference 2018	Language and linguistic studies
WS4	IPERION-CH Meeting 2018	Cultural heritage preservation and restoration
WS5	Digital Heritage 2018, USA	Cultural heritage (pan-disciplinary)
WS6	ARIADNE Plus kick-off meeting	Archaeology

4.5. Interviews

4.5.1. Selection of Interviewees

Potential interviewees were selected in such a way as to ensure representative coverage in terms of various characteristics, specifically:

- Career stage (early, mid, late);
- Geographical location (e.g. Europe, USA);
- Infrastructure experience (yes/no);
- Role (Researcher, Academic, Librarian/archivist/curator, Technical/development, Manager, Funder, Policy maker, Other);
- Discipline (All studies of the past, All language related studies, All Archaeology, Heritage and Applied Disciplines, Archaeology, Cultural heritage, Archives, Libraries, Museums, Preservation / Conservation, Digital curation / edition / publishing, All Social Sciences, All Humanities, Digital Humanities, Other).

The ‘Discipline’ categories followed the general PARTHENOS discipline ontology, although in most cases only using the top-level categories. The exception to this was ‘All Archaeology, Heritage and Applied Disciplines’, as this category covered quite different disciplines, so the associated sub-disciplines were also included.

4.5.2. Research Ethics and Research Data Management

Information sheets and consent forms for interviewees were developed in conformity with the requirements of the KCL Research Ethics Committee, which developed GDPR-compliant templates. These were used for the interviews, although when the interviewer was not from KCL, adapted versions that are not organisation-specific (but otherwise identical)

were used. These documents describe what we will do with the data, and capture the agreement of the interviewees; they are included in Appendix A and Appendix B.

Interviewees were given the information sheet and associated consent form prior to the interview, and were required to give explicit consent by signing the consent form. Scans of signed consent forms have been uploaded to the PARTHENOS VRE.

Each interview was audio-recorded, and then transcribed in full to avoid possible bias and selectivity. Both the original audio files and the transcriptions were added to the foresight area[2] in the PARTHENOS VRE. The interviews folder[3] has two sub-folders, one for the audio recordings and one for the transcriptions.

Interviews could be undertaken in any language – the shared codebook (see Section 5) being used to capture information across languages – however, all information entered into the foresight knowledge base was in English. The data, while not in most cases sensitive, was all pseudonymized. Filenames for interview recordings and transcripts contain no personal information (such as names), and are prefixed with an alphanumeric code in the format ITVnnn (i.e. starting at ITV001, ITV002, etc.) that identifies the interview, and the mapping between this code and the interview details is held separately.

4.6. Use of the PARTHENOS Hub

The PARTHENOS Hub (Spiecker et al., 2018) is envisioned as an openly accessible publication and interaction platform for humanities research communities. It experiments with combining the traditional format of publishing in journals with more dynamic, interactive new media, such as blogs, internet forums and social networks. The Hub is structured around a series of thematic 'issues', each addressing a specific topic or area of interest. Each issue has an editor-in-chief, who takes responsibility for selecting and ensuring the scientific quality of the content. The Hub itself offers some necessary resources, both technical - for presentation, or permanent storage for more volatile content through

[2] https://parthenos.d4science.org/group/t3.4_foresightstudy
[3] https://parthenos.d4science.org/group/parthenos-gateway/workspace?itemid=4e5d7ae8-ae58-4de5-9b42-4c93a839be39

collaborating repositories that provide persistent identifiers - and editorial - through the involvement of an advisory board for supervision and review of an issue's content.

Issue 2 of the Hub[4], published in April 2019, is dedicated to the Foresight Study, and serves several functions:

Documentation and broader dissemination of the study's results;

Obtaining feedback on these results from the community;

Sustainability of the foresight study through the capture of additional data.

The detailed information gathered by the study is contained in a query-able form within a structured knowledge base that forms part of the PARTHENOS VRE in D4Science, and the Hub links to static versions of these tables. However, the former is neither user friendly nor open to the broader community, while the latter is a fixed snapshot that fails to capture the dynamic nature of foresight considered as an ongoing process.

Hub Issue 2 is based on the same snapshot of foresight data as this report, and may essentially be regarded as a supplementary, enhanced dissemination channel for the results documented herein. As part of the sustainability of the foresight study, the Hub will allow very broad communities to continue to contribute input to the foresight knowledge base after the end of the PARTHENOS project, via a Google Form that is embedded in the issue[5], as well as more generally commenting on the published data. The foresight team will continue to moderate and process the input thus gathered, and will feed the processed data back into the knowledge base.

While the content of a single issue is fixed, the editorial team will periodically publish updated versions of the foresight issue (which will have different issue numbers and URLs), representing the evolving nature of the knowledge base, and in particular incorporating data captured via the online form (subject to an editorial process). It is expected that an updated issue will be published at the end of the PARTHENOS project extension period. This issue will in addition provide links enabling queries of the current knowledge base.

[4] https://www.parthenos-project.eu/portal/the-hub/issue-2

[5] https://docs.google.com/forms/d/1cQJAr1eXvZ9NRxNdpvyE-et28QwbUOoI2Ly5RkFwJzo/edit

4.7. Altmetrics, Bibliometrics, and Triangulation

As has already been discussed, the foresight process is iterative, cyclical, and part of an ongoing process. It is therefore important to recognize both the impact and limitations of the initial study, so that future foresight studies can best build upon the initial findings.

Bibliometrics, “the application of mathematical and statistical methods to books and other media of communication” (Pritchard, 1969, p.349), has formed the basis of many previous foresight studies (e.g., Stelzer et al., 2015; Moro et al., 2018) and provides a way of contextualizing the initial findings. Traditionally there have been relatively few bibliometric studies in the humanities due to the inadequate coverage of citation databases (Hammafelt, 2016), however, this is changing due to the increased availability of full text resources and emergence of alternative metrics, and there have been a number of bibliometric studies of the digital humanities in recent years (e.g. Moro, Boelman & Joanny, 2017; Wang, 2018). A bibliometric analysis of the initial foresight findings has both the potential to validate the initial findings of the foresight study, and identify whether the labour-intensive approach of interviews and workshops could be supplemented with a more regular bibliometric approach.

It is also important to assess the impact of the published foresight findings and accompanying Hub issues. Initial insights may be achieved through an altmetric impact analysis. The term ’altmetrics’ was coined by Priem et al. (2010) to refer to the use of the structured nature of web 2.0 technologies (most often social media sites) to establish alternative filters and indicators of research impact. Altmetrics not only provide the opportunity to view a wider range of impact insights than are visible in the scholarly citation network, but also measure impact more quickly (Thelwall & Nevill, 2018).

Both the bibliometric and altmetric studies will feed into a second edition of the foresight report.

4.8. Sustainability and Follow-on Work

Finally, it is important to note that foresight does not end at the end of the project. It is conceptualized as an ongoing process, not only in terms of disseminating the shared

understanding developed, but by ongoing monitoring of the changing landscape and consequent evaluation and evolution of that understanding.

Thus, a key outcome of the study will be to create sustainable networks of foresight research, in particular by embedding stakeholders with ‘foresight interests’ within research and education organisations. The Hub Foresight Issue will be used during the extension period to gather additional data, which will be integrated into an updated version of (i) the knowledge base; (ii) the Hub issue; and (iii) this report; all of which will be published at the end of the project.

5. Analysis

The interview transcriptions and workshop notes were analysed qualitatively for insights regarding trends, potentialities, requirements, and obstacles relating to how digital research infrastructures and methods in the humanities and cultural heritage might develop over the next 5-10 years.

Due to the number of interviews and workshops, analysis was carried out using the qualitative data analysis software RQDA[6]. The choice of software was based on its ability to mark-up the data in accordance with the Foresight Item Schema, and also to enable the export of the data so that it can form the basis of the knowledge base in D4Science. RQDA is an R package that stores all the data in an SQLite database that can be accessed both via a graphical user interface and programmatically.

These information items were then catalogued in accordance with the Foresight Item Schema (see Table 1). The codes under each of the main top-level categories are as follows:

Type:
- trend
- potentiality
- requirement
- obstacle

Context:
- technical
  - infrastructure
  - networks
  - tools and services
  - data
  - integration
- environment
  - social
    - Note: For example, the need to form interdisciplinary communities.
  - cultural
  - economic
  - gender-based
  - political
- scholarship
  - methodologies

[6] http://rqda.r-forge.r-project.org/

    - theory
    - research interests
        - Note: any new research areas, options or possibilities can be added as sub-tags under this tag.
    - publication formats
    - data types
    - education
        - Note: For example, the need for establishing Digital Humanities as a distinct discipline in university departments and research institutes should be so tagged.

Discipline:

- Follows the classification from PARTHENOS D2.1 "Report on User Requirements" (V2.0), p.12.

Consequences/impact:

- Findability
- Accessibility
- Interoperability
- Reusability
- Funding
- Prior Knowledge
- Impact and Outreach
- Scholarly Publishing
- Careers
- Team Structure;
- Bias
- Scientific Interpretation
- Other

Tags:

- i.e. any other codes that do not fall under the above categories]

6. Findings

6.1. Introduction

The diverse nature of the contributions to the foresight study (interviews, workshops, literature review), from multiple disciplines, raised a large number of equally diverse issues, with different groups ascribing varying levels of importance to different issues, as well as arriving at often conflicting conclusions.

To try and make sense of these varying opinions, and to draw conclusions about research and innovation policy in the medium to long term, the main issues raised are grouped under the three contexts identified in Section 4.2: technological, environmental, and scholarly. The aim is not to provide a detailed exploration of all the issues relating to each technology, environmental factor, or change in scholarly practice, but to demonstrate some of the issues and insights that were raised in the interviews, workshops, and literature, and the overall complexity of the ecosystem in the digital humanities and cultural heritage sectors.

Although such a framework is necessary when analysing a diverse range of data, it is nonetheless also artificial. Issues do not sit neatly in any one category, but rather spill over into other categories, reflecting the highly integrated nature of the scholarly information ecosystem and the research process. Open access, for example, is enabled both by technology and by changes in attitudes to openness, and also has important consequences for the practices of scholarly publishing.

6.2. Technology

A wide range of digital technologies were identified as having had an impact throughout the research lifecycle of the humanities, from capturing data, through analysis, to publishing and data reuse. There is now a diverse infrastructure of tools and services that has been developed and may be used by humanities researchers and cultural heritage practitioners. Many of these technologies are not unique to the humanities, but rather reflect the broad digital toolkit that is increasingly available to the wider population, and the increasing number of platforms that can be built upon it.

6.2.1. Data

It is widely recognized that we live in a world increasingly awash with data, variously referred to as a data revolution (Kitchen, 2014), a dataquake (Alpaydin, 2016), or a data deluge (Anderson, 2008). This has had a significant impact on the humanities. The spread of digital practices in research is not just the result of technological developments as such, but an aspect of their generalized use in everyday life and work [ITV011].

The digitization of content has become increasingly widespread [ITV003] with improved data capture technologies not only providing higher definition images, but also facilitating the move from 2D to 3D images and photogrammetry in areas such as archaeology [ITV004, ITV021]. Archaeological data analysis has also been revolutionized by the development of geographic information systems and digital mapping applications that can represent coherently and accurately the spatial distribution of findings [ITV008]. This is accompanied by the growing availability of online databases [ITV021], open access data [ITV021], social media data, and the explosion in data traces about mundane, everyday life practices [ITV041]. One digital humanities scholar based in the United States pointed out that such digitization had "transformed" how they were now able to do their work, enabling them to work with very large datasets from Parker On the Web[7] to the whole of the British Museum's database[8] to the Met[9] or Schomburg[10] [ITV033]. In a similar vein, a computational linguist stressed the steady increase of computational power, which enables researchers to store and process big language and literature corpora [ITV039].The increase in social media data is part of a wider trend in 'datafication', where we live in an environment of interconnected smart devices, and our everyday lives and lived environments are being translated into discrete data points [ITV017]. One interviewee underlined the common experience of being integrated into a general digital flow of information, which leads to a situation of constant data processing [ITV011].

Digitization in the cultural heritage sector, and the enormous increase in social media data, bring new possibilities for studying societal and cultural phenomena [ITV024], and changes in the nature of data (e.g., 3D data and models) are forcing researchers to work with data in different ways [ITV004]. Social media data analysis poses a very fruitful challenge for

[7] https://parker.stanford.edu/parker/
[8] https://www.britishmuseum.org/research/collection_online/search.aspx
[9] https://metmuseum.github.io/
[10] https://www.nypl.org/about/locations/schomburg/digital-schomburg

developing adequate quantitative and qualitative methodologies [ITV013], which, in their turn, contribute to the refinement of our analytical tools for the interpretation of social phenomena in the past [ITV012]. Fast digital repositories and collaborative formats open new avenues for exploration, and will spark new ideas [ITV027]. Virtual research environments enable collective work in medium and large-scale projects [ITV013]. The emergence of new and much closer forms of research cooperation, which affect research projects in their entirety and not just their distinct parts, brings forward a new aspect in humanists' work, namely, planning and engineering [ITV011]. At the same time, digital image and sound applications facilitate a fuller and more nuanced documentation, interconnection and interpretation of data, a fact particularly important for social anthropologists and heritage researchers who deal with “live” performances of culture [ITV022].

Once content is digitized a host of tools may be applied to ease the process of discovery and analysis: full text indexing, both of born-digital content and enhancements of digitized content through OCR (Optical Character Recognition) [ITV003, ITV009], image processing, image entropy and object recognition [ITV021, ITV009], and speech and video recognition and indexing [ITV003] with increasingly improved quality and performance for processing speech material [ITV024].

