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The Role of Digital Technologies in Social Research in the UK: An Emerging Digital Research Community?

FINAL REPORT

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Executive Summary

This study explored the employment of digital tools, resources and services by the social research community in the UK, from the stage of designing the research through to data collection and dissemination of the results. It examined ongoing and prospective patterns of use of digital technologies in research contexts (e.g., complexity, multiplicity, duration, research timing etc.) and shed light on associated skills and capacity challenges. In departing from techno-deterministic approaches, it aimed to map out the actual, claimed and potential role of digital technologies in social research so as to offer a critical assessment of the existing and potential innovation pathways signalled by the employment of digital technologies in social research, especially in relation to the development of a digital research culture and the subsequent rise of a digital research community.

This study explored ten cases of UK-based research in the disciplines of business/management, education, history, literature and politics so as to develop an understanding of how social researchers in five different disciplines employ digital tools, resources and services to conduct or facilitate research-related work. Two research cases were selected from each discipline. Each case employed digital technologies and related tools, services and applications for the purposes of research design, data collection, data analysis or dissemination of research.

The ultimate aim of this study has been to reach preliminary conclusions on whether we can suggest the *rise of a digital research community* in the broader social research community in the UK. Its findings suggest that, regardless of discipline- and project-specific variations, there is an emerging and highly dynamic digital research community in the UK that is yet to develop concrete shape and features. This is to say that an emerging and dynamic digital research community runs across traditionally defined disciplinary boundaries in both social sciences and arts and humanities research, but it still lacks a clear research culture. We can summarise the trends in this emerging and dynamic digital research community as follows:

- *Varying levels of digital knowledge and expertise.* Digital literacy and practices vary across the research community and among researchers, research projects and disciplines. Those who are practically involved in the use of digital means of work as part of individual or collaborative research constitute most of the researchers who report a satisfactory degree of knowledge and expertise in the use of digital technologies as tools and/or platforms of research.
- *Varying perceptions of the 'digital' as part of the research process.* Interestingly, we found that not only 'digital practices' but also perceptions of 'digital' vary among researchers, projects and disciplines. Researchers tend to develop their perceptions on the basis of existing or known categorisations of the

'digital', thus endorsing different perceptions and evaluations for different digital technologies, applications and services.

- *Gaps in institutional support and bespoke training.* The emerging digital research community seems not to be in great need of generic techno-centric training for digital literacy enhancement. However, we found that the community will be unable to become fully fledged unless, first, traditional research cultures that foster resistant attitudes to digital technologies are changed and, second, research institutions and universities offer bespoke support for the use of digital technologies while at the same time removing institutional constraints on the innovative and tailored usage of digital technologies in research.
- *Uncertainty about the role of digital technologies in future research.* The participant researchers thought that the digital realm will continue to develop rapidly and so they argued for the increasing importance of digital technologies in research. However, they seemed to be uncertain about how precisely digital technologies will influence research in the future, especially with regard to the qualitative changes that the digital will bring about for future research. This is mostly due to the unpredictability of the digital domain in general, as researchers are not confident making concrete plans and developing specific visions about the use of digital technologies to promote high-impact and inter-disciplinary research in the future.

Overall, this study offers findings and insights that could usefully pave the way for a larger scale examination of the employment of digital technologies and tools in social research in the UK. Specifically:

1. The study sheds light on the use of digital technologies in social research and highlights the parameters of complexity (e.g., level and quality of technology and/or its use); multiplicity (e.g., single or multiple technologies and/or uses); research timing (e.g., when technologies are used in the multi-staged research process); literacy (e.g., researchers' digital skills as well as the availability of associated resources and support); and the importance of technology for the impact, inter-disciplinarity and future prospects of research.
2. The study offers insights into past 'failures' and current insufficiencies, pointing to lessons for researchers, such as, first, the need to consult with other researchers and the scholarly community within and outside strict disciplinary boundaries in order to learn from each other's experiences; second, the value of considering the needs and culture of the broader (non-scholarly) community and the 'target audience' of the research in order to develop a better understanding of how to best communicate research through technological means; and, third, the importance of providing funders, research institutions and universities with recommendations on research capacity development and associated training and support provision.

3. The study provides universities and research institutions in the UK with feedback on the need for bespoke support and for a departure from the currently generic and 'one-size-fits-all' training provision. The study also points to the need for research institutions to conduct awareness-raising initiatives that will inform the research community on innovative research in general and on the benefits that come from the employment of digital technologies in research in particular.

The findings of the study will be disseminated through various means and activities so that they inform the broader social research community in the UK while also promoting knowledge exchange among researchers, research funders and technology experts on existing patterns of use of digital technologies in research and associated opportunities and challenges for the future.

Aims and Objectives

The use of digital technologies in social research is a rapidly growing area of development, deliberation and reflection. At the core of this development is the employment of Internet technologies, tools and services as *objects* of research but also as tools and platforms for the *conduct* of research and the creation of innovative methodological practices (Markham and Buchanan 2012: 3).

Social researchers have put forward the premise that digital technologies can both expand existing research interests and yield new themes and questions for research (Costigan 1999; Sterne 2005: 254). For instance, hyperlinks have given rise to (hyper)link research (Ackland and Gibson 2013; Chang, Himelboim and Dong 2009; De Maeyer 2013; Park and Thelwall 2003; Shumate and Lipp 2008). Similarly, websites and web content have given rise to website analysis (Cai and Zhao 2013; Das and Turkoglu 2009; Kingston and Stam 2013; McCluskey 2013; Ortega, Aguillo and Prieto 2006; Schweitzer 2008), while search engines have fed the study of search-engine results and their politics (Granka 2010; Introna and Nissenbaum 2000a, 2000b; Mager 2012; Muddiman 2013; Van Couvering 2008).

At the same time, digital technologies have driven researchers to revisit old methods and devise new methodological tools for research (Fielding, Lee and Blank 2008; Hine 2005; Hughes 2012; Johns, Chen and Hall 2004; Jones 1999; Markham and Baym 2009; Roberts et al. 2013; Salmons 2010, 2012; Sappleton 2013). To overcome the drawbacks of offline methods of research, researchers often employ Internet tools and application that alter conventional methodologies and create virtual or online versions of them (Bryman 2012; Foot and Schneider 2010). Some have even stressed the need for the research community to develop the necessary capacity to treat digital methods as 'mainstream methodology' (Roberts et al. 2013). Along these lines, the employment of digital technologies in research suggests the collaboration of social and computer researchers, with knowledge elements from various disciplines being combined so as to boost new areas of research or niche spaces for the operation of new knowledge networks and fields of study (e.g., artificial intelligence). This has led to the deployment of new research models (e.g., computational social science, agent-based models) and data; the pursuit of large-scale research; and the initiation of new practices and communities of inter-disciplinary collaboration that often involve technology experts, funders, creative practitioners, industry actors and ordinary technology users.

In this context, our study explored the employment of digital tools, resources and services by the social research community in the UK and from the stage of designing the research through to data collection and dissemination of results. It examined ongoing and prospective patterns of use of digital technologies in research contexts (in terms of complexity, multiplicity, duration, research timing etc.) and shed light on associated skills and capacity challenges. In departing from techno-deterministic approaches, it aimed to

map out the actual, claimed and potential roles of digital technologies in social research so as to offer a critical assessment of the existing and potential innovation pathways signalled by the employment of digital technologies in social research, especially in relation to the development of a digital research culture and the subsequent rise of a digital research community. Hence, the aim of this small-scale study was to cast light on analogous and dissimilar patterns of appropriation of digital technologies in social research in the UK so as to generate an initial assessment of:

- the employment of digital tools, resources and services in social research, with an emphasis on *complexity* and *multiplicity* for both the ‘technology’ and ‘usage’ parameters;
- the *stage(s) of the research process* at which digital means of work are employed, with an emphasis on whether social researchers use digital technologies to design research, for data-gathering purposes, in order to analyse the collected data or for dissemination, impact and knowledge transfer activities;
- the *skills* and *level of expertise* (observed and perceived) of the researchers and possible capacity or training needs for the effective use and full operationalisation of digital technologies;
- the implications of digital technologies for the *impact, inter-disciplinarity* and *future prospects* of social research, especially within the context of the UK-based social research community;
- whether we can suggest the *rise of a digital research community* within the broader social research community that is marked by a distinct research culture and runs across traditionally defined disciplinary boundaries in social research.

