Digital Humanities Foresight
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The future impact of digital methods, technologies and infrastructures

Mark Hedges, David Stuart, George Tzedopoulos, Sheena Bassett, Vicky Garnett, Roberta Giacomi, Maurizio Sanesi

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Digital Humanities Foresight

The future impact of digital methods, technologies and infrastructures

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Abstract

The digital humanities is a complex and dynamic ecosystem of interactions between changing scholarly priorities, technological advances, and the broader social, cultural and economic contexts. This working paper provides an extended summary of a foresight study into how digital research methods, technologies and infrastructures in digital humanities and cultural heritage may develop over the next 5-10 years, based on the results of a series interviews, workshops, survey results, and a review of the literature. Recommendations for interventions to optimize future development in the field include public engagement, research infrastructures, development of the digital commons, artificial intelligence, impact and evaluation.

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Contents

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.

The PARTHENOS foresight study investigated how digital research methods, technologies and infrastructures in digital humanities and cultural heritage may develop over the next 5-10 years. The aim of the 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 results are designed to feed into strategic Research & Development (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.

This working paper summarises the findings and the proposed research agenda of the PARTHENOS Foresight study (Hedges et al. 2019), and reflects on the foresight process for insights into the potential of digital technologies in the humanities and cultural heritage sector.

2 What is "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 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, 45))

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.

Foresight is an iterative and cyclical process with five broad stages: pre-foresight; recruitment; generation; action; and renewal (Popper 2008). *Pre-foresight* involves identifying the objectives, assembling the team, selecting an appropriate methodology, and carrying out an initial analysis of the literature. *Recruitment* involves identifying and engaging with key stakeholders through (e.g.) workshops, panels and interviews. *Generation* involves the construction of the knowledge base through the analysis and synthesis of the information collected. *Action* is the stage where the knowledge base is used as the basis for decisions, and planning for change and innovation. *Renewal* includes follow-on activities, including addressing sustainability issues, as well as evaluation and modification of the current vision as new knowledge emerges and the landscape continues to evolve. This working paper reflects the ongoing *renewal* aspect of the foresight study, not only summarising the findings of the original report (Hedges 2019), but additionally including the results of feedback on that report.

3 PARTHENOS Foresight Methodology

Within the foresight process 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. 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 is 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.

The literature review was followed by a series of six 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 41 *interviews* with targeted stakeholders.

As part of the *renewal* phase of the foresight process, a survey was used to collect feedback on preliminary results shared via the PARTHENOS Hub (Hedges 2019), and five additional interviews took place after the publication of the initial report (Hedges et al. 2019) to address the perceived lack of coverage of certain areas (e.g., languages and blockchain). 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.

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).

This resulted in fifteen questions that were asked of each interviewee.

Sector	Question
Technology	1. What do you think are the most relevant tech developments that are having an impact on your sector in recent years?
	2. How are these developments changing your own work?
	3. Given these developments, what technological developments do you see taking shape in the near future?
	4. What technological developments would you like to see? -How would this improve matters for your work?
	5. What 3 things do you think need to change in order for this to happen?
Environment	6. What socio-economic, cultural and political factors do you feel have affected your sector?
	7. How have these made an impact on your own work?
	8. Where do you think these changes might lead the sector?
	9. What changes do you think need to happen to improve the sector?
	10. What 3 things do you think need to change in order for this to happen?

Sector	Question
Scholarship	11. What trends have happened within your research / area of practice in recent years?
	12. How has this made an impact in your own work (e.g. changes in research focus, methodologies, etc?)
	13. How do you see this developing in the near future?
	14. What changes in scholarly practice would you like to see happen?
	15. What 3 things do you think need to change in order for this to happen?

4 Findings

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, and identifying emerging trends, obstacles, potentialities and requirements. The study 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 these technologies.

The main findings of the foresight study are summarized below, grouped according to identified trends, obstacles, potentialities and requirements.

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 intellectual property rights (IPR) and the General Data Protection Regulation (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 (AI) 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 in 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.

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 frequently 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 science, technology, engineering and mathematics (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.