At the same time, it is important to recognize that there are still a lot of limitations. Digital content may lack context, provenance, and selection criteria (Dix et al., 2014). There is still a need for both the digitization of primary sources [ITV020], and for cataloguing data [ITV021]. In this aspect, it is significant that the dramatic increase in the availability of digitized cultural data creates new expectations for more digitization, better findability options, and fewer restrictions in the reusability of the data, a fact pointing to IPR issues [ITV039]. There is also a need for greater interoperability between catalogues [ITV021], with the interlinking of different databases of digitized cultural heritage not only having implications for findability and analysis, but also for more practical impacts, such as fighting the illicit trade of cultural goods [ITV028].

A social anthropologist shared his preoccupations about the data life-cycle in the digital environment and pointed to four main challenges: the continual conversion of analogue data into digital form, the documentation of this immense corpus of digital data, the

interoperability of the documented digital data, and the sustainable preservation of those data for the future, together with eventual data migration into new formats [ITV022].

Researchers need to be trained in good data practice [WS1], and there is a need to recognize the advantages of good data practice. For example, it is widely recognized that open data has many advantages: increasing research impact and visibility, preserving data, ensuring higher quality data, creating new collaborations, and maximising transparency and accountability [WS1]. But there is currently a significant gap between and this ideal and actual data practice [WS1]: there is a lack of consideration given to the preservation of data [ITV035], a fear of data sharing [WS1] as researchers have no knowledge of how data will be reused (Dix et al., 2014) and have difficulty imagining how it might be reused (Mayernik, 2010), and there is a difficulty in convincing people to use standards and tools [WS1]. This contributes to a growing digital divide (see *Section 6.3.2 Digital divide*). This is more pronounced in relation to countries in the European "periphery", where the adoption of digital strategies in the humanities is lacking in funding, iterative feedback, and systematic institutional engagement [ITV008]. There is the potential both to help researchers with their data management plans, instead of each researcher or faculty developing its own protocol, and to move up the data production column by incorporating quality assessments or quality assurance regarding how this data is produced [ITV026].

While there are obstacles to be overcome, and potentialities yet to be realized, as regards data in the humanities, it is also important to recognize that the humanities nonetheless have the potential to be at the leading edge of data practice:

> *"… the humanities, because of their intrinsic diversity and the fact that they cannot avoid going digital, could be at the forefront of the future evolutions in the domain of proper data modelling, open science and the corresponding practices."* *[ITV002]*

Associated with the increase in the amount of data that is available is the ongoing issue of findability in the data catalogue [ITV026]. Search and discovery task are still hard, Google isn't the answer to everything, and not everything is digitized [ITV031]. As one interviewee put it:

> *"There could be a great number of data platforms that become available, but if we don't succeed in keeping the overview on what's happening and how to find it, then*

> *we will get lost in the forest … As universities will now develop and keep their own data, and do their own data archiving, it's essential to have a good overview or a data catalogue."* *[ITV026]*

The heterogeneous nature of much of the data means that there are challenges in integrating much of this disparate data, and there is an increasing trend towards exploring the integration of data obtained by different means [ITV004]. Big data is a problem of scale that is now emerging:

> *". [It's not only big] in amounts, in gigabytes, but also in the complexity of the data. If we want users, researchers, other users, to actually use the data, we have to tackle the complexity that is in some of these data sets, the complexity when you start combining data sets."* *[ITV026]*

In one workshop it was suggested that many technologies are unable to deal with the great variation in Digital Humanities data, so the technologies are not taken up as quickly as in other areas [WS2]. There is a need for more pilot projects for frameworks for working with this type of mixed data [ITV024].

6.2.1.1. Data services

There is an increasing emphasis on the provision of tools and services for researchers. Social data archives have evolved into data service providers, not only providing archiving, but also developing tools and services for researchers [ITV026] and services for developing new software and systems [WS1]. The provision of these services may be seen as an important step in helping to overcome one of the biggest obstacles in the technical realm, the full exploitation by researchers of the digital technologies that are available.

Over the next several years there is going to be a greater expectation among researchers for technologies that can help them manage and make better use of the increasingly large corpora of material available to them [ITV032]. Even if all content were to be open access tomorrow, there would still be competition between vendors for the best discovery tools and the best analysis tools on top of that free content [ITV032].

6.2.1.2. Data preservation

At the same time, the challenge of preserving digital data in the long term [WS1]. is increasingly recognized, although there is still the need for greater awareness [ITV021]:

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> *"… one of the things I think is a bit overlooked at this stage is, how do we preserve all this digital information and digital heritage? … how do we ensure that what's being digitized now will be digitized for a longer period? What technologies and procedures will be put in place to update the digital information and also what kind of backwards technology should be used in order to be able to use this digital information to its full extent?" [ITV035]*

For many cultural institutions, it is important to have a second or a third location to store their collections. It is not obvious that all of them are storing all their files safely [ITV038]; in other situations, there is a need for a digital warehouse of available data bringing disparate data sets together [ITV028]:

> *"I would like to really see … an integrated digital back office for researchers, policymakers and law enforcement. It is not really on the development side … that we are underperforming, it is the political willingness to create European cooperation for dealing with the digitalisation in the realm of cultural heritage." [ITV028]*

6.2.2. Standards

Digital Humanities takes place "in a universe constrained by a set of technical norms that govern the informational and operational behavior of the digital environment." (Flanders, 2012, p. 67). They shape both data representation and research practice.

The development of standards is an important step in the sharing of both data and services, it can enable the virtual integration of previously dispersed archival sources [ITV001], and humanities can increasingly be studied at scale [WS1]. For example, cataloguing systems that are increasingly digitized [ITV001], are part of a move towards open IT systems [ITV001], that make use of cataloguing standards [ITV001], and can be more easily integrated with the new developments in database technologies [ITV001]. However, the development of standards is not in itself enough:

> *"… developing standards is one [step], but implementing and compliance of these standards is another step. If that would be easier or the incentive for organisations to really start using standards and not have deviation from these standards or develop their own dialects."* *[ITV026]*

There is a need for policies regarding standards and requirements from research institutes [WS1]. Interoperability requires standards ranging from the general to the specific; from JSON to domain ontologies [WS5].

As one interviewee suggested, one of the major problems in Europe is that the different developments are not really shared: "the European Research Infrastructure for Cultural Heritage … still has to deliver the sharing of different tools, equipment and digital infrastructure" [ITV028]. There is increasingly a change in how researchers in the humanities address data management issues, "knowing that there could be a sense of using a standard somewhere, sharing some practices or even documenting … That's changed a lot the development of research projects and their sustainability, above all" [ITV002]. At the same time, it is important to recognize that cultural heritage is not required to produce exactly the same results, e.g., archaeologists may not use the same epistemology as other disciplines [WS2].

While it is suggested that open data is increasingly becoming standards compliant when created within the improving infrastructure of libraries and universities [WS1], standards are most often notable for the wide variety that are available. IIIF (International Image Interoperability Framework[11]) is an example of a standard for describing and delivering images that has become widely adopted, and was referenced by a number of different interviewees [ITV027, ITV033, ITV035]; it can be built upon with browser interfaces such as Mirador[12], which means that you can manipulate your data in ways that simply weren't imaginable even five years ago [ITV033]. Such coalescence around a standard, however, may be seen as the exception rather than the norm, especially where there are competing standards with more general applications. IIIF is a standard with a very specific application and recognizable benefits, which provides versatile access to content, at source, and enables providers to see and track who is accessing their content [ITV027].

[11] https://iiif.io
[12] http://projectmirador.org

Conversely, the debate over the competing approaches of TEI (Text Encoding Initiative) and Linked Open Data shows few signs of reaching a resolution. Although one respondent proclaimed the increasing recognition of TEI as a major technical development over the past twenty years, and noted the number of reports dismissing the Linked Open Data approach [ITV002], others continued to extol the virtues of Linked Open Data for exchanging better quality data [ITV027, ITV034].

Part of the problem is that the same standard may be highly appropriate, or inappropriate, depending on the user community. On the one hand, the impact of the standardisation of metadata and the ability to put it together under Linked Open Data or the Europeana Data Model may be hailed by someone in a cultural heritage institute [ITV034], while the same Europeana Data Model may be dismissed as not good enough for researchers or for law enforcement [ITV028].

Standards can be an emotive issue, and in some situations it may be better instead to focus on best practice. For example, it was suggested that ERIHS (European Research Infrastructure for Heritage Science) could colonize best practices, which would become *de facto* standards: propose a practice, obtain feedback and approval, and the result is a *de facto* standard and recommended practice [WS4].

6.2.3. Social Media, Crowdsourcing and Cloud computing

Social media sites and services have attracted hundreds of millions of users, and are of increasing interest to researchers and practitioners in the digital humanities, as the services' ease of use offers the opportunity for "information sharing, collaboration, participation and community engagement" (Ross, 2012, p.23), as well as providing potential sources of research data.

Social media is seen as providing cultural heritage institutes with the opportunity to "… break down its walls. To give access to more than what's in display in the galleries" [ITV035]. Although there are many notable examples of cultural heritage institutions adopting social media, its adoption is by no means universal among museums (Suzić, Karlíček, & Stříteský, 2016). Social media also offers the possibility of gaining insights from the community that are not being realized, for example, it was suggested that the Twitter hashtag #DigitalHumanities

might provide useful source of research for future trend analysis, but this potential was not recognized and the tweets not kept [WS2].

Crowdsourcing platforms take the potential for engagement a step further, recruiting online publics to undertake a variety of activities as part of organized projects or initiatives. In many cases, these projects involve the enhancement or creation of digital information resources, for example within GLAM collections, and may also make use of participants' specific knowledge or interests (Hedges & Dunn, 2017, p. 1). Participation in crowdsourcing projects can also develop beyond the simple fulfilment of tasks, leading to the development of various forms of online communities, and to contributors taking a more proactive role in the creation of outputs (Hedges & Dunn, 2017, pp. 147-151).

Institutions can also put their data into a service like Wikidata, taking advantage of the multilingual functionality and the ontologies that are incorporated into it (due to its association with Wikipedia), while nonetheless continuing to own their own data [ITV034]. Crowdsourcing enables experiments on a larger scale [ITV003]. More data enrichment is often needed in the digital humanities [WS1], and annotation technology allows virtually everyone to create data about cultural assets, creating a lot of opportunity for getting richer data [ITV027]. There is some distrust in crowdsourcing due to worries about quality of results, for example, non-experts 'correcting' archaic spellings in historical documents (Dix et al., 2014).

Once you have created this data to train the systems, a lot of work can become automated [ITV003]. Humans are still good at certain things AI can't do, and crowdsourcing provides a way of gathering information in a democratized way [ITV031], as citizen science shifts the hierarchies of knowledge creation [WS2]. In the words of one historian, "The changes introduced by crowdsourcing are, first, the scale of data, and secondly, the possibility for the wider public to appropriate again the past" [ITV012].

These tools are part of a wider move towards cloud computing, where "computing power, data storage, and services are outsourced to third parties and made available as commodities to enterprises and customers" (Rimal & Lumb, 2017). Although use of the cloud has been a relatively recent development, it has spread quickly, even, as one professor of archaeology pointed out, in fields where researchers are not completely technologically aware:

> *"…in a project I coordinated a few years ago...we proposed to share in a cloud environment some intermediate results produced by researchers. We discovered, much to our surprise, that about one third of the research community used this kind of approach… the present stage goes beyond 50%."* *[ITV007]*

Video conferencing technologies, which build on cloud computing, also facilitate collaboration across the world, teams don't have to be in one place [ITV033].

The EOSC (European Open Science Cloud) is seen to be a fundamental enabler of open science and the digital transformation of science [WS2], even making it easier to explain what open access means [WS6]. It was also suggested, however, that movements with such broad scopes (both thematically and geographically) will lose connection with some parts of the community [WS2]. In particular, small areas like the Social Sciences and Humanities and Cultural Heritage could get lost [WS3]. The shift away from the desktop to services in the cloud is now widespread, with another interviewee highlighting the move from desktop-based geographic information systems to systems where you share or stream files [ITV020].

6.2.4. Augmented Reality, Virtual Reality and Mobile Technology

The ubiquitous nature of mobile technology also provides opportunities for new ways of engaging with cultural heritage, whether through mobile apps, augmented reality (AR) or virtual reality (VR). AR adds "contextual, digital information to one's natural environment, thus augmenting one's experience of it" (Harley et al., *in press*), whereas VR replaces one's natural environment. The potential is evident, among other things, in language studies: learning (or even analysing) a language develops quickly when integrated into a process that employs digital immersion and augmented reality environments [ITV039].

The increasing availability of relatively low-cost AR and VR technologies provides new ways of exploring data that can be implemented with widely available technologies such as an Apple Tablet or Google Cardboard [ITV021],

This is part of a wider shift towards increasing portable tools and services. Increasingly portable technologies enable devices to be taken into the field in disciplines such as

archaeology, rather than necessitating objects being taken to the lab [ITV004]; it enables less invasive techniques [ITV004] and technological investigations without destroying material [ITV028]. The falling costs of some tools can have negative effects, however; for example, it was suggested that there was a need for new frameworks and laws to control the use of metal detectors, and a raising of cultural heritage awareness so that people do not misuse the detectors [WP6].