To pursue these aims, we conducted a seed study of UK-based research in the disciplines of business/management, education, history, literature and politics to develop an understanding of how social researchers in five different disciplines employ digital tools, resources and services to conduct or facilitate research-related work. The selection of these five disciplines might suggest a broad scope of study but it can be justified on the grounds of their similarities and differences. On the one hand, all five disciplines are unfamiliar with the development and form of digital technologies, unlike disciplines such as media and communication, information science/information systems, technology studies and so on. This is useful because this study aimed to explore the employment of digital technologies in areas where digital technology is not an integral part or the very object of research. In addition, these five disciplines involve a large volume of what is broadly defined as ‘social research’, and a significant bulk of their research output derives from the study of culture and community. On the other hand, we were interested in making sense of the legacies of diverse disciplines and of how they have variously been positioned historically towards technology, with some disciplines having just recently started to incorporate digital means of work and with others having for some time provided fertile ground for the use of digital tools in research. In addition, some of the selected disciplines – business/management, education, history, literature and

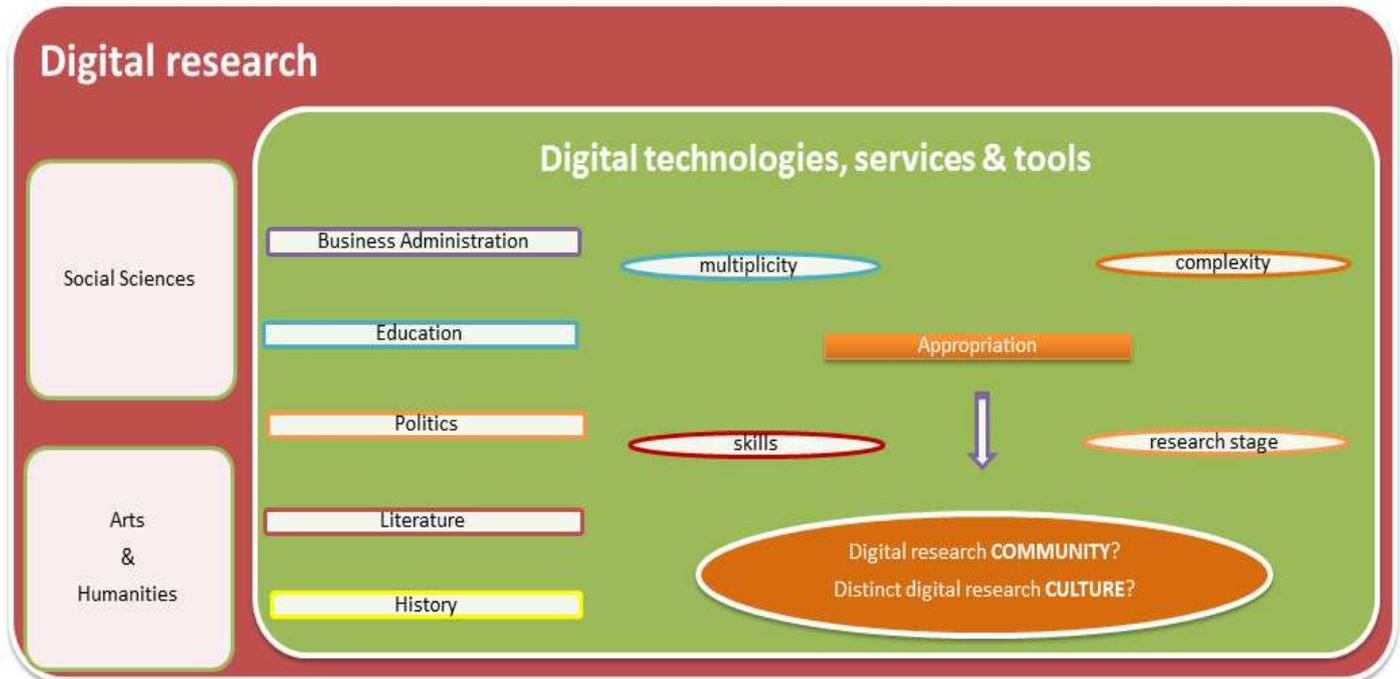
politics – belong to the social sciences. Our study thus accommodated fields of research that apply different scientific principles and methodological practices. This distinction between humanities and social sciences – although not always a clear-cut one – was useful, since this study hoped to shed light on the hypothetically dissimilar dialogue that the humanities and social sciences have developed with technology as well as on relevant developments (e.g., digital humanities).

Finally, although the study examined the employment of a diversity of digital tools, resources and services, its focus was mainly on social media and online community tools and specifically on micro-blogging, social networking sites and blogs due to their phenomenal spread and their implications for the rise of a digital research community.

Methodology

Following on from the broader conceptual mapping of the study and its aims and objectives, the design of the empirical part of the study employed the following research framework (Fig. 1).

Figure 1: Research framework



Two research cases were selected for each of the five disciplines; thus a total of ten research cases were studied.¹ Due to the small-scale nature of this study and the associated time and budget constraints, the ten research cases were purposefully selected and satisfied the following two conditions: first, employment of digital means of work – at least to an extent – and, second, current/ongoing research. The decision to study ten research projects from five different disciplines ensured a sufficiently wide scope and satisfactory disciplinary diversity within the timeframe of the study.

After we selected the ten research cases for study, we produced a brief but comprehensive review of each case. Specifically, we used background information, online information and information found in research case documentation (e.g., cases for support, pathways to impact, outlines of research etc.), and we drafted a review of each case that highlighted the following areas of interest:

- *Description of the case and the discipline(s) it falls within.* Although each case was labelled in terms of discipline, we explored whether it had involved inter-disciplinary work. We also discerned this by looking at the research expertise of the involved researchers.

¹ See the Appendix for a description of all ten research cases.

- *General remarks on digital technologies, tools and services, as well as specific references to how digital technologies were to be used in the research case.* We sought information on what technologies or services were to be used, when (in terms of actual time as well as research time) and for what purposes (e.g., research design, data collection, data analysis, dissemination of results etc.).
- *Whether the research cases made any references to technologically mediated scholarly communication.* We looked for references to the day-to-day use of technology for communication and exchange both within the research team and between the research team and the broader scholarly community.
- *A clear mapping of the research activities and deliverables and whether any of them were to involve digital technologies.*

Qualitative methods were employed in the main part of the study. More specifically, fieldwork consisted of the following two elements:

(1) *Collection of qualitative data from the research field.* Observation data were collected for the ten selected research cases and for various activities in each case. Observation took place in a number of formats, depending on the specifics of each case as well as the preferences and convenience of the observed researchers. In most cases, we conducted non-participant observation, but, when this was not possible or suitable, data were collected through purposeful and interactive demonstration of one or more research activities or via an unstructured and reflective account of the research case. For instance, after discussion with the researchers involved in the business case at the Open University, it was agreed that an unstructured and reflective account would be produced of the project as a whole instead of us observing any of the project activities. Therefore, one of the researchers in the business case at the Open University talked us through the project as a whole, reflecting on the work process and associated issues or problems and referring to the use of digital technologies in the project whenever he felt the need to do so. This account was highly reflective and unstructured and we did not direct it in any instance, only prompting the researcher to continue reflecting as appropriate.

(2) *Semi-structured in-depth interviews with one or more researchers in each of the ten research cases.* The number of interviews for each case varied depending on the size of the research team and the availability of individual researchers. Ethical approval was secured prior to commencement of data collection and all interviewees approved and signed a consent form prior to the interview. In some cases, we deviated from the interview topic guide and added, removed or modified questions depending on the case-specific review, the discipline and the type of research of each case, as well as the stage the research had reached when the interview took place. For example, when the interview for the politics case at the University of

Nottingham took place (15 September 2014), the work for the project had just been completed so we could ask the interviewees a number of questions in addition to those on the standard topic guide, mostly regarding successes, failures, difficulties and future plans.

In terms of logistics, data collection was discussed and finalised in collaboration with the leading researcher(s) in each research case. Data collection took place in the main site or institution of each case and for most of the cases it lasted two days.