There is a perceived 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 their message, and to have more discussion about the "fundamental questions" and "inspirational goals" that the DH community has to offer society, so that society may be more willing to fund the humanities.

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, and the tools and resources available for working with different languages.

- **Interdisciplinary digital divide**: There are significant differences between the research infrastructures that are available to the digital humanities compared with STEM disciplines, which have been prioritized for funding. This, in turn, has contributed to a 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.

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.

These existing 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 and methodological 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 AI nor crowdsourcing 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.

- **Blockchain**: The distributed ledgers of blockchain have the potential to "revolutionize the way information is stored and transactions occur" (Tapscott 2018, 6), and potential uses identified in the study included ensuring rich personal data was kept anonymous, tracking cultural artefacts, and facilitating the crediting and ownership of digital data.

From a technological perspective, the typical view was the expectation of more of the same. The existing tools have a lot of potential that is currently untapped. 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.

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.

There is also a need for departmental structures to be more adaptable to the changing research environment. It was suggested that specialisations within departments may disappear, with people united by major themes or major types of approaches to the work that they do, folded into giant humanities departments. Similarly, the old model of separate language departments may also need to change, with departments having a much broader focus.

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.

5 Research Agenda

The results of the foresight study are designed to feed into strategic R&D thinking within the European Commission, other funding bodies, and research organisations. They are designed to influence strategic developments over the coming years, and maximize the innovative potential of digital research in the humanities. This section identifies five broad themes that emerge from the foresight study and 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.

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 this fact, along with the need for humanists to make the case for their work more forcibly with a combined voice, was raised multiple times:

> "You win more votes when you say you want to put money into science, technology, engineering and maths because those things have a clear job connection…if you put money into the cultural heritage sector, people don't necessarily see the jobs that come out of it." [Interview 45]

There are many ways that the new technologies can be used by humanists and the cultural heritage sector to ensure research outputs are as widely accessible as possible: open access, open data (following FAIR data practice), social media, augmented reality, virtual reality, and mobile apps. There are challenges, however, in ensuing the tools meet stakeholder needs. For example, one museum-based interviewee highlighted the failure of a mobile app for tourists exploring the local area, while another researcher pointed out the tendency to focus on eye-catching technology because it appeals to people who donate money despite its lack of wider appeal:

> "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?'" [Interview 38]

> "…the British Museum launched a virtual tour of the Egyptian exhibits…that required an Oculus Rift, which maybe 2 million people have in the world…As public funding decreases in cultural heritage…you just have to have more projects that appeal to the people who donate money" [Interview 45]

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, it can "empower… audiences and potentially increases their engagement with the history and the service which is promoting it" (Haunton 2019).

Society is increasingly divided politically at the beginning of the twenty-first century, with the rise of populism (Moffitt 2016), nationalism (Duelund 2016) and fake news (Lazer 2018). Demonstrating the contributions that engagement with humanities research can make to these grand challenges is essential.

5.2 Research infrastructures

The necessity of research infrastructures, "facilities that provide resources and services for research communities to conduct research and foster innovation" (Commission 2019), and the value of recent initiatives in the development of research infrastructures, were widely recognized in the foresight study. As one interviewee noted, "[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?'" [Interview 31]. Now research infrastructures 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:

  "…the importance of cultural heritage has to stretch beyond the 'national masterpiece'. Local archives can be of great importance in showing more marginal histories." [Survey response 1]

- ensure that access and analysis is not only possible for the technologically literate:

  "[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." [Interview 33]

- provide data services and tools as well as data:

  "Even if all content were to be open access tomorrow, you'd still have a vendor fight for the best discovery tools and the best analysis on top of that free content." [Interview 32]

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

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 as regards 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 should rather be 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, integrating diverse data sets, and building context and provenance for online resources.

There is still a need both for the digitization of primary sources and for cataloguing data, with one survey respondent suggesting that the focus on technological developments might be too strong, and that instead of investing in more tools, it is important to recognise the importance of the groundwork of "simply" scanning more archives [Survey response 1]. In this respect, 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. As has already been mentioned above, there is also a long way to go in increasing access to marginalized collections. While there has been an increase in the diversity of collections that are available, many of these are 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 [lesbian, gay, bisexual, transgender, and queer] issues. You're not seeing that reflected in lots of openly available materials." [Interview 32]

There is also a need for greater interoperability between catalogues and databases, 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 [Interview 28].