It is important to recognize, however, not only the need to develop innovative services, but to ensure they align with users' needs and habits. One museum-based interviewee highlighted the development of a mobile app for tourists to explore the local area:

> *"They didn't use it not because it was designed in a really bad way, because it wasn't, but because they don't have such habits. At some point we started revising, 'What are the habits of people, and what are their needs?'" [ITV038]*

On the other hand, it has been suggested by some interviewees that, with "digital native" generations coming of age [ITV042], digital and analogue experiences and methods will quickly blend into a new condition, which we cannot easily describe *a priori*, since the pace of technological innovation is quicker than our capacity to deal with it in depth. In this process, computational modelling of human intelligence and cognition, and brain-computer interfacing, are going to be crucial [ITV039].

6.2.5. Tool and software development

Equally important as the growth in data, data standards and new platforms, is the growth in digital tools and software that are now available. There are a lot of digital humanities initiatives, and support by technology must be top-notch [WS2].

The growth in the availability of open source software has been particularly notable, although there are still areas where additional development is required. For example, more open source platforms were seen as a requirement for the museum sector [ITV038], and the current AAI (Authentication and Authorisation Infrastructure) tools on the market are expensive [ITV026].

Open source itself was considered to have both advantages and disadvantages [ITV038], and there was seen to be a need for a balance between open access culture and proprietary systems [ITV035]. Not all projects have the resources for coordinating and maintaining an open source community (Villa, 2015). GitHub, for example, the principle platform for open source software development, was seen as a burial ground, where software and data is dumped with no continuing service or maintenance [WS6]. It was suggested that some people won't use GitHub as there is too much on it, making it hard to find what one wants, and because it is owned by Microsoft [WS4]; they proposed instead that it would be good to have a shared software repository for Cultural Heritage [WS4], or other specialist versions, for example, a specialist version of GitHub host geo services, user-friendly services which can enable better interaction with the data [ITV020]. GitHub may also be seen as important part of the increased move away from using pre-packaged tools, and towards digital humanists themselves coding, which obviously changes the required research competence profile [ITV041].

Tools are also an important part of the understanding of cultural data at scale. The EHRI (European Holocaust Research Infrastructure) project was raised as an example of this; EHRI is exploring the use of graph databases to understand how cultural data is networked and how you can represent historical events, people in the past, and other entities [ITV018]. There now exists data at such a scale that it is necessary to work either with cloud computing, which may be impossible because of GDPR issues, or with a High Performance Computer cluster, which requires knowledge of database architecture [ITV041].

Whether open source or proprietary, a sustainable infrastructure is necessary if software is to be reusable [WS1] and to be built upon. Neatline[13] was given as a good example of a tool for displaying spatial and temporal data, which allowed researchers to present their research in a different way from the traditional article [ITV025]; it also provides an example of a tool that is built upon the open source Omeka framework[14]. Too often there is a desire to not reinvent the wheel, but then do it anyway [WS4].

[13] https://neatline.org/
[14] https://omeka.org/

6.2.6. Artificial intelligence, machine learning, and other computational tools

Undoubtedly, the biggest perceived impact in tools and software has been the development of tools for various types of computational analysis, from natural language processing and data mining [ITV021] to artificial intelligence and machine learning.

Artificial intelligence and machine learning were widely mentioned in interviews, workshops, and the literature, and the increasingly large quantities of data available were recognized as an ideal candidate for applying the widely spoken about computational technologies. Some were keen to emphasize, however, that while it may have become a buzz phrase, computational methods in the digital humanities are well established:

> *"Everyone seems to be doing AI now … It's not, for me, an exciting new thing that's just about to happen."* *[ITV031]*

Nonetheless, AI was often raised as a general concept rather than with reference to specific technologies or methodologies (although neural networks were mentioned on a couple of occasions [ITV003, ITV033]), suggesting that not everyone who mentioned its potential had a full understanding of its possible limitations and biases.

Computational methods are now facilitated by the text, data and machine learning libraries that have built up over the last ten years [ITV002], enabling working with data at a greater scale and with new forms of data. These methods are becoming more prevalent in the cultural heritage sector; for example, whereas music analysis once focused on music manuscripts, it is now possible analyse recordings of live performances [ITV031].

The tools available provide the potential for increased automation [ITV031]; for example, there is a need to automate the assignment of metadata to a data set, so that machines can extract the information needed to describe the data set [ITV026]. The data group at the Smithsonian was raised as an example, where they are looking for ways of better classifying biological samples and historical images, and are trying to adapt facial recognition techniques to identify people in civil war photography [ITV018]. Other specific suggestions as to how artificial intelligence and machine learning can be applied in the future range from

the identification of falsified or looted objects [ITV028], to finessing colour recognition tools, using medieval manuscripts as a basis because the nuances of colour they contain [ITV033].

It was felt, however, that there is not much commercialized artificial intelligence for discovery and analysis deployment that is truly serviceable at this point [ITV032], and that in particular there is a need for better algorithms for minority languages such as Danish [ITV040]. At the moment many of the technologies are still in an experimental stage, although there is an expectation that many of them will be rolled out in more day-to-day work [ITV021], an expectation that can be shared across a wide range of technologies as access to tools, services, and expertise become more fluid [WS1]. Research software increasingly facilitates modern research, access to and use of data [WS1], and artificial intelligence and data mining can be applied to all kinds of data: images, videos, text, metadata, and usage data [ITV 027]. The use of computational modelling and simulation is also seen as being on the on the rise, with more expected with augmented reality and virtual reality [ITV031].

It is also essential, however, that there is a greater understanding of the potential for bias that is potentially inherent in many of these algorithms [ITV032]. Humanists need to know how the black box works, and to be clear about the underlying assumptions and the limitations of the tools [WS2]. Mathematics may be a common language, but it is unclear whether humanists are willing to delve more deeply into it [WS2]. Researchers often lack an explanation of how the algorithms behave [ITV003]. In some cases, this obstacle may be overcome through the gaining of additional skills; in others, this may be a feature of the technology itself:

> *"We have to be aware of the dangers [of AI]. The more the infrastructure is doing the scholarship for us, the more it's applying its own lens, do we really know what we're doing anymore?" [ITV031]*

Another issue is the ethical problems posed by algorithmisation:

> *"Stylometry can even trace whether there is a potential for Alzheimer's disease. Can we use and disseminate this knowledge? [...] Can we give information about a person to an eventual employer? Can we use information about a person's psychological profile or sexual identity?" [ITV039]*

Overcoming, or at least understanding, these limitations and biases necessitates a wide range of researchers to be involved in the development and application of the technologies. This requires both that AI resources and software are easier to use [ITV027] (see *6.2.7 Usability* below) and that there are stronger connections between the developers and users of algorithms, so that researchers in the humanities can explain what needs to be done with their data and algorithms are better selected [ITV003] (*see 6.3.1 Collaboration and Openness* below).

6.2.7. Usability

The biggest obstacle in the technological realm is not the lack of a particular technology, or the need for some cutting edge development, but the digital divide. There are many factors contributing to the digital divide, including social, political and economic factors (see *6.3.2 Digital Divide* below), but it is also important to recognize that some of the causes of the divide are intrinsic to the technology itself and in particular to its usability. As has been noted previously: "[Digital] Tools have generally neglected the typical humanities user in their design and documentation" (Gibbs & Owens, 2012).

The need for technology to move beyond the technologically-minded was raised by many interviewees:

> *"The digital should not be the end purpose. The end purpose in any Humanities research, again, is interpretation. Digital tools are called tools for a reason, they are the means to get there" [ITV008]*
>
> *"Technical support is required" [WS1]*
>
> *"We also need to use the World Wide Web … in making tools more and easier available to all researchers." [ITV025]*
>
> *"[Coming] from a generation that have learned to carry out their work very efficiently without digital tools, [I am not ready to embrace uncritically all those] very, very state-of-the-art environments, [unless I am] convinced that there is something really concrete to gain out of them. [In contrast to] semantic linking tools that require endless nights to put your data in before they start working, [digital tools have to be simple*

and easy to use. They have to] facilitate, enable, simplify, [or create] a particular research interest in that effort and training." *[ITV008]*

"… there will be more technical developments … with data management, sharing, discovery, use, and reuse … [making] things more accessible and useable for people, for scientists that are not expert in data science." *[ITV004]*

"We need to have stronger service units … so that they can actually enhance and stabilize services for a wide community, and not just the DH geeks, who represent just a small proportion of those who will have to deal with digital methods in the future." *[ITV002]*

"We have used specialists in the field of data management to actually come up and develop very specific tools that often still need some kind of tailor-made approach to develop these archives." *[ITV025]*

"Non-profit bodies like OpenStreetMap should be focusing more effort on providing services for people who are not necessarily developers, to critique and use that data more intelligently." *[ITV020]*

"User friendliness includes a lot of themes, it includes smooth interfaces. It's coming with tutorials for the use of certain technologies. Also, better understanding of how machine learning results can be put to use in a given scenario of use." *[ITV024]*

"[The] material is open access … but the majority of users, don't have the skillset to interpret the material or to begin to interpret the material in efficient ways." *[ITV033]*

Even for the more technically minded, there are advantages from the development of more seamless software. For example, one interviewee recognized the need for the development of a more flexible text and data mining environment, so that introducing data mining components in an application is just "plugging in what you have" [ITV002]. There are challenges, however, in scaling some of the services that researchers require:

> *"… it's very hard to scale text and data mining services to a potentially infinite list of idiosyncratic needs from as many researchers as there might be ... This is not so much a technology question, but a legal question, with content aggregation and helping researchers be able to aggregate content from multiple sources into a secure computing environment. Secure computing environments are really important for us, especially in the US, given we feel we've got a very clear claim in fair use under our copyright act to support text and datamining without reference to licences."* *[ITV032]*

Although there are some economic and social solutions to overcoming the digital divide, such as mixed groups to overcome the skills gap [ITV038] and a need to recalibrate teaching around the new tools and services [ITV020], technological solutions are also necessary, focusing on accessibility and user interfaces.

6.2.8. Research Infrastructures

Research Infrastructures are "facilities that provide resources and services for research communities to conduct research and foster innovation" (European Commission, 2019), and the lack of the necessary research infrastructure was raised multiple times as an obstacle for the humanities, with infrastructures for the humanities considered to be very modest compared to hard sciences, both from a financial point of view and also from the point of view of political willingness [ITV028].

At the most general level there is a perceived lack of infrastructure [WS1], with the digital divide meaning that some institutions have more limited access to research infrastructures than others [ITV025]. There was a wide range of views on both the form and purpose of the required infrastructure, but one of the key trends in recent years is that infrastructures are increasingly seen as necessary:

> *"[It used] to be if you go to a meeting about digital humanities infrastructure someone puts up a slide saying, 'Do we need an infrastructure?' That's … not a good starting position to seize an opportunity of new investment in the area. However … I am seeing people thinking much bigger about this."* *[ITV031]*

There is a need for both national and international infrastructures [WS1]. One UK-based researcher suggested that there could be national investment in a national facility to support

the digital humanities, similar to the Turing Institute for data science and artificial intelligence, the Crick Institute for biomedicine, or the Faraday Institute for science and religion [ITV031]. At a European level it was suggested that:

> *" [Europe] should really aim at having European reference activities and centres. The Getty Institute comes to mind to all researchers … In Europe, you don't have such a specific European centre…through the European infrastructures, we should aim at the same excellence and reference in cultural heritage conservation."* *[ITV028]*

Alternatively, it was suggested the European Union should support the creation of European chairs for the study of cultural heritage in the new European universities as a relatively cheap solution to creation of better infrastructures [ITV028].

It was recognized that there had been an improvement in European research infrastructures, with more research infrastructures receiving funding and the growth of the ESFRI (European Strategy Forum on Research Infrastructures) Roadmap [WS2]. In particular, the European Research Infrastructure for Heritage Science (E-RIHS) was recognized as a key element for the development of this sector in the future and for doing good science [ITV004]. However, many of the projects are still in the early stages:

> *"…many of them are in a preparation phase, so … it is important to maintain funding and to see how those infrastructures really become part of the European institutional landscape."* *[ITV028]*

The UK is also scoping a roadmap for research infrastructures, including Cultural Heritage, Heritage Science, and Social Science, which is very digitally focussed (UKRI, 2019). Hard scientists used to have the voice but others now have some voice too [WS4]. It was also suggested, however, that infrastructures sometimes took the form of digital colonization, with infrastructures only in privileged places rather than across the community [WS2].

At a local level there is a need for existing institutions, such as libraries, archives, museums and galleries to be recognized as infrastructure [ITV031], but at the same time some of them need to re-evaluate their role:

> *"If there are going to be services that are of true value to scholars, libraries have to stop trying to own all of the infrastructure at the local level."* *[ITV032]*

> *"… we continue to need more compelling storytelling about what libraries do in the contemporary era … If we're going to continue to make a difference in higher education and in the research sector, we've got to continue to make a difference in the public sector as well. I feel like this ability to tell the story of what a library is and does is undervalued in my community and is still not one that we're very good at doing."* *[ITV032]*

It was suggested that, as libraries are losing their main traditional function, they could take over the preservation of data, but not of data services and tools [WS3].

It is also important to consider the nature of the infrastructures that are required, the influence of existing platforms such as Amazon, AirBnB and the European Open Science Cloud [ITV026], as well as alternative infrastructure models, whether these are federated structures, with an emphasis on coordination [ITV026], or infrastructures that facilitate non-consumptive research, where you can run analyses over datasets where they are being hosted [ITV031]. New regimes of access that follow cultural protocols also need to emerge [WS1].