The interview data were analysed using NVivo 10.0 so as to develop textual and graphic analytic reflections on the key thematic areas of the study. A coding framework was designed for NVivo analysis and through inter-coder reliability tests new or revised codes were added throughout the analysis. The analysis ran through three different levels:

- *First level – case-level analysis*: main trends in each case; similarities and differences across cases.
- *Second level – discipline-level analysis*: main trends in each discipline; similarities and differences across cases in each discipline.
- *Third level – cross-disciplinary-level analysis*: main trends across all five disciplines; similarities and differences across all five disciplines.

The NVivo interview data analysis was complemented with insights from the observation data, all together resulting in a rich set of qualitative findings.

Findings

At the very beginning of our analysis, we aimed to map out the main attributes of all ten research cases. Thus, in putting together the case review documents and considering remarks and findings from the collected qualitative data, we produced a map of the key attributes of each case, as shown in Table 1.

Table 1: Research case attributes

Research case	Discipline	Inter-disciplinarity	Location	Project team	Seniority of PI*	Technology's position
Project 1	Business	No other discipline	England (not London)	5+ persons	Professor	Technology as means of research
Project 2	Business	No other discipline	England (not London)	Up to 2 persons	Professor	Technology as means of research
Project 3	Education	Two or more other disciplines	London	3–5 persons	Reader	Technology as both object and means of research
Project 4	Education	Another discipline involved	Scotland	Up to 2 persons	Research staff	Technology as both object and means of research
Project 5	History	Another discipline involved	London	3–5 persons	Senior lecturer	Technology as means of research
Project 6	History	No other discipline	England (not London)	3–5 persons	Lecturer	Technology as means of research
Project 7	Literature	No other discipline	England (not London)	5+ persons	Professor	Technology as means of research
Project 8	Literature	No other discipline	Scotland	5+ persons	Professor	Technology as means of research
Project 9	Politics	No other discipline	Scotland	3–5 persons	Professor	Technology as means of research
Project 10	Politics	No other discipline	England (not London)	Up to 2 persons	Professor	Technology as means of research

* Principal investigator.

The main part of the analysis mostly focused on identifying key themes and patterns of discussion in the interview data. So, if we look at some of the most frequent words in the interview data (see Fig. 2), we can see that the interviewees made reference once or more often to the following words (ordered here in descending frequency): 'think', 'project', 'work', 'see', 'use', 'make', 'know', 'research', 'training', 'data', 'technology', 'find', 'website', 'digital', 'public', 'communication', 'university', 'recording', 'material', 'information', 'documents', 'course', 'support', 'design', 'trying', 'online', 'blog', 'understanding', 'access', 'report', 'resources', 'email', 'social', 'tools', 'video', 'media', 'impact', 'dissemination', 'future', 'Twitter', 'Web', 'learning', 'database', 'outputs', 'archive', 'content', 'images', 'link', 'collection', 'exchange', 'activities', 'follow' and 'practice'. Each of these words (and words with the same etymological root) appeared in the interview texts more than 100 times in total. Whereas all these words belong to various thematic clusters, the NVivo analysis showed that most of them are concentrated within the themes of 'digital technology', 'action', 'reflection' and 'training'. This indicates that the researchers in the ten cases think of digital technologies and tools mainly in terms of their active and reflective appropriation for

- email was mostly used for internal and external project communication;
- Skype was mostly used for internal project communication;
- social media (e.g., blogs, Twitter, Facebook, LinkedIn, Academia.edu etc.) served various purposes, such as dissemination, development of research dialogues, sharing of resources and so on.

As regards the parameter of *complexity*, we found significant differences in the *complexity* and *level of usage* of digital technologies between research cases as well as across disciplines. For instance:

- The business research case at the University of Manchester made advanced use of complex digital means of work, such as webscraping, webmining, social media data analytics and other social computing techniques for the search, retrieval and analysis of web-based data of small companies manufacturing energy and other green technologies in three countries (China, UK and USA).
- Both cases in the discipline of literature made extensive use of online repository systems and digitisation practices for sharing and preserving literary resources (online editions, audio material etc.).
- Both cases in history were mostly focused on the use of digital media for preserving historical resources and disseminating research.
- Both education cases made use of web-based platforms, mostly for data collection and pedagogical/training purposes.
- Finally, both cases in politics emphasised the use of digital tools that enhance dialogue and communication with stakeholders, although certain differences were found between the two cases.

A project-dedicated website, a plain webpage or something else?

Looking more specifically at the key digital means of work in the ten studied cases, project-dedicated websites or webpages appeared to be the most popular web-based tool for researchers in all five disciplines. Most of the studied cases had a website – in many cases one that incorporated interactive and social media tools as well as advanced design features.

Researchers viewed project-dedicated websites as mostly being useful for dissemination and public engagement purposes. A project-dedicated website is the main technological platform that social researchers use to present and disseminate their work. For instance, the principal investigator (PI) of the education case at the Institute of Education (IoE) stressed the purely dissemination-facilitating function of the project website and argued that the website was all about making project resources – such as pictures from fieldwork and slides from talks or interesting papers – available to stakeholders and other researchers in the area. The website of the English literature case at the University of Leicester contained a page titled

'Get involved'; this page offered information on the project's book group, on the Waugh Forum and on project events and also invited the public to help the project trace 'orphan works' – specifically, to help the project uncover the identities of Evelyn Waugh's more elusive correspondents and trace their families.

An exception was the history project at the University of Leeds. This project had two websites: one public-facing and one interactive. The interactive website had been designed to make available a web map facility and various research resources, such as secondary archival, photographic and directory data as well as primary interview data, and was thus intended to be a rich site for other researchers.² On the other hand, the PI of this project considered that the public-facing website should develop throughout the project, not only towards its end. He believed it could help the project's researchers to share and communicate their work with other researchers in the field and also be of practical value to other researchers through providing information, insight and input in key areas of interest. He seemed to think of the project website as having a lot more significance for him and the research community than just dissemination value. To the question of why researchers need to have a website to present their project work, he answered: 'Why? At least it identifies that there is such a project that's taking place. You know, it's a public-facing resource or for sharing the research with both other researchers and members of the general public and students ... all that.' He even argued that project websites can constitute a valuable research resource, showing to the broader research community what research is being done and what more is to be done in the future:

Actually, sometimes it [a website] can help your research in the sense you don't have to do other research you thought you were going to do because somebody has done it for you and so if you ask them and they share the research with you, it can enrich your research project. So I think you get that with a public-facing website, as it's not hidden behind the door and you do not have to physically go to universities to discover what people are doing.

In contrast to these examples, a couple of research cases had just a single webpage that described their work in rather general terms. For instance, both cases in business presented themselves through a single text-based webpage, with the researchers in these cases considering the creation of a project-dedicated website to be unnecessary. Although the PI of the business case at the University of Manchester acknowledged the use of advanced digital technologies in the project for data collection and data analysis, he stressed a lack of investment in technologies that can serve research communication, dissemination and networking purposes. He confirmed that the project does not have its own website, since, for him, an interactive and appealing website required resources (material, temporal etc.) that were not available in the project. He seemed to think that a website is not really necessary, as there are multiple other sites

² The interactive site was not yet live and running at the time of the interview.

online where people can find information about the project. Also, this project seemed to largely rely on offline events, workshops, summer schools and similar activities to disseminate its work.

An even more exceptional case was that concerning politics at the University of Nottingham. It ran a standalone blog where the project researchers posted news and thoughts, but there was no project-dedicated website, nor a single webpage. According to the researchers, this was due to a lack of opportunity and of an aspiration to have a 'board of advisers' who would provide input for such a website. The researchers also pointed to project-specific reasons, such as the appropriateness of 'conventional' (i.e., offline) means of dissemination when Chinese non-governmental organisations (NGOs) and other stakeholders/audiences in China are targeted. In any case, during the interview the researchers declared their intention to go ahead with the creation of a website that would be useful for dissemination purposes only, as the project had just come to an end when the interview took place.