Digital content may lack context, provenance, and selection criteria (Dix 2014), and thus may be viewed "without context, interpretation or support" (Haunton 2019). There is also a need for digital discipline and data cleaning: too often people don't care about consistency, and combined datasets may not adhere to the same standards, as standards are often an emotive issue.

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

5.4 Artificial intelligence

The potential for artificial intelligence, machine learning, and other large-scale computational methodologies is as prevalent in the humanities and cultural heritage sector as in the sciences. It is essential, however, that these technologies are not simply applied in an *ad hoc* manner, but are addressed 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, to establish real world applications that are reusable, and to ensure the technologies are used to help close rather than extend the digital divide.

There is a need for a greater understanding of the potential for bias that may be inherent in many AI algorithms; humanists need to know how the black box works, and to be clear about the underlying assumptions and the limitations of the tools:

> "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?" [Interview 31]

There is also a need to address new 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?" [Interview 39]

It was suggested that there is not much commercialized artificial intelligence for discovery and analysis deployment that is truly serviceable at this point, with many of the technologies still in an experimental stage. There needs to be more investment in developing more bespoke learning machines rather than trying to "ham-fist" [Interview 45] general AI tools into the cultural heritage sector.

It is important, however, that these technologies are used to help close rather than extend the digital divide. In particular, there is seen to be a need for better algorithms for minority languages.

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. The belief in evaluation, and more specifically in quantitative evaluation, for performance and reward is ubiquitous in the modern world, but it is met with increasing exasperation at the failure of the measures taken to meet their objectives (e.g., Sayer (2015); Muller (2018)). This can lead funders and consortia to bring "perverse incentives" [Workshop 1] in terms of publication, 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." [Interview 26]

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 sectors. These methodologies and metrics should incentivize innovation, sustainability, collaboration, and public engagement. They should also recognize a far wider range of outputs and applications, with data citation, repository citation, survey citation and software citation. They should also contribute to the development of standards and best practices in research evaluation.

6 Conclusions

The findings of the PARTHENOS Foresight study reflect the dynamic impact digital technologies continue to have across the humanities and cultural heritage sectors, but also the difficulty in exploiting opportunities and overcoming challenges given the continuous underfunding since 2008.

Five key areas were identified that should form the basis of any future research agenda for the humanities and cultural heritage sector: public engagement, research infrastructure, development of the digital commons, artificial intelligence, and impact and evaluation. Successful public engagement is a key part of ensuring support for future research funding, and this not only requires engaging the public with the research but demonstrating the impact of the research with evaluative measures that actually reflect the work of the sectors. The importance of research infrastructures and the development of the digital commons also complement one another; it is important not only to continue to develop the infrastructure to enable sharing and analysis of data, but also to extend the digitization of primary sources and catalogue data, especially with regards to marginalised communities. It is unsurprising that artificial intelligence was raised as an issue as often as it was, but it is most notable for the importance that was ascribed to the creation of bespoke tools for the digital humanities and cultural heritage sector, and the contributions the sector has to offer the artificial intelligence community.

The value of the PARTHENOS foresight study, and other similar studies in the humanities and cultural heritage sector, was noted by multiple respondents. The broad nature of the study raises the most widespread issues and commonalities across the sector, as well as more idiosyncratic concerns in specific areas. It might be argued, however, that the relatively limited horizon of the study (5-10 years) gave little scope for truly innovative ideas to emerge. Indeed the potential of many of the ideas raised have already been widely discussed for many years (e.g., open access). There is a need for such studies to be ongoing, however, so that changes in trends, obstacles, potentialities and requirements can also be identified, but also for longer-term foresight studies to be taken (e.g., 10-20 years). Inevitably this is likely to lead to a greater number of misdirected suggestions, but it may also help stakeholders to look beyond their most immediate environment.

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