There are now an increasing number of platforms upon which further services can be built: geo web platforms for third-party apps [ITV020], and archive software so that universities can take care of archiving themselves as it is not such a specialist task any more [ITV026]. There are still additional platforms required, however. As already mentioned under 6.2.5 *Tool and software development,* there is the suggestion that more specialized versions of GitHub are required [WS4, ITV020], while one digital humanist highlighted the need for learning platforms around the concept of explainable machine learning, so we can better understand the impact of AI [ITV017].

Importantly, there is a need for a catalogue of the services provided by the e-infrastructures, "because it would not be efficient if content service providers … would need to develop their own tool[s]" [ITV026]. There have been many smaller start-up organisations with similar missions around digital preservation and similar service offerings, but they don't all have

compelling reasons to exist; consequently, there has been more consolidation, or market corrections, in the provision of infrastructure services for the cultural heritage sector [ITV032].

6.3. Environmental

Research does not happen in a bubble but is constrained and influenced by various changing social, socioeconomic, cultural, and political factors in the wider environment.

6.3.1. Collaboration and openness

"Communism" (Merton, 1973) or communalism, the idea that scientific results are the property of the whole scientific community, has long been considered one of the essential principles of science, with the growth of modern science coinciding with the rejection of the idea of secrecy (Bernal, 1939). Openness is a continuum, however, and one of the most often noted changes is the increasingly collaborative and open research environment, for which there has been a "dire need" [ITV025]. Collaborations are increasingly multidisciplinary, international, and reaching out to the wider public: "The modern ways of working are collaborative and distributive" [ITV027]; "it has become natural to be multidisciplinary by construction" [ITV002].

There is wide recognition of the breadth of interdisciplinary collaborations, whether between technical experts and museologists [ITV038], historians and archivists [ITV001], cultural heritage institutions and researchers [ITV027], or researchers working together with other disciplines, especially those areas of science where data publication is accepted practice or indeed the norm [WS1]. One interviewee referred to a state-of-the-art research project that combined language studies, psychology, musicology, biology and didactics [ITV039]. Collaborations are expected to involve the adaptation of different techniques to the specific needs and requirements of the cultural heritage sector, working together with people from humanities, social sciences, engineers, chemists, physicists, mathematicians [ITV004]. There is increasing use, for example, of the natural sciences in archaeology [WS6], with the sequencing of ancient DNA providing a range of new and surprising insights into human origins and expansions (Kristiansen, 2014).

Most noticeably, however, collaboration is now international:

> *"10 years ago, international cooperation between culture and heritage and institution was very limited or almost non-existent in comparison to now … That is something to last, continuing and profound cooperation will be the future."* *[ITV035]*

> *"I'm working much more in a collaborative European environment than 10-15 years ago. Most of the research projects I'm engaged in are pan-European now."* *[ITV021]*

There are also increased attempts to look beyond academic and cultural heritage institutions for long-term cooperation, targeting different stakeholders such as businesses and the wider public. Businesses are generally not involved very much in research and innovation in the humanities or cultural heritage [ITV028], and there is a lot of potential for really disruptive innovation from reaching out to data professionals outside universities, to government at all levels, and to companies who want to use research data [ITV026].

One historian underlined the need to overcome bias and haughty condescension among academics toward the economic uses of culture and to recognize the impact digital humanities may have on creative industries [ITV012]. As data becomes part of everyday life, so it becomes easier to engage broader groups of society when a researcher needs to run some experiments [ITV003]. Moreover, when the type of data researchers use is so strongly embedded in contemporary socioeconomic and cultural contexts, the potential for obtaining contributions of data, and the visibility of the associated fields of research, is much more favourable [ITV024].

> *"A fruitful intervention should involve the interaction between universities and society, specialists and non-specialists, scientists and artists. [...] Intervention should lead to a creative transgression of boundaries and to the creation of new knowledge. [Given that] technological artefacts (broadly speaking) are not simply products of a specific workshop or factory, but are the outcome of a long process of co-construction, in which users have an active role, [Humanists should study and endorse] the interaction of science, technology and society, and focus on the co-constructive relationship between the three."* *[ITV010].*

There have been calls for the scholars to be bolder in the nature of the public collaborations and what is considered knowledge (Cantor & Levine, 2006).

Holocaust archives and museums provide an example both of how cultural heritage resources can be opened up to the public, and of the importance of opening up certain collections more. Holocaust studies has become more diverse in terms of the people that contribute, not only researchers and archivists, but a much broader section of the general public as well [ITV001]. Archives have become much more open, they have started to undertake much more in terms of outreach to the general public, genealogists, family historians, and local historians [ITV001]. The importance of this wider engagement can be seen in the context of the rise in nationalism and populism (see 6.3.3 *Nationalism, Populism, and Fake News* below):

> *"We have to push the research more into the public … especially when it comes to historical questions, or to developments where we now look back on and say, 'How could this happen?'" [ITV025]*

The increased emphasis on collaboration and cooperation is part of a much wider, and more widely heralded, shift towards openness. This includes the opening up of resources and the exchange of expertise across boundaries, as well as political and social openness [ITV001]. Open science, open access, and open data policies are affecting all sectors of science [ITV004], and open access in the humanities is now a subject of debate [ITV002]. There is a growing social pressure for disclosing results, not only in a publication when they are completed, but also during the work. Researchers increasingly feel accountable for the money they receive for the research they produce [ITV007]. One researcher emphasized that scientific publications on digital infrastructures should not be packaged in expensive books, particularly when the relevant research has been funded by the EU (or other public bodies), but rather

> "should be offered for free to the European citizens and the citizens of the world" *[ITV008]*

Although this push to openness and collaboration is on the increase (see Section *6.4.5 Open access*), it still is not universal. For example, one interviewee felt that the level of European cooperation in cultural heritage was very low because the cultural heritage institutions and

sites were financed as a part of nation building, and there isn't the same readiness to create an institutional framework for European cultural heritage [ITV028].

There is also a need for the political will to allow open access to data, which is regarded as sensitive in some countries [ITV021], and also for an appropriate intellectual property rights framework.

Indeed, IPR is still a major issue; there are a lot of legal obstacles to providing access to data and content in the cultural sector [ITV027], and legal frameworks have not adapted to the present climate and to open access in particular [WP6]. A lot of developments are hampered by IPR legislation, which runs counter to what the humanities and cultural heritage sector wants to achieve [ITV035]. Open access is underpinned by legal issues [WS1], and in the cultural sector there is a problem of shared ownership when sharing resources – one doesn't necessarily own the sources one uses [WS1], and the GDPR creates significant obstacles in many disciplines that make use of observation of human behaviour [WS2]. There needs to be a better understanding of licensing and service use [WS1], and it was suggested that legislators should allow for research exceptions to IPR and GDPR regulations [WS2]. One digital humanist described the consequences of the GDPR as a "nightmarish scenario … towards not doing any qualitative work at all … [because] it's basically become impossible to anonymize datasets" [ITV041].

It is also important to recognize the potential power imbalances when it comes to collaborations and increased openness. While humanities researchers and cultural heritage institutions may be becoming more open, there are wider factors about who is in control of digital culture, with the rise of increasingly powerful technology companies such as Facebook and Google [ITV020]. Social media APIs (Application Programming Interfaces), the means by which developers access social media data programmatically, are also increasingly being shut down. It is getting harder to obtain data from platforms like Facebook and Instagram, which presents a problem when a researcher wants to do critical studies of modern media and politics [ITV040]. There is a need to come to an arrangement with social media companies so that it is still possible to undertake independent data research on questions that are important for democracy [ITV040]. Facebook's suggestion that they will primarily work with American researchers is considered deeply problematic for European digital humanities, as Facebook is not just an American company, but also has influence on

European elections and European public debate [ITV040]. There may be more debates about whether researchers should be better at scraping these platforms, taking the data without getting permission from the social media platform [ITV040].

At the same time, there is also a need to take cultural sensitivities into consideration for individuals and communities. For example, one participant at a workshop related how an Inuit community was upset when a picture of a sacred Inuit costume design in a learned publication was subsequently used by a fashion designer [WS1].

The increasingly collaborative nature of the humanities, bringing together such a wide variety of different actors, also has as a downside the risk that the community can become increasingly fragmented:

> *"The stakeholder community for humanities in general, for digital humanities and also for cultural heritage is really fragmented … [Scholars] come from different backgrounds… there are digital experts, engineers, architects, conservation specialists, historians, archaeologists, and so on and so forth. They are not only fragmented along national lines, but also disciplinary lines, so I think one of the big improvements would be if they could [come] together and voice their concerns in a more unified way towards policymakers."* *[ITV028]*

6.3.2. Digital divide

One of the greatest obstacles facing the adoption of digital research methods in the humanities and cultural heritage sector is the digital divide. This is a divide in skills and access rights (Zelenkauskaite & Bucy, 2016) as well as in availability of technology. As may be expected across such a diverse discipline, the impact of technologies differs considerably by both sub-discipline and country. To a great extent, what is required is not new technological developments but rather the ability to exploit existing technologies, for which both resources and knowledge transfer are necessary [ITV001].

This divide takes many forms, most noticeably in the form of the digital divide between well-resourced, digitally-mature institutions and the ones that are left behind. This can have a greater impact in some research areas more than others, for example, in the area of Holocaust research:

> *"…because often the most important sources, and especially the sources that have traditionally not been used extensively in Holocaust research are located in marginal regions, in marginal institutions."* *[ITV001]*

Although the digital divide is most noticeable between developed and developing countries, there can nonetheless be a cultural divide between developed countries [ITV035]; for example, in the UK there has been a lot of investment in data standards, ontologies and thesauri, but this is less well developed in some other European countries [ITV021]. There are also differences in terms of skill levels between disciplines, and even between individuals doing the same job: "digital savvy curator and the not-so-savvy curator" [ITV035]; not everyone is necessarily enticed by using digital methods [WS2]. While it is expected that the next generation will adopt digital tools, it is not happening yet [WS2] (see *6.4.3 Education* below). European countries hit harder by the recent financial crisis have lost a step in the development of digital infrastructures for the humanities, which has accentuated existing gaps between them and the countries of the European core [ITV009, ITV013].

The digital divide also takes the form of a participation divide in many online services that make use of user-contributed data. For example, people are increasingly dependent on smart devices in urban environments and that is changing in the way that they interact with geodata more generally, but services such as OpenStreetMap tend to reflect the concerns and interests of those demographic groups most strongly represented among the active contributors [ITV020]. In the case of OpenStreetMap this is overwhelmingly males in wealthy educated areas (Bright, De Sabbata, & Lee, 2018; Stephens, 2013), with Schmidt, Klettner and Steinmann (2013) finding that 96.2% of active contributors were male. These sorts of disparities in the data that is available have important implications when the research questions that are being asked reflect the data that is available, and questions are set aside because there is no access to the data [ITV003].

The digital divide also raises a fault line within the humanities themselves, namely the division between the *digital* humanities and the *non-digital* humanities [WS1]; humanists who do not use digital tools are increasingly disconnected. On the one side, some traditional researchers won't use statistics [WS1], one interviewee suggesting that there is an "ideological barrier" [WS2]. There is scepticism about doing source analysis and source interpretation

digitally [ITV001], technology is perceived as a threat [WS2], there is a fear of black box technology [WS1], and even a dislike of the word "data" because there are perceived to be better or more nuanced words [WS1]. One linguist expressed frustration regarding the tendency to theorize against Digital Humanities before actually having concrete research results to evaluate and on which to ground eventual objections [ITV009]. On the other side, there is a feeling that the digital humanities are too proud of themselves, too smug [WS1], and sometimes lacking in theoretical depth and analytical goals. One historian said:

> *"There is a trend to come back to data processing with a taxonomic logic. It is, let us say, a new kind of empiricism. The difference is now that the digital tools and the way we work with them make you think that this the beginning and the end of research. [...]. Sometimes we plan and do things just because we can, without asking ourselves what we do and whether we actually need it. And sometimes we spend more time in order to feed the infrastructure with data and we do not have time for interpretation". [ITV011]*

Although collaboration and openness are one of the most significant trends in the humanities, there is still a lack of communication between developers, researchers, scholars, projects, data centres, libraries, and archives [WS1], with a need for more centres and meeting points for researchers and technologists [WS1].

6.3.3. Nationalism, Populism and Fake News

As well as the technological divide, it was also felt that society is increasingly divided politically, with the rise of populism (Moffitt, 2016), nationalism (Duelund, 2016) and fake news (Lazer et al., 2018) adding to an environment of uncertainty.

It emerged from the interviews that these environmental factors not only have a knock-on effect on individual institutions, but can also undermine trends in collaborative efforts and even, potentially, the integrity of the EU itself:

> *"That is a great and grave danger to the sort of more positive trend which is toward Europeanisation, towards integration, towards exchange" [ITV001].*

The rise in nationalism was particularly seen as having a significant impact, unsurprisingly, on areas such as Holocaust studies, where the need for political non-interference is required [ITV001]:

> *"… very narrow nationalism in a variety of European countries … xenophobia … anti-semitism, and at times very overtly anti-semitic sentiments."* *[ITV001]*

> *"We have to keep on making the case why we need to study the Holocaust, and … the relevance of the event in contemporary societies."* *[ITV001]*

> *"History sometimes runs the risk of losing its relevance … due to some developments in countries where we're suddenly teaching on and about the Holocaust has become somewhat of a disputed field, gained more relevance, and it's now more visible as a factor, that we have to invest more time, energy and research in."* *[ITV025]*

In areas such as archaeology, findings have sometimes been used to promote political ideology, and it's important that scientists communicate what their results really mean, and educate the public [WS6].