At the perceptual level, even in cases where a rich-in-content and advanced-in-design website exists, researchers continue to appreciate the value of non-technological means of dissemination and public engagement. For instance, the co-investigator (Co-I) of the education project at the IoE thought that platforms such as a project website are not really used to convey research to the general public and questioned the usefulness of online means of communication for the purpose of public engagement with research:

The website itself, I think, has got a very short lifespan. I don't think that – in four or five years – the website is going to count for much. The papers will still count, they will still be important in terms of what we're doing. Uhm, I'm actually considering non-web based... the relationships we build with people are so important. So, of all the things that we're doing, to be honest, the website is one of the things that, personally, I consider the least important.

Social media

Social media were broadly used in most of the studied cases and were mostly seen as information dissemination and networking tools. The majority of researchers valued the role of social media in the research process, although quite a few stated that they lacked time and other resources to keep up with social media communication: 'I don't think that I'm maximising my Twitter presence, but then you see you need to be that kind of person who devotes half an hour or an hour every evening to just be looking through...; I don't have that time and it's not my priority' (PI, politics case, University of Edinburgh). Also, some researchers, such as the PI of the education case at the IoE and the PI of the politics case at the University of Edinburgh, expressed the view that it takes a long time to build useful and substantive research networks through social media platforms.

Many researchers distinguished between the various social media platforms, thinking that each platform has a distinct role in the research process and evaluating the various platforms differently. For instance, the PI of the history case at the University of Leeds suggested that Facebook was not needed in the project, as it would essentially replicate the project website, while he clearly referred to Twitter as a networking tool where content (i.e., what you write) is not that important. At the same time, he thought that a blog is the right place to offer substantial ideas and thoughts about or in relation to a project. For his project in particular, he thought that the blog served not only as a space where important things about the project and its findings were presented and discussed but also as an archive that could be used to trace back important themes, discourses and so on. In this respect, he viewed the blog as a project output in its own right as well as a venue for reporting, presenting and discussing project information, findings and so on. Also, interestingly, he argued that social media platforms such as Twitter can be used differently in different projects and for different kinds of activities, often going beyond a sort of publicity and networking function. For instance, as an expert in history and museum studies, he has used Twitter to relay live news from a conference to people who were interested in the topic but had not been able to attend, while also feeding those people's questions and comments back to the conference venue. Similarly, the PI of the politics case at the University of Nottingham decided not to use Facebook to communicate regarding his project; instead, he used Twitter to disseminate project news and found blogging to be the most useful platform for disseminating, discussing and exchanging ideas and knowledge about the project: 'I think blog posts are great to disseminate knowledge beyond the academic field, as in academia there is still a value in the kind of academic, accessible but academic output, so, those are hopefully... I think academically that would be, for me, that would be valuable.' In other cases, researchers appreciated and made use mostly of professional and academic platforms such as Academia.edu, LinkedIn and so on. For instance, the PI of the history case at University College London (UCL) stated:

Appropriate forms of social media, yes. I don't think Facebook is a place about it [the project], whereas Academia.edu is and I think... I was sceptical about it at the beginning but it is a very efficient way of advertising because if you tag things you've put up, keywords like Roman Law or whatever, then anyone who subscribes or looks at this automatically gets a notification. So, that's something you couldn't do a few years ago, which is what we are now able to do.

Nevertheless, rather surprisingly, in a couple of cases where advanced digital means were used for methodological and fieldwork activities, there was particularly limited use of social media and little investment in using technology as a communication, dissemination or networking tool. For instance, the PI of the business project at the University of Manchester stated that the project lacked a Twitter account

and a blog site. For him, these social media resources were not really needed as face-to-face and other more conventional means of research dissemination and networking were being used, while individual researchers tweet in relation to the project through their own individual accounts.

Digital technologies at the various stages of the research process

Besides reviewing the main trends in the use of digital tools, resources and services, the study aimed to look at the various stages of the research process and the digital means of work used at each stage.

In general, we found that different stages of the research process involve different digital technologies and that throughout the research process researchers appear to mostly make use of emails, Skype, and online repositories and file-sharing systems.

In what follows we present the key findings for each stage of the research process.

Digital technologies for project design

The researchers who participated in the study did not reflect extensively on the use of digital technologies at the stage of designing their projects and preparing their actual project proposals. Nevertheless, in most cases the researchers appeared to have made use of online search engines, online databases, web archives and file-sharing systems for project framing and design purposes. Also, given that most of the studied cases have received external funding, the researchers had to go through online funding application systems such as Je-S.³

In the planning of it, I think just the basics... using the Microsoft tools, so you got spreadsheets and Word; I didn't need anything else. In terms of the – any communication, obvious tools are emails; things like Dropbox are very helpful just to be able to share some of the planning documents with people. And then you've got your JeS forms, which themselves are pretty much simple. (PI, education project, University of Edinburgh)

Digital technologies for research scoping and project contextualisation

In terms of placing the research into context, in most cases researchers used online search tools and web-based archives to achieve quick access to vast amounts of literature and to information that was essential for mapping the relevant research area(s) of their projects and for contextualising the projects as a whole. The PI of the history case at UCL stated in this respect:

³ Je-S is the electronic grant services system that all the main research councils and other research-funding organisations use in the UK.

I would say that the percentage of material that I find online first has increased exponentially... I would say 75 percent I find online, whereas before it was the other way around, 25 percent online and 75 percent looking at new periodical shelves; that would have been the way five years ago. I would say that the amount of time devoted to finding out has gone down... to simply find things was a lot more laborious, now it's much faster than it was.

The PI of the politics case at the University of Edinburgh had heavily relied on the Internet for locating literature and government documents, and she expressed the opinion that online archives are considerably rich and continuously expanding: 'yes, the Internet for looking up the relevant literature, what's been written about... to see if there are any other projects dealing with some other things.... make sure that we reference the right people... also looking at sort of government documents, civil service reports, documents from various projects in this area... all of those things'. Similarly, the researchers in the politics case at the University of Nottingham made use of specialised sites such as the International Trade Union Confederation (ITUC) site to find statistics and information that would inform and properly contextualise their project:

Interviewer: I see that you also made use of the ITUC website to find some statistics, so did you access...

Interviewee 1: Yes, directly, as this is the best site at all levels. The United Nations also provide all of that...

Interviewer: So this would provide some international statistics on labour, economics, stuff like that? So, did you access such statistics online but you didn't download it as separate data files like Excel or SPSS data – right?

Interviewee 2: Yeah.

Finally, the PI of the Scottish literature case at the University of Glasgow appreciated the value of digital means and tools for research with respect to finding previously hidden or undiscovered literary resources and texts, while saving tremendous amount of time. However, he remained cautious of the assumption that everything is up online and digitised and still liked to remind himself that there may be materials that are not yet available online. Thus, he continued to make use of library archives and more traditional sources of literary materials, stating that such sources had played an important role in his project and also asserting that a lot of Burns materials (the subject of his research) are in private hands and the Burns community demographically consists of senior people who barely make use of digital technologies.

Digital technologies for fieldwork

Digital means of fieldwork appeared to be extremely popular in most of the studied cases. This was due to the wealth of databases and repositories available online as well as to the speeding up of data search and retrieval processes when technology is used:

Well, I can't imagine how editors worked in the 1960s or 1860s; they did a great job, given how difficult it was to find things. What we are finding now is simply through computer searches and we've got it all... they're putting so much online... quite simply, as I was working over the weekend, a small epic had been attributed to Burns and I had no proof that it's not by Burns; I wanted some information. So I simply went on Google books and I found ten pieces of information. In the old days, I wouldn't have a clue – you wouldn't be able to find those works. (PI, Scottish literature, University of Glasgow)

In addition, the researchers made heavy use of technology to store data and make data broadly available. They used file-sharing systems, such as Dropbox, and login-protected online repository systems or shared drives in order for data to become available for cross-reference and cross-analysis to the members of the project team, while they simply used website-housed databases when they wished the data to be available to the broader community. However, none of the interviewed researchers reported the use of cloud systems or Google Drive.

The exact technologies and platforms used for data collection and storage vary and mostly depend on the type of data appropriate to each project. For instance, researchers in the business case at the University of Manchester used advanced webscraping and webmining software to search for, retrieve and analyse unstructured website data of small companies that specialise in the manufacturing of energy and other green technologies in three countries (China, UK and USA). Researchers in this project also made use of Wayback Machine to access website archives and thus to analyse the prior web pages of the companies under study. The Co-I of the education project at the IoE referred to how collaboration in fieldwork can be achieved through the digital exchange of visual and other materials at a distance: 'The fact that Anne can send me a photo while she's still out in the field and I can reply to her and she can then do follow-up work that relates to that particular image is quite important; that can be quite powerful.'