The British exit from the European Union (Brexit) is also associated with the resurgence of nationalism, and, especially in UK institutions, creates uncertainty about its impact on the higher education sector [ITV020]. UK universities need to ensure that they have continued access to European research partners, are able to participate in funded research, and are able to access and participate in continent-wide research infrastructures [ITV017]. Brexit was also given as an example of a factor raising interest in digital culture, following reports of attempts to influence it and other elections over the last few years [ITV018].

It is often felt that such nationalism is driven by the rise of fake news, with even traditional media no longer a reliable source of information in some countries [ITV038]. The rise of fake news provides a challenge for those disseminating knowledge, but also an opportunity for museums and other cultural heritage institutions to position themselves as reliable sources of information [ITV038]. As one researcher warned: "If we don't succeed in providing trust in our results, then this discussion of, 'Science is just an opinion,' will continue" [ITV026]. A historian stated that, while fake news is destabilizing notions of documentation and validity

of information, interdisciplinarity and digital presentation of research has made scientific interpretations accessible to a large public, a development on which research communities should build [ITV013]. At the same time, one specialist in cultural management focused on a shift toward manipulation through the dissemination of distorted and problematic views of history and culture through social media by powerful economic clusters (such as the evolving Military-Industrial-Media-Entertainment Network in the U.S. (Kaempf, 2018)) that, due to their viral reproduction by the public, renders almost impossible any effective critical reaction [ITV042]. For example, the Pentagon's funding of Hollywood films and commercial games that may rewrite military history and positively influence the portrayal of the armed forces to the public (Kaempf, 2018).

Hate speech is ubiquitous online and can have a knock-on effect on scholarship communication [ITV038]:

> *"Openness by itself can be a good thing or a very bad thing. You see this happening every day on the internet, where everybody pretends to be an expert and there is an overflow of fake news. The risk is that this may happen also in academic practice if the community control on what is published does not find new ways of checking that openness does not negatively impact on quality."* *[ITV007]*

The rise of nationalism, populism and fake news may be seen in part as a failure of the humanities and cultural heritage sector to keep pace with the impact of technology:

> *"About 10 years ago … [there] was the idea that culture was an instrument of understanding each other in Europe … I wonder if that's still the case today."* *[ITV035]*

6.3.4. Diversity

The importance of increasing diversity was also raised by a number of respondents. As one interviewee who had raised the issue of hate speech suggested: a more diverse political scene would improve the scene as people would have to communicate [ITV038].

Many comments focused on the importance of the younger generation superseding the older generation, as this was seen as an opportunity for the embracing of new technologies [ITV007], although it is equally important to recognize what is lost by this generational change:

> *"… less experienced leaders are finding themselves in senior leadership roles now because there are just not as many people available. I think it's important to be aware of how this generational change might affect these institutions these individuals will be leading, how these institutions will work together."* *[ITV 032]*

Interviewees from the US were particularly interested in the increase in diversity in both the workforce and the collections. The diversification in library leadership was recognized in terms of age, ethnicity, and gender [ITV032], although as one digital humanist pointed out, there is still a long way to go before the elitism and snobbery, so prevalent in white privileged scholarship is be knocked off its perch, the Eurocentricity, the maleness and the whiteness of the field has to change [ITV033]. This wasn't purely an American concern, as the fact that cultural heritage sector is a very white, middle class domain was also raised in Europe [ITV034].

Importantly, as one respondent noted, while there has also been an increase in the diversity of collections that are available, many of these are often subscription collections:

> *"… the emergence in the US in particular of social justice interests in the library sector … pointing to gaps in the large corpora that have been made available for studying and computation. There are vendors that have been making a point of creating primary source collections around issues like African American history, African American newspapers and LGBTQ issues. You're not seeing that reflected in lots of openly available materials."* *[ITV032]*

6.3.5. Funding

While the rise in nationalism, populism, and fake news would suggest that the humanities are more important now than ever, funding is generally tighter and the competition is fiercer [WS1], with specific networks and consortia tending to be dominant and to receive the lion's share [ITV011]. Undoubtedly, the most frequently mentioned obstacle influencing the humanities and cultural heritage sector was funding, or rather the lack of it. There are insufficient resources to support the growing requirements for digitization [WS2]. Funding is imperative [ITV021] and there is a need to increase funding for research and innovation in a coordinated manner [ITV028]. It is also felt that there is an uneven distribution of resources

across disciplines [WS1]; where there is a limited pot of money, culture is not considered as important as, for example, medical studies [ITV038]:

> *"The effect of the [financial] crisis that started in 2008 and 2009 is still something we [haven't] overcome. Research in the field of humanities and cultural heritage … is underfinanced. In many countries, the institutional infrastructure behind humanities and cultural heritage … is underfinanced."* *[ITV028]*

> *"More resources in the field for working on data [are needed] … our cultural sector is not very rich in general, and that's not getting better."* *[ITV027]*

> *"There's a bit of fear in my sector right now that public funding is going to end up retrenching even further back and it's going to start damaging our ability to really have a significant role in some of these issues in the cultural heritage sector."* *[ITV032]*

There is a need to gain the attention of funders and policy makers, and to show them that the pushing of 'science' will increase the digital divide in the research world [ITV007]; people should stop dividing knowledge into the arts and sciences [WS2].

Even within the humanities, there can be significant disparities depending on what the money is for. For example, while there is often plenty of funding for open data, in Italy there is little funding for education [WS6], in Ireland they will often fund a project but won't fund people within that project [ITV034], whereas in the UK bioarchaeology is better funded as it can be counted as STEM [WS6].

There is a need to ensure that narratives from the social sciences and the humanities sector are phrased in such a way that people outside the sector can understand the message [ITV024], and to have more discussion about the "fundamental questions" and "inspirational goals" that the DH community has to offer society [ITV003]. Identifying these inspirational goals will require more frameworks for the exchanging of ideas and experience [ITV003] (See *6.3.1 Collaboration and Openness* above).

There are some signs, however, that things are starting to change, at least in some areas:

"… cultural heritage in general and heritage science specifically is more and more widely recognized as a relevant topic, is … [giving] more and more opportunities to develop my work … [and] obtain funding for more projects, for bigger projects, for more ambitious projects, and also to do this in collaboration with European colleagues." *[ITV004]*

"In the past a report would come out from a taskforce or something and it would cover everyone except humanities, we're getting humanities on the table now, which is a really positive step." *[ITV031]*

"There has been a change in the view of cultural heritage. It has changed from being seen as an expense … to more and more seen as an investment." *[ITV004]*

The increase in support from the European Parliament culminated in the European Year of Cultural Heritage in 2018 [ITV028], although there are some who feel there is a need for a further change in political attitude:

"It's not just a place to make money from selling tickets. It's a place for helping- for supporting the understanding by people of their identity, of their identities, let's say, in the modern world." *[ITV007]*

The next big political step would be for the European Union to acknowledge the importance of European cultural heritage and take it into account in financing decisions [ITV028], and for national governments to provide long-term financial guarantees [ITV038]. This is being facilitated in some cases by the emphasis on infrastructure, and the growing distinction between infrastructure funding and research funding [WS1]. The existing European Union investment in research infrastructure, and the emphasis they're putting on funding that, is making a real difference in certain research areas [ITV021], and it is suggested that stable funding should be an official duty of infrastructures [ITV002]. Disruption in funding flows provokes lack of feedback and destabilization of career opportunities, a fact that renders almost useless the knowledge and experience gathered by projects implemented through former funding [ITV0013].There is a need for more cooperation between the national funding agencies in order that there is a joint programme initiative for cultural heritage [ITV028].

There is a need for more long-term planning by governments and international programmes, engaging with professionals in culture and heritage to understand what needs are emerging [ITV035]. There is growing support on a European level for research-oriented programmes, for initiatives like the European Open Science Cloud and the Horizon 2020 programme [ITV027]. Mission-based funding is prioritized, tied to sustainable development goals [WS1], and a broader emphasis on the grand challenge questions, which is leading to an interest in big data solutions [ITV021].

From the perspective of researchers there is an increasing interest in building international projects, and in applying for European funds as a consequence [ITV027]. There needs to be a rethinking of priorities on the part of funding bodies, to encourage interdisciplinary research [ITV020], to support innovation in cultural heritage, to re-empower researchers, and researchers to engage more with cultural heritage [ITV027]. There is also a need to fund research that is done purely for the sake of research, without having to explain in the project proposal what product it will end up in [ITV003]. For example, it was felt to be hard to get funding for benchmarking campaigns, because they are not developing their own algorithm, but rather analysing how others perform [ITV003]. According to one interviewee, projects should be funded and endorsed even when they are outside established networks and trusts; new ideas should be seriously funded and tested, even if they do not promise any immediate practical use [ITV039].

There was also recognition of the need to identify more and alternative funding options [ITV027], including taking a greater interest in technical developments by private companies [ITV004]. There is the opportunity to start doing more consultancy-type research, with new clients persuaded by the large amounts of data that are increasingly available for humanistic analysis [ITV041]. A problem with this, however, is that a government's industrial strategy can end up distorting the funding environment by emphasising a particular subset [ITV021]. Some sectors, such as the library sector, also have a tendency to view the commercial sector of the scholarly communication world with deep suspicion, making them sceptical of anything that looks like revenue generation [ITV032]. This is a problem that can be exacerbated by the speed with which things are changing [ITV032] and the lack of candid analysis of the costs associated with sustaining research collection [ITV032]. A similar suspicion was raised by a computational linguist, who expressed the wish to see the private sector participate seriously in research projects and not just in order to make quick money [ITV039].

Funding bodies and organisations that evaluate proposals should make sure that reviewers are instructed to assess the potential added value of the multidisciplinary elements in proposals [ITV024].

6.3.6. Impact

Increasing attention is being given to the somewhat vague concept of impact, the utilisation of scientific and scholarly knowledge outside the purely academic sphere [ITV024]. There is growing recognition of the socioeconomic impact of culture, for helping to build European identity, for improving citizens' wellbeing, for developing better education, and for creating more jobs [ITV027], and there is a need to develop flexible guidelines for recognizing and rewarding public scholarship and artistic production (Cantor & Lavine, 2006). Political leaders should not consider culture and cultural heritage only as an economic resource, but rather take note that it has a much wider societal importance for European society – while at the national level this is obvious, at the European level it is completely forgotten [ITV028]. Cultural heritage has the potential to be a countervailing trend in the rise of nationalism and populism:

> *"… the added value of culture and cultural heritage for European integration … We have a political pillar. We have an economic pillar. Now, we are talking more and more about the social pillar, but the fourth cultural pillar is needed."* *[ITV028]*

Such a cultural heritage pillar relates back to the need for infrastructures, and that such infrastructures should be highly visible:

> *"We should create a highly visible European project – for example, a network of cultural heritage sites, a reference research centre, more visible research infrastructures and more visible international interventions."* *[ITV028]*

Policies by organizations such as ESFRI, the European Strategy Forum on Research Infrastructures, means there is a growing need to try and identify key performance indicators [ITV024], and there are now tools and methodologies to help the cultural institution measure impact, such as the Europeana Playbook [ITV027].

6.3.7. Environmental Impact

It is increasingly argued that we are now in the Anthropocene age, a term “coined to crystallise the growing realisation that human activities – or, more often, the unintended consequences of human activities – had fundamentally changed the Earth System” (Zalasiewicz et al., 2019). Although the term has not yet been formally accepted, it is nonetheless a growing area of research and discussion in areas such as archaeology (Edgeworth, 2014; Bauer & Ellis, 2018).

Climate change is both a challenge and an opportunity for the humanities. On the one hand it risks impacting cultural heritage sites and resources – for example, one of the challenges caused by the melting permafrost in Spitsbergen, Norway, is the deterioration of a cemetery [WP6] – but at the same time the humanities have the opportunity to show how humanity has coped with climate change in the past.

Politicians are increasingly concerned about the impact of tourism on the preservation of our cultural heritage [ITV004], but it is not just a problem caused by large numbers of people. One participant raised the issue of the increase in TV shows about archaeology that encourage untrained people to play at being archaeologists, people need to be engaged in real archaeological research projects to make them aware of cultural heritage [WS6], for example the Cambridge Community Heritage project, which sought to involve local communities in gathering archaeological data from villages in eastern England (Lewis, 2015). The increasing availability of data online and the ease of access could lead to a greater emphasis on data reuse rather than going out and re-collecting data or destroying sites by excavating them [ITV021].

6.4. Scholarship

6.4.1. New questions

Scholarship in the digital humanities is developing rapidly, driven forward by an increasingly collaborative environment and by the introduction of new technologies. There has been a paradigm change as regards the questions that are available [WP6]. At the same time, there is a wider realisation of the need to understand the kinds of technological mediation that are present in society and of culture [WS017]. Traditionally, the humanities is a sector in which people worked in isolation [ITV007], so the increased collaboration introduces a host of new

ideas and potential opportunities alongside the new tools and technologies. An interviewee stated that the paradigm shift has led to epistemological changes in the direction of problematizing the distinction between “hard” and “soft” science, Science and Humanities [ITV039]. In the context of a specific discipline, e.g. history, an interviewee underlined the positive effect of digitality in handling complex issues, taking into account the broader context, and analysing diverse genres of sources, some of which were only superficially included in historiographical synthesis, as, for instance, cinema [ITV011]. The hope is that all humanists will in the future be *digital* humanists, all using digital cultural heritage if they need it as a source, as well as computational tools [ITV027]. Some digital humanities practices are hugely relevant to other sectors; it’s not just the digital humanities playing catch up, rather it was suggested that other fields are playing catch-up with digital humanities, they just don’t realize it [ITV031].