In contrast, the literature, history and politics projects appeared to rely mostly on online databases and archives (e.g., LexisNexis, Hansard Society, literary studies archives etc.) to access and retrieve data in textual, documentary or multi-media format:

I'm looking for annual departmental reports for the Home Office from 1994 to 2014, which is the span of our project. Now if you try to look for stuff on the previous administrations, it

won't be on the Home Office website. The Home Office website doesn't have an archive. If you put it on Google you might get sent to the National Archives, but then you might have a snapshot of a website and not the actual or alive website, which can be frustrating. So then you put in the title of the document and you might find it by an NGO or maybe a parliamentary kiosk. You know, it's published by someone else and you can upload the pdf. So I've managed to find almost all of the annual reports that way [online]. (PI, politics, University of Edinburgh)

Nevertheless, the literature, history and politics researchers appeared to maintain a strong bond with old-fashion sites for data collection (e.g., libraries, museums etc.). Hence, they were still keen to use offline archives to access data and materials that had not been digitised or simply were not accessible online.

Digital technologies for data analysis and output reporting

We found that computer-based or online software is often used to facilitate and systematise data analysis. For instance, the researchers in the business case at the University of Manchester used advanced data manipulation and analysis software (e.g., Content Analytics, IBM and VantagePoint) that was appropriate for large volumes of unstructured web data. The researchers in the politics case at the University of Edinburgh used NVivo to analyse qualitative interview data. In addition, the video data in the education project at the University of Edinburgh were edited or cleared and then coded and analysed through the use of specialist software.

As regards the release of research outputs, in most cases the project website was the main venue for outputs to be reported, released or stored. The PI of the education case at the University of Edinburgh confirmed that all project outputs would be made available on the project website. The literature and history research cases in particular made extensive use of digitisation techniques and aspired to create web-based and highly interactive resources to present data, findings and outputs. For instance, in the history case at the University of Leeds, it was planned that the project website would be where the research outputs of the project would become available. The PI of this case was quite innovative in his approach, as he viewed the interactive website as a project output in its own right and held a similar view on the project blog, which, for him, could constitute a research archive.

Digital technologies for dissemination and public engagement

In terms of dissemination and public engagement activities, we found that, primarily, project-dedicated websites and social media platforms and, secondarily, emailing and research summaries on various sites were the main ways in which technology was used by social researchers for dissemination and public engagement activities.

In most interviews, the project-dedicated website was presented as the most significant technological platform for the dissemination of research work and for engaging the scholarly community or the broader public. Also, researchers seemed to appreciate the potential for viral and instant dissemination of social media tools such as blogs and Twitter. In a couple of cases, researchers also used videos as a dissemination tool, thus employing less conventional means of technologically facilitated dissemination. For instance, the researchers in the education project at the University of Edinburgh converted video data to a format that could be embedded into visual or multi-media presentations while also uploading videos to YouTube. The history and literature projects in particular made available online digitised resources (e.g., song recordings, digitised literary texts, interactive maps) as a means to disseminate their work. Digitisation appeared to be a key dissemination and impact tool for the literature projects in particular:

When we'll have Burns' letters, eventually that will be an online edition... The digital thing will allow us... all kinds of doors will open behind one another to give information instantly and easily in a way you can't get with a book. You open a book and you have to go and find another book... I would like the Correspondence to be ultimately an online edition that you click on, shuffle around, et cetera, et cetera. I would like the whole thing to become not just two-dimensional like a book, but multi-dimensional, I suppose. (PI, Scottish literature, University of Glasgow)

In some cases, though, dissemination was pursued at the end of the project rather than throughout the research. The politics case at the University of Nottingham was illustrative in this respect, as the researchers were planning to move ahead with the creation of an interactive project website to disseminate their work and promote public engagement after the official end date of the project. Similarly, the same researchers had considered the production of podcasts for dissemination, but again this was not something they had taken forward before the official end date of the project. In addition, in a couple of other cases, technological means of dissemination and public engagement were not valued as they were perceived as neither necessary nor particularly efficient. For instance, the PI of the business case at the University of Manchester mostly relied on non-technological means of dissemination:

We had a good workshop on data mining and innovation analysis in November last year [2013] which was part of the work in the Green Goods project.... We had special sessions on science and innovation in China. We had just two weeks ago a summer school with 29 PhD students from different parts of the world and two and a half days of that were on innovative methods, which is a grand thing for this project. We're having a policy workshop... Yes, so I think we have a very clear dissemination strategy but we never

promised that we will spend all of our time on social media... we do some social media communication but I wouldn't say that it's central.

As noted above, researchers in the Scottish literature case at the University of Glasgow had employed technology for dissemination of their research, but the Burns scholarly and local community, to which this project spoke, mostly cherished non-technological means of engagement with research: 'In the scholarly community but also in the Burns community because we know a lot of these people and they would phone up and just say "guess what I found"; and some of them are also friends. So that's the kind of thing that works' (PI, Scottish literature, University of Glasgow).

In any case, offline and online means of dissemination and public engagement often appeared to enhance each other. For instance, researchers made use of project websites, social media and other sites (e.g., SlideShare) to announce events, make available conference presentations and share project materials that had originally existed in an offline format. By the same token, researchers often used conferences and other offline dissemination and networking activities to promote social media events and website resources.

Role of digital technologies in project communication

Going beyond the multiple layers of the role that digital technologies played in the various phases of the research work, an interesting area of examination for this study has been the use of digital technologies for the (internal and external) communication activities of each of the studied cases and in all five disciplines.

Internal communication

Internal communication mostly involved face-to-face meetings, email and Skype communication. In addition, in most cases, online repositories and file-sharing systems (e.g., Dropbox) appeared to be vital for the functional and effective collaboration of the project members. For instance, the business case at the University of Manchester embraced both physical and technological means of communication between partners in China, the UK and the USA. Software and technologies that facilitated both synchronous and asynchronous communication and collaboration between the project researchers in the three countries were employed. At the same time, this project made use of PhD student and researcher exchange schemes as well as conferences and other events (e.g., summer schools) as platforms to enhance offline modes of project communication and collaboration. In contrast, the researchers in the English literature case at the University of Leicester made use of a project-dedicated website to facilitate asynchronous internal communication. Specifically, part of the website was used internally (i.e., it was login protected) for data

collection and the editors in the project contributed searchable text such as copy-texts, essays, articles and reviews, personal writings, comments and discussions. The researchers aimed for the material to comprise an online repository that was accessed and reviewed by the publisher (Oxford University Press) without being accessible to those outside the project. Generally speaking, though, when members of a project team live in different locations, technology is usually employed for internal communication purposes. For instance, one of the researchers in the education case at the IoE lived in Paris and, therefore, relied heavily on Skype and email to communicate with the other team members.

In a couple of cases, researchers painted a more complex picture of the use of face-to-face and technological means for internal communication, presenting online communication as being largely embedded in offline or face-to-face communication. For instance, the PI of the history case at the University of Leeds stated that when the project researchers met face-to-face they made sure they met in places where a Wi-Fi connection was available. Another distinct case was the politics project at the University of Nottingham, as internal communication involved scholars and NGOs in China, which meant that communication technologies were used extensively. In this project, not only Western- but also Chinese-specific platforms of communication, such as Weibo and WeChat, were used for internal communication in order to overcome the Internet access constraints in China and thus to allow communication with partners in China who lacked access to the communication platforms available to the UK-based researchers.

In terms of patterns of communication with research participants, face-to-face and phone communication were the most preferable modes for the recruitment of and communication with participants. For instance, researchers in the politics case at the University of Edinburgh stated that, due to the nature of politics research, they had a clear preference for face-to-face communication in approaching participants and conducting interviews with them. Likewise, the PI of the education project at the University of Edinburgh liked to approach project participants by phone or face to face rather than through emailing, unless he was requested to email first. One exception was the business case at the Open University, since the researcher who conducted the project's interviews made use of social media to recruit interview participants, although without much success, as he admitted. According to him, the reason he had used social media for participant recruitment was the difficulty he had encountered in recruiting home-based entrepreneurs through offline channels.