The rapid development of the digital humanities can be characterized in different ways. For some, it can be seen in the fact that the discipline has moved on from the days of creating XML TEI mark-up of texts for scholars in other departments, to investigating ways of thinking about humanities data that can be applied in the areas of new media, digital asset management, and digital culture [ITV020]. For others, the key trajectory is the shift in focus firstly from platforms to the data produced by those platforms, and subsequently from data to algorithms [ITV017]. As one digital humanist put it “We’re not interested in the digitisation of humanities anymore, we’re interested in the humanities of digitisation” [ITV020].

One historian of science focused on relationship between paradigm transition and theory:

> *“Modernity was based on specific and clear distinctions that were operative, produced wealth, and gave rise to political regimes. With digitality these distinctions began to blur. We cannot use the analytical tools we used until now in order to understand reality, but the new tools have not yet been created. [...] It is somewhat similar to war and revolution. New analytical thought for the interpretation of the new paradigm will need one or two generations to develop.” [ITV010]*

Theoretical frameworks have not always kept pace with the rapid development of the digital humanities. For example, there is a need for more literature on the theory of how digital humanities data is used, which focuses more on the usage than on the data itself [ITV020]. For

example, there are a lot of theories at the moment about how people and user communities are interacting with geographic data, and in particular there has been a lot of theorising on the biases involved with these interactions, particularly in areas such as digital urban studies [ITV020].

For others, however, the speed of development is considered to be too slow:

> *"[There is a need for] speed and urgency … Digital cultural heritage develops rather slow[ly]. If you look at Europeana, for example, how slowly but consistently it developed and matured, but it's too slow. That's partly because a lot of work being done in all these groups and taskforces in Europe are more or less volunteer work … [and also because the European Commission] does not have a real strategy on culture."* *[ITV035]*

Nonetheless, there has been a very steep increase in the thematic coverage of research in the digital humanities in recent years [ITV028], as well as the emergence of opportunities for the consolidation of new disciplines, such as heritage science [ITV004] and spatial digital humanities [ITV001].

It's important, however, to be discerning in the application of digital methods and in the selection of data for analysis. One should be careful not to try to include digital humanities into every research question simply to gain funding [ITV025]; too often, projects are driven by computer science, and end up with a technology looking for a research question [ITV021]. There is some pressure to follow the "trendy" data, and if you want to do something that is not trendy then it's hard to get funding [ITV003].

Developments in new technologies mean that a host of new questions can be asked. For example, musicology has moved on from studying a musical score in a library to analysing music that's been recorded in performance, analysing the reception of the music and finding out a lot more about the audience response [ITV031]. As has already been mentioned (see *6.3.1 Collaboration and Openness*), growing power imbalances between academia and digital industries are leading to restrictions on who is able to ask research questions in some areas. These questions are being divided between industry and universities, and while sometimes they are divided and the results are shared, in other cases they get separated for good [ITV003].

6.4.2. New methods

Digitization of sources, computational tools, and interdisciplinary collaboration mean that a wide range of new methods are now possible, and the practice of digital humanities is "deploying the technical 'state of the art' to humanistic inquiry" (Hughes, Constantopoulos, & Dallas, 2016, p. 152). Where cultural heritage objects are the subject of research, the digitization of cultural heritage, and the consequent use of digital cultural heritage resources and computational tools, have been changing the methodological approach in research [ITV027]; once you have archives digitized you can apply digital methods and tools for analysis on them [ITV001]. With born digital objects too, there has been a shift from social or cultural theory, to a more grounded engagement with those objects [ITV017].

In Holocaust studies, more diverse research methodologies are being used to study the Holocaust, both in terms of digital methodologies, but also in terms of disciplinary perspectives that are brought upon the sources, and the research topics that people pursue [ITV001]. There are both very broad transnational macro perspectives, and very small micro ones, with work being undertaken that is trying to bring them together and integrate them [ITV001]. There has been a trend in studying social and political networks, both of victims and of perpetrators, exploring how the wider social networks of victims had an impact on their chances of survival, or similarly how networks influenced the decisions of perpetrators [ITV001]

Similarly, migration studies can be based on much larger sets of data, whether it relates refugees or to immigrants into America, often now including searchable interviews [ITV025]. It is indicative that the use of digital research methods, a trend that went hand in hand with globalisation, has facilitated the development of world history as a particular field of the discipline of history [ITV013]. The availability of finds data online has enabled archaeologists to take a much broader perspective on landscapes by looking at distributions of finds [ITV021]. In many disciplines, semantic technologies are enabling connections to be made between data that were not evident before, by facilitating the description of the relationships between certain data sets or certain agents [ITV026].

At the same time, new technologies also offer the potential to track real world objects in new ways. For example, the potential to tag tangible cultural heritage with nanomaterials or chemical substances, or just by digital information, possibly secured by new technologies like blockchain, makes it more difficult to traffic cultural artefacts in the black market [ITV028].

Another respondent proposed blockchain as a way of overcoming the problem of keeping the richness of digital material without making it personally identifiable [ITV041].

Some participants suggested that there is a need for a more pervasive embrace of digital methods [ITV031], which would require a lot of strategic planning as well as demonstrations and other forms of engagement in order to show researchers that they can do the work differently from how they used to [ITV035]. There are some people in the humanities who never thought that they would have to deal with digital aspects, and there is a need to make them aware that new tools will help their research to engage with different kinds of digital approaches [ITV025].

An innovative field of research and social engagement, particularly among historians, is the possibility to expand existing knowledge communities through crowdsourcing projects. At the same time, however, an interviewee stressed the importance of adequate curation while opening up to general audiences, since this is a radically different course from merely presenting research results within the community of professional historiography. The digital may offer new paths for scholarship and interaction between scholars and publics, but new paths, in their turn, pose new challenges [ITV012]. In this sense, digitality makes historians reflect again on issues of social responsibility and political relevance. Another interviewee underlined open science as a development specifically pronounced in disciplines as social/cultural anthropology and folk culture studies, because the persons and communities that served as "informants" of culture become actually partners [ITV022].

At the same time, there is a need to be looking proactively at how digital methods are improving the quality of research; digital methods are helping researchers to do old things in new ways, as well as helping them to do (slightly) new things [ITV031]. At the same time, researchers need to keep their critical faculties alert when considering such processes of research [ITV031], there needs to be more critical engagement with the methods [ITV001]:

> *" If we apply many more algorithms on sources, rather than … close reading … [we need] theoretical investigations of what that shift implies of the overall methodology of doing Holocaust history and more investigations on what we can gain methodologically, what we might lose, also how we can integrate old traditional methods of doing historical research with new ones." [ITV001]*

This concern was shared by an art historian and heritage professional, who added that the analysis based on close reading and text hermeneutics runs the risk of becoming marginalised in front of less reflective, more naively positivist approaches [ITV042].

There is also a need for greater awareness of the biases that are introduced into the research process, and the new ethical questions that are emerging. An interviewee, for instance, stressed the need to develop reliable methods for digital research publications in the direction of "enhanced publications" and underlined how crucial it is to elaborate peer-reviewing standards for them, as well as to guarantee that researchers will not have to pay in order to publish, something that would create ethically unacceptable cleavages within academic communities [ITV013]:

> *"… digitisation has changed how scholarship is done today and how historical research is conducted … people use it so much that it's kind of invisible to them. In fact, it has fairly massively changed how scholarly knowledge is even understood … if the material is not accessible online, it's actually not getting used."* *[ITV032]*

> *"Mass digitisation has been driven so heavily by commercial agents … the library sector … has not developed its own coherent strategy for historical reformatting of scholarly collections. There's not a concerted community strategy for funding, not a concerted community strategy for prioritisation."* *[ITV032]*

> *"What is the data that we are using, what are the questions and what are the tasks, how do we formulate them? … Especially when we're talking about social sciences and humanities, we are using lots of personal data. How do we access the data? How do we keep privacy and, at the same time, actually analyse the trends? How do we more carefully explain those trends?"* *[ITV003]*

> *"We have to understand that some of the trends that we might see … are not because a process is really happening… It is because the initial data, that was taken for training or for analysis, had a certain bias at the stage of collection or annotation."* *[ITV003]*

The future of digital humanities is not about technology, but rather about adapting the strengths that already exist to the new opportunities encountered [WS1]. It is important that a discipline does not lose sight of its core mission, but keeps hold of the core scholarly mission that it has set itself [ITV001]. For example, archaeology should not focus just on the employment of methods, but on actually finding out about the past; harnessing technology to meet its goals, rather than just using it for its own sake [ITV021]. Given that examination of primary sources and context-based theorization are always indispensable, digital methods are of great help in managing (and, of course, finding and combining) data, but "no digital tool can do your thinking for you" [ITV013].

6.4.3. Education

As has already been stated, digital humanities is about "deploying the technical 'state of the art' to humanistic inquiry" (Hughes, Constantopoulos, & Dallas, 2016, p. 152), and to achieve this "Aspiring digital humanists need a flexible, inexpensive way to develop key skills, demonstrate their learning and participate in the digital humanities community" (Spiro, 2012, p.332). The current lack of digital humanities educational opportunities was widely recognized:

> *"The curricula of all kinds of culture and heritage studies, the whole idea of digital humanities… needs far more attention in education."* *[ITV035]*

And the need for more lobbying was proposed:

> *"… because when I look at the curriculum at universities… there are very little courses offered."* *[ITV025]*

Good data practice should be introduced from the undergraduate level [ITV003], but even at master's level Digital Methods classes are still lacking [ITV002], a fact that has ramifications at the PhD level: "Most researchers in the universities I still come across are arriving during their PhD in an environment where they are not prepared" [ITV002].

There is a need for more software training and education in digital humanities curricula [WS1]. The pervasiveness of digital culture, and the extent to which it is changing our views around place and so forth, requires technology to be taught more effectively to students so they

think critically about how technology impacts on the sorts of research questions that they and we want to ask in the future [ITV020], although there was some suggestion that younger people have a much better appreciation of how technology is embedded [WS2]. Digital education would enable young researchers to put pressure for the development of technical solutions that fit their needs [ITV008].

It was also suggested that there is a need at university level for programmes that reflect the increasingly collaborative research environment, for example, programmes involving more European perspectives ("You don't really have a European shared master's or PhD programmes for cultural heritage" [ITV028]) and frameworks that support multidisciplinary and collaborative PhDs ("… a space to develop PhD projects which link two areas together more explicitly… the idea of the collaborative PhD or a PhD that relies on collaborative work much more closely embraced" [ITV020]).

There are some signs of change however, with one interviewee suggesting that methodological seminars increasingly include aspects of digital humanities: how to collect large sets of data to use, how to display them, and what new research questions are allowed to be asked in the field if you suddenly have large quantities of data available [ITV025]. Another suggested that humanities students are increasingly engaged in opening the black box of digital technologies and are starting to learn to code and write Python scripts [ITV040].

Changes in approach are also required from the perspective of the curators of information – within archives, libraries and other memory institutions – as well as that of researchers. For example, Marciano et al. (2014) examine from a higher education viewpoint the consequences for Library and Information Science programmes of large-scale digitization, the growth of born-digital content, and the development of new computational methods, specifically in the context of archives, although analogous issues are arising in other forms of memory institution. There is also a recognition within memory institutions themselves of a growing need for enhanced digital expertise (e.g., The National Archives, 2017).

One interviewee emphasized, in this context, the need for practical experimentation to familiarize students with the possibilities of the digital, within "safe environments" that reduces the risk of discouragement:

"I think there are definitely baby steps that involve figuring out how you embed some of these research ideas and developments into training and teaching, not wait until the field is more fully fleshed, but that you … push some of these ideas out and expose students and practitioners. And, I think that will enhance and probably accelerate the development of these spaces and certainly create the next generation of researchers and practitioners that will be more open to change" [ITV018]

"you really need to promote innovative, safe research laboratory type environments, where people who may not have the training yet or the level of comfort can come and be in conversation and engage with colleagues across the aisle." [ITV018]

It was recognized that this digital comfort zone was not shared with all teachers and students in this field, and that support and incentivisation is required at institutional, national and international levels [ITV018].

6.4.4. Career structures

The need for additional opportunities for training in digital methodologies and techniques continues beyond the stage of formal education. Good practices can emerge in many different centres (in both research and practice institutions), and there needs to be greater opportunities to share these practices [ITV031], as well as for greater training opportunities for early career researchers [ITV031].

More discussion is required on how to foster multi-disciplinarity and digital skills [ITV002], and in particular on how to be more multidisciplinary *by construction* [ITV002]. There needs to be a more effective bringing together and knowledge exchange between researchers from the humanities and technical specialists or data specialists, to develop a human level of understanding about advances (in technology or methods) and the possibilities they raise [ITV025]. This could be achieved through long-term projects in which specialists from different fields come together on a regular basis [ITV025], or by exchange programmes [ITV002]. Long-term projects could contribute to the formation of new research communities and to the blending of researchers' personal research interests with the funded projects they are working on. This would enhance mutual feedback [ITV011]. Training programmes also require innovative, safe research laboratory type environments, where people who may not have

the training yet or the level of comfort can come and be in conversation and engage with colleagues "across the aisle" [ITV018].

There is a wider problem of a lack of adequate career structures in the humanities, which would allow people to move more easily from a master's to a PhD to a post-doc to a more permanent position [ITV021]:

> *"There is… a need to give young researchers the possibility of working without having to care necessarily how they will get their salary next month. Researching is a difficult activity and you must have the brain and the heart free from other concerns, as much as possible." [ITV007]*

This possibility would enable "young people with a high motivation to get involved in research because of a genuine drive for understanding and explaining the world" [ITV039].

This issue is linked to that of the need for growth in the sector generally and in the associated research funding in particular [ITV004]. Casualization of academic employment is a short-sighted response to budget cuts (Rogers, 2015), but at the same time little information is provided in PhD programmes about alternative careers beyond academic institutions (Rogers, 2015). The lack of long-term financial security is not only a problem for university researchers, but also for staff in museums where it contributes to the staff turnover and loss of skills [ITV038].

6.4.5. Open access

Open access, "the removal of price and permission barriers to scholarly research" (Eve, 2014, p.1), has been widely touted for the advantages it offers for increasing the impact of research, raising its quality, and speeding the progress of science, among other advantages. Although it has been suggested that open access benefits the humanities and sciences equally, it has been growing faster in the sciences (Suber, 2014), and continues to be an idea on the horizon rather than something that has already been realized.

Open access is considered by some to be the nearest of the horizons [WS1], and as it has been taken up as a theme by policy makers, and lots of money has gone into it, it is expected to be around for a while [ITV024]. It is now part of the normal culture in scientific domains to

speak about open access, open science, and open source software, and this has played a major part in ensuring that groups of researchers involved in projects make their literature available openly [ITV002]. Although our understanding of open access has expanded beyond the traditional narrative form to include open data [WS1] and open source code, there are still many obstacles to be overcome before true open access is achieved; there continues to be a gap between the ideal and actual data practice [WS1], and funding does not always follow new open access regulations/policies, so it is not possible to comply with them [WP6]

Nonetheless, all the movement in favour of open access is definitely challenging traditional publishing models [ITV004]. Open science promises to speed up the distribution of knowledge [ITV026], and people will have the ability to get an overview of all the developments that are happening in a field from both a research and a methodological point of view [ITV025]. New publication models provide the opportunity for sharing negative results as well as positive ones, thus helping to eliminate bias from research fields [WS2]. There is the potential for increased public engagement through greater open access [ITV021], and this may change the perspectives that the public have on, for example, archaeology, making it easier to explain why roadworks need to continue for longer because something was discovered [ITV007], or it may help the public to be aware of cultural heritage without encouraging untrained people to play at being archaeologists, as some television programmes unfortunately do [WP6]. Open access is not without its downsides, however; while it may be easier for experts and non-experts to access information, there is also too much noise [WS6].

The type of openness under discussion has moved far beyond the mere publishing of pre-prints in institutional repositories:

> *"360 degrees' openness in research, with a potential impact on the integrity in research. That means also the possibility to freely access sources and to share sources and results according with the open science principles."* *[ITV027]*

Researchers are also increasingly expected to partake in a far wider range of informal publishing activities; they may have to use Twitter, write a blog, and there may be pressure to have a Facebook profile [WP6].

The impact of these changes in publishing may be compared with the seismic change of researchers going from keeping results secret to publishing them openly [ITV007], and researchers are increasingly trying to accompany publication with access to or an explanation of data or code, giving more details of research practice so that it can be reproducible and accountable [ITV003].

Fundamentally, open access is seen as expensive and time consuming, and there are both cultural [WS1] and legal issues [WS1] that need to be taken into consideration when increasing adoption of open access in the humanities:

> *"[We] are producing data that is… based on objects that have some intellectual property or exploitation property rights already attached to them… So, that probably complicates or is something specific to our field that affects very much this general trend of opening up the data and sharing of data that is happening across all the scientific fields." [ITV004]*

The humanities and cultural sectors need to have an appropriate legal infrastructure [WS1] to support open access in their fields, and there is also a need to educate researchers to use the rights they have now, and not to give their rights away [WS1].

There is a need for a change of mentality among researchers as regards how they manage, analyse and share data; people often think that the data they produce is their sole property [ITV004], and they need to recognize the benefits that come from sharing it. As has already been mentioned, there is also a need for greater education about the benefits of open data, to overcome the fear of data sharing [WS1]. Open access for publications implies access to open data underpinning the research outputs [WS1]. Publishers have been experimenting with linking between the higher-level interpretive text and the underlying supporting data [ITV021], introducing data-enriched publications [WS1]. Researchers need to know that open data increases your research impact and visibility [WS1], helps with the preservation of data [WS1], ensures higher quality data [WS1], creates new collaborations [WS1], and maximizes transparency and accountability [WS1]. There is also a perceived lack of awareness of and necessary budget to support FAIR (Findable, Accessible, Interoperable, Re-Usable) [WS2] data principles, and when FAIR principles are applied there are different approaches [WS2]. It was suggested that FAIR's use should be incentivized [WS2], since if data has been

processed primarily to support goal-specific analysis, then at some point additional work will be needed to fill the gaps to make it more open and interoperable (Dix et al., 2014). Intensive digitization has made interoperability indispensable in the digital management and re-organisation of archival corpora [ITV022]. Others felt there is already a trend in libraries and universities for open access to be increasingly standards-compliant [WS1].

Even where the promise of open access is accepted, there is still a lack of clarity about the form the new publishing environment will take, in terms of both the nature of the publications and the model of publishing:

> *"We are now in an interim situation in which the old model is not working, we see that it is going to change, but we don't really have a good solution, a good new model. So, I would really like to see… a new model for publishing." [ITV004]*

Communication based on publication and the related activities and methods needs to change because they are no longer sustainable [ITV007], and the rise in cross-field collaborations helps researchers to learn from how results are being shared around in other fields [ITV003]. How to publish research results will in future become a more diverse consideration, whether you want to publish it online or in book form, changing the whole face of the output of the humanities [ITV025]. Currently, open access publications don't always fit in with the way that certain communities have established their work and their practices, so it is not always easy to comply with open access policies [ITV003].

There is a trend towards more and more different publication venues, but at the same time it becomes unclear which are more valuable or less valuable [ITV003]. There is also an increasing number of initiatives trying to meet researchers' needs, and so making project results more visible, such as university or national or international repositories, platforms showing publications, such as Academia.edu or ResearchGate, platforms for tracking the impact, like Google Scholar, or initiatives like European Science Cloud [ITV027].

6.4.6. Evaluation

The belief in evaluation, and more specifically in quantitative evaluation, for performance and reward is ubiquitous in the modern world, and is met with increasing exasperation at the failure of the measures taken to meet the objectives (e.g., Sayer, 2015; Muller, 2018).

Nonetheless, there is increased pressure to demonstrate metrics and metrical achievement both in teaching and in research [ITV020], and in particular increased political pressure to demonstrate the value of humanities research [WS2]. This can lead funders and consortia to bring "perverse incentives" in terms of publication [WS1], which have a knock-on effect on other areas of open access such as open data:

> *"One of the barriers is the lack of incentive for data sharing… Researchers are evaluated and rewarded based on… the articles, the publications, not on whether they provide an excellent data set."* *[ITV026]*

Creating a data set requires substantial effort, but if rewards are only gained from publishing the analysis of the data, there is little incentive in developing an open data set (Dix et al., 2014).

Some funding organizations are now asking researchers to make data and outputs public by default (Villa, 2015), but researchers would like to see greater recognition of those factors that are having the greatest contribution to innovation in the humanities:

> *"…the recognition of [collaborative] work… Unfortunately, in the academy, the evaluation and the career,… still is based on old concepts and old ways of doing things."* *[ITV007]*

> *"…full recognition of digital open access works in the academic world. That means that use of digital data and computational tools have in the academia a full, really a true recognition, and it means also that they will affect in a different way researchers' careers."* *[ITV027]*

> *"Software should be recognized as a research output."* *[WS1]*

Ensuring that the value of work is recognized begins with the citation of work, and the need for more data citation, repository citation, and survey citation was raised [WS3]. When researchers use data from a public repository, they rarely cite the repository and are inconsistent in citing their own data (Pasquetto, Randles, & Borgman, 2017). Encouraging a consistent practice in data citation will increase data reuse and sharing (Pasquetto,

Randles, & Borgman, 2017). One way to encourage data citation is by data publishers including a ‘how to cite’ notice (Goodman et al., 2014).

7. The State of the Humanities and Imagined Futures

The foresight study was designed to address how digital research methods in the digital humanities and cultural heritage sector may develop over the next 5-10 years, examining the current state of the art, identifying emerging trends, obstacles, potentialities and requirements. This study has found a dynamic field with a host of opportunities offered by new technologies, but requiring additional skills and infrastructure if full use is to be made of them.

7.1. Trends

The adoption of digital research methods is increasingly widespread in the humanities and cultural sectors, with the development of new data sources, technologies, and expanding collaborations creating a dynamic and innovative environment.

In recent years the development of the digital humanities has been characterized by the explosion in data available for analysis, through digitization of collections, the increase in open data, and the mammoth quantities of born-digital content. There are limitations and issues with each type of data, however:

- **Digitized collections**: There is still a need for further digitization, in particular of collections relating to marginalized groups.
- **Open data**: While there has been growing interest in open data principles and practices, significant concerns have emerged about potential infringement of IPR and the GDPR.
- **Born-digital content**: While there has been a rapid increase in the digital traces that people leave online, with (in principle) great potential for undertaking cultural research, much of these traces are becoming inaccessible to researchers outside the big technology companies as APIs are shut down or restricted. Research using such data also raises significant ethical and legal issues.

The rise in the quantity of data has been accompanied by an equally important development of a wide range of tools for engaging with and analysing these data – in particular tools

associated with natural language processing, machine learning, and artificial intelligence – as well as a trend towards open source software:

- **Natural Language Processing, Machine Learning, and Artificial Intelligence**: The development of software libraries for the computational analysis of digital resources offers the potential for widespread analysis that wouldn't otherwise be possible. However, there is a risk that artificial intelligence may be seen as a vague panacea for all difficulties, without the community fully understanding the potentials, limitations and biases of the tools that are available.
- **Open Source Software**: Open source software not only provides the opportunity for broad adoption of new tools, but also potentially facilitates sustainability beyond a single project, as it enables software to be extended and built upon. There is an importance difference however, between dumping software on GitHub and ensuring it is sustainable in the long term.

The availability of data and tools means that new opportunities have emerged to ask a host of new questions, and indeed digital humanities is now embedded in an increasingly broad range of research projects, leading to a corresponding increase in the number and variety of collaborations:

Interdisciplinary collaboration. Collaborations between the humanities and other fields, and sub-fields within the humanities, are increasingly common and bring new perspectives and ideas to projects and data sets.

Intersectoral collaboration. Universities and research institutes also increasingly work with partners in other sectors of society: cultural heritage institutions, businesses and government. These intersectoral collaborations reflect the growing recognition that research and knowledge creation are to not only of interest to the wider society, but wider society are also drivers of knowledge creation (Gibbons et al., 1994; Etzkowitz & Zhou, 2018).

International collaboration. While programmes such as Horizon 2020 support collaboration across the EU, the situation for international collaboration further afield is more complex. While funding does exist, at both EU and national levels, it is limited and restrictive in terms of who can be involved, and may include unacceptable terms

for non-EU countries, such as necessitating IPR disputes to be settled in European courts (Hudson, 2018).

These trends towards increased data, tools and collaboration are all expected to continue into the near future, albeit with the potential for some restrictions on access to data due to concerns about IPR and the GDPR. However, the opportunities offered by recent technological advances in the humanities have not yet reached their full potential, a situation that has been heavily influenced by environmental obstacles.

7.2. Obstacles

Many obstacles to the application of digital research methods in the humanities and cultural sectors were raised during the interviews and workshops, ranging from the very specific (e.g., laws restricting speech about the Holocaust) to the very general (e.g., the various forms of digital divide). The three most often raised obstacles, however, were: funding, the digital divide, and concerns about IPR and the GDPR.

The lack of sufficient funding for the digital humanities and cultural heritage sectors, especially since the financial crisis of 2008 and the growing emphasis on the funding of STEM subjects, has had significant consequences for the capability of the sector to meet the challenges of the 21st century:

- **Distortion of research interests**: Insufficient funds drives researchers to focus on those areas where funding is available, with an accompanying lack of freedom to explore other areas that they consider important.
- **Loss of people from the sector**: Restricted budgets inevitably lead to a lack of job security, and the loss of team members has ramifications for the sustainability of projects and the loss of vital skills from the sector.

This lack of funding also, inevitably, feeds into one of the other major obstacles facing the digital humanities and cultural sectors, the digital divide. This digital divide can take many forms:

- **International digital divide**: There continues to be significant differences between the research infrastructures available to researchers and research institutes in different countries.
- **Interdisciplinary digital divide**: There are significant differences between the research infrastructures that are available to the digital humanities and cultural heritage sectors, compared with certain STEM disciplines that have been prioritized with funding. This, in turn, has contributed to the digital divide in technical skills.
- **Intradisciplinary digital divide**: There continues to be a significant and ongoing divide within the humanities between those who embrace the potential of digital methodologies and those who don't.

A lack of funding and the digital divide may be considered perennial problems within the humanities and cultural heritage sectors, albeit ones exacerbated since the financial crisis of 2008; however, the rise in concerns about **IPR** and the **GDPR** is a relatively new phenomenon. The GDPR in particular is seen as blocking avenues of research, and preventing the humanities researching some of the most important emerging issues affecting the EU, including fake news, populism, and nationalism.

7.3. Potentialities

The potential of digital research methods in the humanities and cultural heritage sectors is reliant not on the emergence of new technologies or discoveries, but rather on the application of existing technologies. As one participant mentioned in the last workshop, when shown some of the preliminary findings of the foresight study: a lot of the technologies could have been mentioned 10 years ago [WP6]. The future is already "now", in particular with deep learning technologies [WS3], or as William Gibson more famously put it: "The future is already here — it's just not very evenly distributed."