On the other hand, the politics case at Nottingham is distinct here again, as technologically mediated communication with participants from China proved quite difficult. Unlike workers in China, who were happy to be physically observed in the workplace, Chinese NGOs were particularly sceptical about sharing ideas and thoughts on labour-sensitive matters via technology. The interviews with labour organisations

and representatives from China took place either face to face or via the phone, as the interviewees were not happy with the idea of making use of Skype or other technological means to be interviewed. Thus, the primary interview data in this project consisted of a compilation of notes rather than audio-recorded data. This highlights that Chinese participants who have mostly been active in the domestic realm are affected by the Internet censorship regime of China and thus feel at risk whenever they are asked to communicate 'sensitive' information or ideas via Internet-based technology.

External communication

Similarly to internal communication, we found that external communication mostly relies on both physical and technological means. Conferences, workshops and publications are the conventional means for researchers to communicate their work externally, namely outside the project. On the other hand, emails, project websites and social media platforms are the main technological means of external communication. The PI of the history case at the University of Leeds appreciated the use of a website as the project's public interface and argued that websites can help researchers share and communicate their work with other researchers in the field. In this sense, he considered websites important for scholarly communication as well as of practical value as through them researchers outside a project can obtain useful information, knowledge and resources. In contrast, researchers in the Scottish literature case at the University of Glasgow problematised the role of social media platforms, such as Facebook, Twitter and blogs, in how they communicate a project to the scholarly and local community. For instance, the PI argued: 'The blog, originally, I thought it would, along with Facebook, facilitate a lot of discussion with the community. That hasn't happened as much as I thought, but from the website hits we know that people are reading that, people are looking at that but it hasn't been as dialogic as I thought it would be.'

Also, one of the research assistants in this project stated that social media are used differently by different people in the local community to obtain information about a project. According to her, Facebook and Twitter are more handy and engaging platforms than blogs due to their lower degree of formality and the lower effort required by the user to access content and information about a project. In the same vein, she noted that age matters, as the youngest people are more in favour of using Twitter and Facebook than blogs, while the oldest members of the local Burns community cherish face-to-face, mail or phone communication within a project.

Evaluation of digital technologies

In general, the researchers in all ten cases and in all five disciplines demonstrated that digital technologies are valued, although for different reasons, to different degrees and in relation to different parts and elements of research work.

Many researchers expressed a balanced view of the importance of digital technologies and argued that technology plays an ancillary role in research. For instance, the PI of the Scottish literature case at the University of Glasgow argued for the complementary and ancillary role that digital technologies play and pointed out that technology facilitated and supported the work that was carried out in the project. The PI of the history case at the University of Leeds was conscious of the importance of 'human feeling' in research work and referred to constraints that technology can place on researchers with respect to what research they can do and whether they can express themselves through research. Specifically, in discussing the use of volunteers to assist the project with the retrieval of historical trade data, he stated:

Volunteers get involved on the project website which works relatively effectively in terms of acting as a catalyst; we're getting volunteer researchers but not that many, maybe half a dozen people. But actually when I went out into the local studies library for an evening... I think it was about 6:00 in the evening when they've had a local history club and I just talked to them for 30 minutes, I showed them a few PowerPoint slides about what the project is and if anybody was interested... that worked more effectively relatively in terms of well-being in the sense that you've actually felt something and there was a connection there that you don't get if it's through email. So, I felt happier, they felt happier because there was something happening there that you don't get electronically.

Of course, the use of digital technologies in social research is not problem free. Some of the researchers stated the lack of a clear plan as to how, when and why to employ digital means of research work. Also, some expressed the view that what had been done in terms of the use of digital means of work was less than what had been promised to the funder, while sometimes it had been necessary to change their initial plans on the use of digital media and platforms of communication. For instance, the PI of the history case at the University of Leeds acknowledged that the way technology had been used in the project had diverted from their initial plans. An example was their interactive web map tool, as its initial production plan proved to be over-ambitious and the project lacked the knowledge base as well as the money and resources to practically pursue that plan. Thus, in the interview the PI described the steps taken to adjust the initial production plan and, hence, to ensure that a feasible interactive web map tool would be developed at some point. Similarly, the researchers in the politics case at the University of Nottingham

reported delays in the creation of an interactive project website and uncertainty about whether podcasts would be used for dissemination purposes and according to what they had put forward in the project proposal. The researchers in this case explained the gap between what they had proposed in the first instance and what they had taken forward to date on the basis of how research priorities had worked in the context of this project. Furthermore, the researchers in the politics case at the University of Edinburgh changed their initial plan to host the project on the departmental website as this made the project relatively invisible and hard to trace.

In addition, some researchers reported practical difficulties in their attempts to employ digital technologies; these difficulties mostly related to the institutional framework in which the researchers operated. For instance, the researchers in the politics case at the University of Edinburgh had difficulties with NVivo licencing, something that prevented them from proceeding to the analysis of interview data. Also, researchers in cases such as the Scottish literature project at the University of Glasgow, the history project at the University of Leeds and the English literature project at the University of Leicester encountered problems relating to the resources and support available at the institutional level for the employment of digital means of work.⁴ Lastly, the researchers faced the kinds of technology malfunctions that any other user can encounter, such as a slow or bad Internet connection, equipment crashing, data loss and so on.

Digital literacy and training

Another aim of the study was to examine the skills and level of expertise (observed and perceived) of the researchers so as to identify possible capacity or training needs for the effective use and full operationalisation of digital technologies in the future.

Digital literacy

Interestingly, we found that most of the researchers were satisfied with their knowledge and skills using digital technologies, while some were willing to learn and familiarise themselves more: 'Well, I'm quite fine with the communication tools that I have. I think I'd like to know more about what other tools or apps are available in terms of data analysis, methodological issues that end up here in the project. In terms of... how other people are using this stuff or what they are using, that's what I think' (PI, education, University of Edinburgh). The researchers reported on their digital literacy and skills on the grounds of purely subjective perceptions and also often by reporting facts and experiences. For instance, the PI of the Education case at

⁴ Institutional support is discussed in the 'Training and provision of support' section.

the University of Edinburgh reported on his computer-programming skills by reflecting on the following experience:

When I did my PhD, I got bored and I joined a greater group of people playing around with programming bits and we caught ourselves making stuff. I suppose it was a sort of design interaction group of a mixture of people who can program and people who can... and yeah we got just in a year and a half, we came out with five or six playful designs that were really good. So that taught me a lot of – Oh yeah, you could do that, you could do that... it gave me ideas.

Researchers also evaluated their digital skills and literacy by assessing their practices and performance in relation to the use of specific platforms and technologies. For instance, the PI of the history case at the University of Leeds argued: 'I've been blogging – well, research, project blogging – for ten years and I'm relatively familiar with WordPress. I'm not brilliant in terms of the... I'm good on; I can write the blogs and put photographs in; anything more complex... I wouldn't know.' At the perceptual level, the role of age came up quite a lot, with some researchers thinking that they lagged behind as they belonged to the generation of researchers who used to work entirely on paper and with print materials. For instance, the PI of the Scottish literature case at the University of Glasgow stated: 'I surely do not think about online and digital things in the same way that my younger colleagues do.' Similarly, the PI of the politics case at the University of Edinburgh stated:

I'm of this generation where ultimately I do like to look at something in a hard copy, so quite often you see I'm a little bit... I'm kind of a little bit in between. I went through my undergraduate university training writing hand-written essays... So in '93 I graduated and then when I did my masters we were just starting to do word processing. So I still... first thing I still quite like handwriting my ideas when I have – when I'm thinking randomly, in the creative process of thinking, and secondly I like reading stuff that's printed out.

As regards patterns of skills and literacy within the same case, it is interesting to note that researchers in the same project appeared to have dissimilar levels of digital literacy and a range of skills. Skills and literacy seemed to correlate to the role individual researchers had in the project and the extent to which they used technology as part of their project work. Many researchers stated that they had gone through new learning and skills enhancement in order to produce the work they envisaged for the project. For instance, the PI of the education case at the University of Edinburgh had to familiarise himself with the use of a camera in order to produce the video data required for the project.

The researchers' views of digital literacy in their research fields also varied. For instance, the PI of the education case at the IoE thought that in his sub-field of research (e-education) there is no literacy and knowledge capacity gap when it comes to research operationalisation of technology, but others problematised the extent to which researchers in their field are happy or prepared to make use of technology in their research. This is something we shed more light on in the section 'Role of digital technologies in the field'.

Training and provision of support

Researchers' digital literacy is closely related to the issue of training and the provision of support in the use of digital media in research.

In our discussions with the researchers in the ten different cases, we did not identify any particular technical training gaps or unmet needs. Most researchers referred to their training needs at the personal level as well as in relation to their project work, with most feeling quite content with the training or other skills-enhancement activities they had undertaken to date. This does not mean that researchers claim knowledge of everything concerning digital technologies and their use for research. On the contrary, they often coupled a sense of satisfaction with an understanding that keeping up with the use of digital technologies in research is an ongoing learning process: 'I don't claim to be great on the digital humanities agenda. I'm learning hopefully reasonably fast and I have, I got a hell of a lot more to learn' (PI, Scottish literature, University of Glasgow).

Whereas most of those involved in social media/blogging and website-related work in their project had undertaken some kind of training in the past, it appears that informal knowledge exchange and skills sharing between project members as well as between them and researchers outside the project was a quite popular practice. For instance, the PI of the education case at the University of Edinburgh stated his preference for independent and bespoke learning and skills enhancement and argued that this can be achieved through informal, face-to-face discussions with more experienced researchers about the technical needs of a project. For instance, he referred to the various skills he had developed over time, such as computer programming, video data production and YouTube video production, as skills he had developed through research collaboration or simply by asking knowledgeable people for advice and help. This demonstrates the existence of a research culture where informal and not-institutionally-framed knowledge exchange and skills sharing can often substitute or even replace formal forms of training.

In addition, some researchers expressed the need for non-technical training that would change researchers' mentality and ways of thinking with regard to how technology can facilitate research work. For instance, the PI of the education case at the IoE stressed that, within the broader field of education

research (depending on the specialisation of education researchers), there is a need for training and awareness-raising, not to advance researchers' technical knowledge but in order to change resistant mentalities and to enhance researchers' understanding of the research value of technology in general. In this respect, the main challenge for digital research in the future is in the realm of dealing with research traditionalism and mentalities that often dismiss the use of technology as a means and/or tool of research.

In terms of institutional support and training provision, most researchers stated that training was available but that there were institutional constraints (e.g., rigid institutional practices, bureaucracy) as well as a lack of bespoke support. For instance, researchers in the politics case at the University of Edinburgh noted that somewhat generic, non-bespoke IT support is offered at the institutional level and that this is a rather common problem for universities. Also, in most cases, institutional IT services were involved in training and technical assistance, although the researchers in the history case at the University of Leeds had to make use of external support and IT services to develop the required web tools.

Role of digital technologies in the field

Another study aim was to look at each of the five disciplines and examine researchers' views on the importance of digital technologies, especially with respect to the implications for research *impact* and *inter-disciplinarity* as well as for the *future prospects* of research in the discipline.

Importance of digital technologies

Researchers in all five studied disciplines valued digital means of work and recognised their increasing importance, although they did not dismiss traditional or non-digital research tools. Indicative is the statement of the PI of the Scottish literature case at the University of Glasgow: 'Literary studies are increasingly digital. And, maybe ten years ago, people were sceptical or were being dragged along. Now, the literary studies community and English studies across the world are all doing digitalisation and they know that it's the future; it's not in the future, it's the present.' Although most of the emphasis was placed on the value of digital technologies for the dissemination of research – which is a narrow perspective on the research use of digital technologies – many participants emphasised that digital technologies can result in huge time and effort savings while also offering access to an unprecedented wealth of information. The PI of the Scottish literature case at the University of Glasgow also stressed the transformative changes that digital technologies can bring to literary study and research with regard to dictionaries, lexicons, indexing and so on.

Some researchers provided a less conventional reflection on the role and importance of digital technologies in their respective research fields. The PI of the history case at the University of Leeds reflected on the value of digital technologies in humanities/history research more broadly and argued that technology is not only a means to quickly identify multiple sources of great volumes of data that speed up data collection and the overall research process but also a development that fundamentally challenges and reframes research questions, inviting humanities and history researchers to revisit their research questions and reposition themselves in the broader research field. At the same time, he was quite critical of the dominant trend in his field, as he thought that most historians view digital technologies as a great tool to access databases and speed up the research process, looking at the quantitative rather than the qualitative research implications of technology:

Most of the research projects that I've looked at... tend to be using just the premise of mass data; more data means more information, and I think they're missing a trick, in the sense that it isn't just about masses of data; it's about thinking about how the technology might reframe research questions or reposition you in relation to the research that you're undertaking, also allowing you to kind of think about the categories that already exist.

In this respect, he argued that his project could be a model, as, through the creation of an interactive website that aspires to make a wealth of research resources broadly available, digital technologies are employed in a way that is highly reflective and significantly reframes conventional research questions as well as the vision of similar projects in the field.

On the other hand, some researchers problematised the importance of digital technologies in their respective research fields. For instance, although researchers in the politics case at the University of Edinburgh considered social media important for future research in their field, they stressed that social media were not yet used extensively by all researchers in the field. The PI of this case expressed uncertainty about whether social media are better used for research or personal purposes and admitted she lacked the time to invest in social media while acknowledging the increasing importance of social media platforms for certain aspects of politics research. Also, the PI of the Scottish literature case at the University of Glasgow pointed out that age is an important parameter to consider in his field when it comes to how researchers view, evaluate and make use of digital technologies, as well as how research audiences use digital technologies to keep up with and receive information about research. Interestingly, the Co-I of the education case at the IoE stressed that education research consists of many different areas and sub-fields of research and that not all of them are equally positive about the use of technology in research work:

The people in philosophy of education, generally, are less excited about technology than people who are working over here on educational technology projects, not surprisingly. So, characterising the whole field of education on the basis of one or two areas of practice... there's a lot more, there's a lot... I think I'm speculating, but I should imagine at least a wide variation within each discipline as there is across disciplines.

Finally, the PI of the business case at the University of Manchester referred to technical challenges that researchers face in their attempt to collaboratively use digital means of work: 'it is an ineffective approach to use software and tools that were there and at some point to decide to replace them with other tools. Because there is a lot out there and they all vary.'

Role of digital technologies in research impact

In terms of how technologies might influence research impact, researchers in literature and history provided positive accounts of the role of digital technologies in enhancing research impact. For instance, the PI of the history case at the University of Leeds stressed how difficult it is to measure or demonstrate research impact in general but he associated digital technologies with research impact, mostly in terms of how digital technologies can make research relevant to and important for the public. Also, interestingly, the PI of the Scottish literature case at the University of Glasgow presented the research use of digital technologies and related outputs (e.g., online materials) as an important resource for teaching, emphasising the pedagogical role that online materials and resources can have. He even considered the digital resources produced in the project, such as digital recordings and interactive maps, potentially useful for the entire Scottish community, as they could promote Burns tourism in Scotland. In this vein, he envisaged collaboration in the future with Scottish organisations that are interested in making use of such digital resources and in developing them further. At the same time, researchers in disciplines such as politics seemed to think of research impact solely in terms of research dissemination and public engagement and they maintained that social media can enhance research impact by facilitating researchers' outreach activities.

Role of digital technologies in inter-disciplinarity

The researchers provided quite limited input on the ways in which digital technologies might make a difference to the future course of inter-disciplinary research. In some cases it even seemed that they were not particularly concerned with the subject of inter-disciplinarity, as if it had not been something they had engaged with or reflected upon. For instance, although inter-disciplinarity was extensively discussed with the PI of the history case at the University of Leeds, he expressed various general ideas about inter-disciplinarity, largely problematising its meaning and actual standing, but did not make any specific

references to the role of digital technologies. This indicated that for him inter-disciplinarity is not something that derives from or is significantly affected by the employment of digital technologies in research and, therefore, he did not think of inter-disciplinarity in association with digital technologies.