The new digital technologies and primary sources offer a host of new possibilities, but a decade of underfunding has left much of the potential unrealized. It is, therefore, with a certain inevitability that a particular interest was noted in those technologies that potentially offer a technological solution to overcoming the problem of a lack of growth in the humanities, although neither is without its faults:

- **Crowdsourcing**: Crowdsourcing offers the opportunity both to outsource certain tasks to the wider community, thus scaling up certain types of activity, and to engage the public more deeply with humanities research. However, it also raises a range of ethical questions, including issues about unpaid labour (Hedges & Dunn, 2017, pp. 105-125).
- **Artificial Intelligence**: Artificial Intelligence (AI) offers the potential to contribute to a wide range of research in the digital humanities, but it is important that humanities researchers are willing to investigate the black box of these technologies more fully.

Neither crowdsourcing nor AI can be seen as a panacea to the underfunding of the humanities, however. While they may offer the opportunity to increase the scale of projects, in different ways, they nonetheless require expert guidance and a fuller understanding on the part of those researchers employing them.

As well as opportunities for enhancing the research process, new technologies and publication models offer the potential for greater public impact:

- **Augmented Reality, Virtual Reality, and Mobile Applications**: The near-ubiquitous smartphone, and the growing potential of augmented reality and virtual reality technologies, offer numerous opportunities for promoting research and collections in new ways. Not all will be successful, however, and there needs to be room for experimentation and failure, which is increasingly difficult given the importance accorded to impact and metrics in research evaluation.
- **Open Research**: Open research is seen as having potential not only for improving research access and quality, but also for reaching out to the wider public. For this to be achieved, however, there is a need for funding to ensure that open access policies can be followed.

From a technological perspective, the typical view was the expectation of more of the same. However, the impact of these technologies on the structure of the humanities, or the potential of the humanities for culture more broadly, is much less clear. At a departmental level, it was suggested that specialisations within departments may disappear; rather than being united through specialism, people will be united by major themes or major types of approaches to the work that they do, folded into giant humanities departments [ITV033]. This

view may also reflect a change from an era of interdisciplinarity, to one that increasingly sees humanistic research as a hybrid itself, rather than as something requiring the addition of a computer scientist to a project [ITV041].

7.4. Requirements

There is a fundamental need for growth in the funding of the humanities and cultural heritage sector to ensure that it can meet the challenges of the 21st century and our increasingly technology-mediated society.

This is not simply a request for unlimited funds to support blue-sky thinking, but reflects the need for a discussion about the "fundamental questions" and "inspirational goals" that the community has to offer society [ITV003]. It is not just a matter of technologies, but rather about finding the questions. As one interviewee suggested, there needs to be a Davos-like summit in the arts and humanities, which asks the questions that everybody understands:

> *"Why are people dispossessed? Why are people evicted? ... Everybody understands the urgency of those questions. The fact is that humanists are doing that work, they're just not describing it in those terms."* *[ITV033].*

At a European level there is a need for a stronger European lead, with a more explicit European Commission strategy on cultural heritage [ITV035], and more visible public institutions offering leadership on research infrastructure and standards. It was suggested that cultural heritage institutes may contribute to the building of European identity in the same way that 18th and 19th century cultural heritage institutes contributed to nation building. Europe is not a single homogenous region, however, and there is a need for segmentation in future digital humanities strategy, with different regions requiring different answers [WS1], and so there is an important role for national governments in ensuring sustainable levels of support for the humanities and cultural heritage sector.

Most importantly, there is a need for a suitable information regulation framework that supports rather than hinders humanities research; this framework should distinguish between the work of academic or public sector researchers and those from private corporations, and should recognise that the protection required when handling personal

health records differs from the protection required when analysing political commentary that is already in the public arena. If the EU could summon up the same kind of energy to oblige social media companies to make their data available for research and for good public use, as it has for fining them, it would be a move in the right direction [ITV040]. The EU is not totally powerless in this area [ITV040].

Finally, as more than one contributor noted, there is a need for more projects similar to the PARTHENOS Foresight Study (or indeed a sustainment or continuation of this study), that engage with professionals in culture and heritage to ask them what they see happening and what their needs and issues are [ITV035]. The digital humanities and cultural heritage sectors form a diverse community, without a single voice, and it needs to find that voice if it is to meet some of the challenges of the 21st century.

7.5. Research Agenda

From the foresight study, five broad themes emerge that should form the basis of a research agenda in the digital humanities: public engagement; research infrastructures; development of the digital commons; artificial intelligence; and impact and evaluation methods and metrics.

7.5.1. Public Engagement

Public engagement is an essential part of ending the underfunding of the humanities and cultural heritage sectors. The contribution of STEM research to society is widely recognised in a way that the contribution of the humanities is not, and there is a need for humanists to make case for their work more forcibly with a combined voice.

There are many ways that the new technologies can be used by humanists and cultural heritage sector to ensure research outputs are as widely accessible as possible: open access, open data (following good data practice), social media, augmented reality, virtual reality, and mobile apps. Crowdsourcing platforms can also be used for soliciting contributions from the public. Engagement, however, is not just about promotion of research or extracting free labour, but about engaging with the public to ensure the humanities are meeting the challenges society faces at the beginning of the twenty-first century, whether

that is fake news, nationalism, populism, or climate change, and demonstrating the contribution humanities research is making to these grand challenges.

7.5.2. Research infrastructures

The value of recent initiatives in the development of research infrastructures were widely recognized in the foresight study, as they provide a certain amount of sustainability to research projects, and more development of research infrastructures for the humanities and cultural heritage sector was seen as necessary.

At a time when projects are often short and the competition for funding is fierce, research infrastructures need to facilitate collaboration and sustainability, establishing communities around the infrastructures that are developed. It is important that research infrastructures do not simply perpetuate or exacerbate existing inequalities but help to bridge the digital divide. New research infrastructures, or enhancements to existing ones, should:

- bring to the fore marginalised collections.
- ensure access and analysis is not only possible by the technologically literate
- provide data services and tools as well as data.

Importantly, research infrastructures should feed into the public engagement by being visible, and findable, and should be used to establish authority in the development of standards and best practice.

7.5.3. Development of the digital commons

New data sets and new technologies offer the potential for a host of new research questions to be addressed, but the humanities must be more critical in both the application of digital methodologies and the data that is available. The digital humanities should not be reduced to the application of trendy technologies and data sources looking for research questions, but rather answering the big questions, while at the same time enhancing the digital commons and other digital resources. There is significant work to be done in:

- making new collections freely available online, especially those from marginalised communities.
- integrating diverse data sets.
- building context and provenance for online resources.

These issues are particularly important in the context of the widely recognised potential for artificial intelligence.

7.5.4. Artificial intelligence

The potential for artificial intelligence, machine learning, and other large-scale computational methodologies are as prevalent in the humanities and cultural heritage sector as the sciences. It is essential, however, that these technologies are not simply applied in an *ad hoc* manner, but are applied critically with attention to sustainability and ethical considerations. There is in particular a need to focus on:

- the ethical implications of the application of AI technologies.
- real world applications that are reusable.
- ensuring the technologies are used to help close rather than extend the digital divide.

7.5.5. Impact and evaluation

Impact and evaluation are important parts of the research process, especially when ensuring that limited funds are used in the best way possible, and it is essential that new methodologies and metrics are developed for measuring impact and evaluation that reflect the specific needs of the humanities and cultural heritage sector. These methodologies and metrics should incentivise innovation, sustainability, and public engagement. They should also recognize a far wider range of outputs and applications, and contribute to the development of standards and best practices in research evaluation.

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Appendices

Appendix A: Foresight Information Sheet

Appendix B: Foresight Consent Form

INFORMATION SHEET FOR PARTICIPANTS

REC Reference Number: LRS-17/18-5418

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of study

PARTHENOS Project – Foresight Study

Invitation Paragraph

We would like to invite you to participate in a foresight study addressing the future of research infrastructures in the arts, humanities and cultural heritage. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

What is the purpose of the study?

The foresight study forms part of the PARTHENOS Project (http://www.parthenos-project.eu/), and aims to investigate the future of research infrastructures in the arts, humanities and cultural heritage. The primary aim of the study is to identify and examine emerging trends, requirements, prospects, issues and risks, and look at how organisations such as funding bodies might help in these developments.

Why have I been invited to take part?

You are being invited to be interviewed as you are someone with expertise in a topic of relevance to research infrastructures in the arts, humanities and cultural heritage.

Do I have to take part?

Participation is completely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in anyway. Once you have read the information sheet, please contact us if you have any questions that will help you make a decision about taking part. If you decide to take part we will ask you to sign a consent form and you will be given a copy of this consent form to keep

What will happen to me if I take part?

If you choose to take part in the study you will be invited to an interview, which will last approximately one hour, and will take place at a location to be agreed in advance. As part of participation you will be asked to provide information on your opinions regarding aspects of research infrastructures and methods in the arts, humanities and cultural heritage.

If you agree to take part you will be asked whether you are willing to be contacted about participation in future studies. If you are not willing, the research team will only contact you subsequently if clarifications of particular points are needed, or to seek your permission to

publish in unanonymised form any information you have provided (see below). Your participation in this study will not be affected should you choose not to be re-contacted.

What are the possible benefits and risks of taking part?

You will benefit by making an important contribution to the greater understanding of research infrastructures in the arts, humanities and cultural heritage, and to their future development. You incur no risks by participating.

Data handling and confidentiality

Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR). With your agreement, an audio recording may be made of your interview, and transcribed at a later date. The audio file, transcription, and any notes made by the interviewer will not be published. They will be held in a secure electronic system, accessible only to the research team. They will not be shared beyond the research team, nor will they be used for any purpose other than the team's research. Pseudonymised versions of the audio files may be shared with a third-party transcription service, for the purposes of transcribing the interviews.

Excerpts and quotations from interviews may be used in online or print publications in anonymised form. If we wish to publish any of your data unanonymised – e.g. by attributing quotes to you, or by publishing information which could be clearly identified as having come from you personally – your written permission will be sought first. You will have the right to refuse such permission without giving any reason.

Audio files, transcripts and interviewer's notes will be archived in pseudonymised form in a secure electronic system, accessible only to the research team, and will be kept for 5 years after the end of the project. Anonymised extracts will be archived as an open access dataset.

Data Protection Statement

The data controller for this project will be King's College London (KCL). The University will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under GDPR is a 'task in the public interest' You can provide your consent for the use of your personal data in this study by completing the consent form that has been provided to you.

You have the right to access information held about you. Your right of access can be exercised in accordance with the General Data Protection Regulation. You also have other rights including rights of correction, erasure, objection, and data portability. Questions, comments and requests about your personal data can also be sent to the King's College London Data Protection Officer Mr Albert Chan info-compliance@kcl.ac.uk. If you wish to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk.

What if I change my mind about taking part?

You are free to withdraw at any point of the study, without having to give a reason. Withdrawing from the study will not affect you in any way. You are able to withdraw your data from the study up until 2 weeks after the interview, after which withdrawal of your data

will no longer be possible because data will already have been anonymised, processed and incorporated into the project deliverables. If you choose to withdraw from the study we will not retain the information that you have provided.

How is the project being funded?

The study is being carried out as part of the PARTHENOS project, which is funded by the EU Horizon 2020 programme.

What will happen to the results of the study?

A copy of the project report for this study, and offprints of any academic articles arising from the study, will be sent to you on request.

Who should I contact for further information?

If you have any questions or require more information about this study, please contact me using the following contact details:

mark.hedges@kcl.ac.uk

Dr Mark Hedges
Department of Digital Humanities
King's College London
Strand
London
WC2R 2LS

07725216244

What if I have further questions, or if something goes wrong?

If this study has harmed you in any way or if you wish to make a complaint about the conduct of the study you can contact King's College London using the details below for further advice and information:

The Chair, A&H Research Ethics Panel, rec@kcl.ac.uk

Thank you for reading this information sheet and for considering taking part in this research.

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: __ PARTHENOS Project Foresight Study ____

King's College Research Ethics Committee Ref:__ LRS-17/18-5418 _____

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

I confirm that I understand that by ticking/initialling each box I am consenting to this element of the study. I understand that it will be assumed that unticked/initialled boxes mean that I DO NOT consent to that part of the study. I understand that by not giving consent for any one element I may be deemed ineligible for the study.

Please tick or initial

1. ***I confirm that I have read and understood the information sheet dated 10th July 2018 (Version 3.0) for the above study. I have had the opportunity to consider the information and asked questions which have been answered to my satisfaction.** ☐
2. ***I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason, up until two weeks after my interview.** ☐
3. ***I consent to the processing of my personal information for the purposes explained to me in the Information Sheet. I understand that such information will be handled in accordance with the terms of the General Data Protection Regulation.** ☐
4. ***I understand that my information may be subject to review by responsible individuals from the College for monitoring and audit purposes.** ☐
5. **I understand that confidentiality and anonymity will be maintained and it will not be possible to identify me in any research outputs, unless we obtain written permission from you first.** ☐
6. I agree to be contacted in the future by King's College London researchers who would like to invite me to participate in follow up studies to this project, or in future studies of a similar nature. ☐

7. I agree that the research team may use my data for future research and understand that any such use of identifiable data would be reviewed and approved by a research ethics committee. (In such cases, as with this project, data would/would not be identifiable in any report). ☐

8. I understand that the information I have submitted will be published as a report and I wish to receive a copy of it. ☐

9. I consent to my interview being audio recorded. ☐

_____	_____	_____
Name of Participant	**Date**	**Signature**
_____	_____	_____
Name of Researcher	**Date**	**Signature**