Role of digital technologies in the future

As regards the future importance of digital technologies in research, most of the researchers in all five disciplines considered digital technologies to be playing an increasingly important role in research in their field. The PI of the Scottish literature case at the University of Glasgow thought that in future online resources will replace the print, offline literary work and materials. Although he was strongly of the opinion that digital technologies and their outputs (e.g., digitalised content and resources) could not and should not be the foundation stone of his project, he anticipated that things would change in the future:

Technology changes all the time. So, who knows? All I know is that Glasgow University is obviously committed to maintaining this [online] material and its current form. At the end of the ten years – assuming that it's a ten-year funded project – it should still be there, it should be still – but who knows exactly what is going to happen? ... but there will be radically transformative platforms in ten years from now and who knows what those will be... I would not be surprised if in 10 years' time there is no critical monograph. I would not be surprised if in 20 years' time most editions are online.

On the other hand, the researchers largely avoided making concrete predictions about the research use of digital technologies in the future, mostly due to the unpredictability of the digital domain: 'I think the unpredictability of the shape of the digital environment in five years' time, ten years' time, fifteen years' time, is one thing that it's unpredictable and it's very hard to anticipate it. I've never successfully anticipated it. I've been wrong about it every time' (PI, history, UCL). Also, they broadly acknowledged that future opportunities will go hand in hand with challenges:

I think the next challenge is not about communication, it is about e-science. And, well, because we're working with large databases... somehow maybe physicists and medical scientists have worked out how to do that in multiple locations or even across campuses because this is a big campus and people don't talk to me all the time. So they're working and I think for social scientists it is also interesting and useful to learn about ways of working with data. I mean the kind of virtual work. (PI, business, University of Manchester)

Issues: An Emerging Digital Research Community and Culture?

The ultimate aim of this study was to reach preliminary conclusions on whether we can suggest the *rise of a digital research community* in the broader social research community in the UK. The findings presented above suggest that, regardless of discipline- and project-specific variations, there is an emerging and highly dynamic digital research community in the UK that is yet to develop concrete shape and features. This is to say that an emerging and dynamic digital research community runs across traditionally defined disciplinary boundaries in both social sciences and arts and humanities research, but it still lacks a clear research culture.

We can summarise the trends in this emerging and dynamic digital research community as follows:

- *Varying levels of digital knowledge and expertise.* Digital literacy and practices vary across the research community and among researchers, research projects and disciplines. Those who are practically involved in the use of digital means of work as part of individual or collaborative research constitute most of the researchers who report a satisfactory degree of knowledge and expertise in the use of digital technologies as tools and/or platforms of research.
- *Varying perceptions of the 'digital' as part of the research process.* Interestingly, we found that not only 'digital' practices but also perceptions of 'digital' vary among researchers, projects and disciplines. Researchers tend to develop their perceptions on the basis of existing or known categorisations of the 'digital', thus endorsing different perceptions and evaluations for different digital technologies, applications and services.
- *Gaps in institutional support and bespoke training.* The emerging digital research community seems not to be in great need of generic techno-centric training for digital literacy enhancement. However, we found that the community will be unable to become fully fledged unless, first, traditional research cultures that foster resistant attitudes to digital technologies are changed and, second, research institutions and universities offer bespoke support for the use of digital technologies while at the same time removing institutional constraints on the innovative and tailored usage of digital technologies in research.
- *Uncertainty about the role of digital technologies in future research.* The researchers thought that the digital realm will continue to develop rapidly and so they argued for the increasing importance of digital technologies in research. However, they seemed to be uncertain about how precisely digital technologies will influence research in the future, especially with regard to the qualitative changes that the digital will bring about for future research. This is mostly due to the unpredictability of the digital domain in general, as researchers are not confident making concrete plans and developing

specific visions about the use of digital technologies to promote high-impact and inter-disciplinary research in the future.

Impact

Overall, this study offers findings and insights that could usefully pave the way for a larger scale examination of the employment of digital technologies and tools in social research in the UK. Notwithstanding of the seed nature of the study, one could argue that:

1. The study sheds some light on the use of digital technologies in social research and highlights the parameters of complexity (e.g., level and quality of technology and/or its use); multiplicity (e.g., single or multiple technologies and/or uses); research timing (e.g., when technologies are used in the multi-staged research process); literacy (e.g., researchers' digital skills as well as the availability of associated resources and support); and the importance of technology for the impact, inter-disciplinarity and future prospects of research. This way, the study can inform the broader social research community in the country and trigger reflections on the rise of a digital research community with a distinct research culture. The findings could constitute the ground for conversations between researchers, research funders and technology experts on existing patterns of use of digital technologies in social research and associated opportunities and challenges.
2. The study offers insights into past 'failures' and current insufficiencies, pointing to lessons for researchers in the country. These are lessons such as:
 - the need to consult with other researchers and the broader scholarly community within and outside strict disciplinary boundaries in order to exchange knowledge and learn from each other's experiences;
 - the value of considering the needs and culture of the broader (non-scholarly) community and the 'target audience' of the research in order to develop a better understanding of how to best communicate research through technological means;
 - the importance of providing funders, research institutions and universities with recommendations on research capacity development and associated training and support provision.
3. This study provides universities and research institutions in the UK with feedback on the need for bespoke support and for a departure from the currently generic and 'one-size-fits-all' training provision. The study also points to the need for research institutions to conduct awareness-raising initiatives that will inform the research community on innovative research in general and on the benefits that come from the employment of digital technologies in research in particular.

Dissemination

The findings of the study will be disseminated through various means and activities in order to inform the broader research community in the UK as well as to pave the way for a follow-up, larger scale study.

Specifically, the present report will be disseminated to the broader research community in the UK through the Joint Information Systems Committee, the Economic and Social Research Council (ESRC) and the National Centre for Research Methods (NCRM). The preliminary results of the study were presented at the European Communication Research and Education Association (ECREA) Fifth European Communication Conference in Lisbon (12–15 November 2014) and at the Communities and Culture Network+ (CCN+) annual event at the University of Leeds (12–13 December 2014), while a line-up of conference and workshop presentations is being planned for 2015. The study will lead to the production of three peer-reviewed journal articles (journals under consideration: *Information, Communication & Society*; *International Journal of Social Research Methodology*; *New Media & Society*; *Qualitative Research*; *Studies in Qualitative Methodology*). Also, the findings of the study will be presented and discussed at a dissemination and engagement workshop in autumn 2015 that will involve members of the social research community, funding bodies and technology experts.

This seed study will form the basis of an ESRC grant application for a follow-up, larger scale study in collaboration with other UK higher education institutions (discussions have commenced with Cardiff University, the University of Brighton and the University of Hertfordshire). Among other aims, the larger scale study will enrich and develop the preliminary conclusions we have reached on the rise of a digital research community, and it will propose a typology of digital social research and also produce a best-practice guide for researchers who aim to employ digital technologies. In addition, the larger scale study will pursue systematic and ground-breaking knowledge and skills exchange as well as experience sharing between social researchers, funders and other stakeholders.

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Appendix: Research Cases

Title	Institution	Principal investigator	Discipline
Home-based businesses and online home-based businesses	Open University	Prof Elizabeth Daniel Dr Muhammad Naveed Anwar	Business
Sustaining growth for innovative new enterprises	University of Manchester	Prof Philip Shapira	Business
mCHW: a mobile learning intervention for community health workers	Institute of Education (IoE)	Dr Niall Winters	Education
Interaction, embodiment, and technologies in early years learning	University of Edinburgh	Dr Andrew Manches	Education
Law and the end of empire 2: AD 800–1150	University College London (UCL)	Dr Richard Salway	History
Antique dealers: the British antique trade in the 20th century	University of Leeds	Dr Mark Westgarth	History
Editing Robert Burns for the 21st century	University of Glasgow	Prof Gerard Carruthers	Literature
The complete works of Evelyn Waugh	University of Leicester	Prof Martin Stannard	Literature
The politics of monitoring: information, indicators and targets in climate change, defence and immigration policy	University of Edinburgh	Prof Christina Boswell	Politics
Globalisation, national transformation and workers' rights: an analysis of Chinese labour within the global economy	University of Nottingham	Prof Andreas Bieler	Politics