Literacy and Training in Digital Research: Researchers' Views in Five Social Science and Humanities Disciplines

Panayiota Tsatsou

Associate Professor

School of Media, Communication and Sociology

University of Leicester

Bankfield House, 132 New Walk

Leicester LE1 7JA

t: +44 116 252 2889

e: pt133@le.ac.uk

Abstract

This paper examines the views of researchers in five social science and humanities disciplines on their digital literacy and the training they need or have undertaken. Theoretically, the paper draws upon two competing conceptualisations of digital literacy: digital literacy as 'user skills' and digital literacy as 'user–technology interactivity'. Empirically, it suggests that social science and humanities researchers' understandings and evaluations of their digital literacy unfolds at two levels – the factual and the perceptual – and involves not only (technical) skills but also user experiences, emotions, and complex processes of learning, practicing and self-development when interacting with technology. Furthermore, researchers challenge the value of generic institutional training for literacy enhancement and envision the development of informal communities of experience exchange and knowledge-sharing across the research community. These findings lead to recommendations on training provision and support the conceptualisation of digital literacy as a process where user interactivity with technology results in certain experiences, reflections and lessons, rather than merely reflecting users' technical skills.

Keywords: digital research; digital literacy; training; humanities; social sciences; interviews

Introduction

Digital research involves the employment of digital technologies in research practices and is a rapidly growing area of scientific development and deliberation. Researchers have put forward the premise that digital technologies can both expand existing research interests and yield new research questions (Costigan, 1999). For instance, hyperlinks have given rise to (hyper)link research (e.g., De Maeyer, 2013; Park and Thelwall, 2003), websites have given rise to website analysis (e.g., McCluskey, 2013; Schweitzer, 2008) and search engines have fed the study of search-engine results and their politics (e.g., Granka, 2010; Mager, 2012). Furthermore, digital technologies have driven researchers to devise new methodological tools for research (e.g., Hughes, 2012; Markham and Baym, 2009), altering conventional methodologies, introducing digital methods and creating online versions of long-standing methodological approaches (Hine, 2005; Rogers, 2013).

Questions of research capacity and associated skills and literacy are embedded in such research and methodological breakthroughs, which mark the integration of digital tools and technologies in the research process. However, currently there is limited study of researchers' digital literacy and related challenges and particularly a lack of insight into researchers' views on their literacy and associated training needs when they employ digital means of research.

In order to address this gap, this paper presents the views of researchers on the meaning and state of their digital literacy as well as on the training they have undertaken or need for the optimal use of digital tools and services. Specifically, the paper examines researchers' digital literacy and training in five social science and humanities disciplines, also offering insight into the vigour of related disciplinary practices and traditions. The paper does not aim to promote the use of digital technologies in social science and humanities research, but it acknowledges that this is an increasingly popular trend that raises important questions regarding researchers' digital

literacy and the associated challenges relating to training and the provision of support. Hence, the paper theoretically reviews the concept of digital literacy and empirically tests its two competing conceptualisations (i.e., digital literacy as skills versus digital literacy as interactivity), aiming to address the following two research questions:

Q1: What are the views of researchers in five social science and humanities disciplines on the meaning and state of their digital literacy?

Q2: Are those researchers' views on their digital literacy linked to their undertaken training and training needs for the optimal use of digital tools and services in their research?

The next section discusses the two competing conceptualisations of digital literacy. Then, the paper reviews examples of digital research practices and showcases the significance of and emerging trends in researchers' digital literacy. This paves the way to point out knowledge gaps in researchers' literacy and how this study can address such gaps. The empirical part begins with a discussion of the qualitative methodology of the study and continues with the findings. The paper concludes with reflective remarks on the answers to the research questions and on how the study informs the theoretical debates on the concept of digital literacy and its two competing conceptualisations. The conclusion also points out the ways in which the study can inform institutional and research actors.

Digital literacy and competing conceptualisations

Ofcom (2015: 19) defines media literacy as 'the ability to use, understand and create media and communications in a variety of contexts'. Media literacy has gained prominence in accounts of digital media use and, from a literacy studies perspective, Mills (2010) has referred to a 'digital turn', namely the emergence of new literacy practices in digital environments and

across a variety of social contexts. However, researchers are yet to address complexities surrounding the definition and measurement of digital literacy (Bulger, 2012; Helsper and Eynon, 2013), while there are competing accounts of digital literacy's nature, importance and purposes (Livingstone et al., 2012).

Of importance is whether literacy depends solely on people's 'skills', 'ability' and 'competency' (Bawden, 2008; Brandtweiner et al., 2010; Hobbs, 2010; Koltay, 2011; Livingstone, 2004; Park, 2012). Hence, what follows presents two competing conceptualisations of digital literacy: digital literacy as 'user skills or abilities' and digital literacy as 'user–technology interactivity'.

Digital literacy as user skills or abilities

Early scholarly attempts to define digital literacy (e.g., Gilster, 1997) suggested that digital literacy consists of a set of enriched and challenging skills that go beyond the skills required for mass media communication. For instance, Carvin (2000) argued that digital media users should be not only 'technologically literate' (able to use technological tools effectively) but also 'information literate' (able to identify high-quality and/or appropriate digital content), 'adaptively literate' (able to develop new skills while using digital technologies) and 'occupationally literate' (able to apply digital skills to business, professional and occupational environments). Similarly, recent accounts suggest that Internet literacy consists of *Internet skills literacy*, namely the basic skills required for Internet use, including the ability to navigate a hypermedia environment, and *Internet information literacy*, namely the ability to sift through information so as to achieve certain needs (Kim and Yang, 2016).

Digital divide scholarship in particular has stressed the importance of digital skills in explaining digital exclusion and has identified skills with digital literacy (e.g., Brandtweiner et al., 2010; Gui and Argentin, 2011; Hargittai and Hinnant, 2008; Van Deursen and Van Dijk, 2010, 2015). Although this literature has gradually shifted emphasis from narrow technical skills

to informational, strategic, social creative and critical skills (Helsper, 2008; Helsper and Eynon, 2013), it has largely understood literacy through a skills lens and the user as bearing responsibility for the attainment of those skills (Thoman and Jolls, 2004). In this respect, Hargittai and Hinnant (2008: 605) have suggested: ‘that the way in which people utilize the Internet is at least in part driven by their online skills.’

Thus, although the interactive traits of digital technologies and the active role of the digital user have led scholars to acknowledge that digital literacy is multi-faceted, scholarly work has mostly interpreted digital literacy as the user’s skill or ability to access, use effectively and (re-)create elements of the digital. Even accounts that appear to go beyond such a skills framework and study different aspects of digital literacy, such as motivation to use digital media and engagement with it, rely on skills data and related policy evidence at the national and cross-national levels (Helsper and Van Deursen, 2015).

However, this paper suggests that skills and abilities are narrow concepts that fail to unpack the nuances of literacy and how literacy evolves during and throughout usage. Furthermore, people’s skills and abilities should be placed within a broader context and be seen as a social practice that takes place in complex social, cultural, economic and political milieus. This is particularly the case with digital literacy, which occurs in an overly complex and rapidly evolving technological context.

Digital literacy as user–technology interactivity

The need to contextualise digital literacy has been addressed to an extent by Livingstone (2004, 2008). About a decade ago, Livingstone approached the concept of digital literacy through people’s ‘relations with different media rather than...independently of them’ (2004: 8), in order to comprehend how users interpret, diverge from, conform to or recreate meanings in the process of engaging with digital media (2008: 55). Livingstone’s conceptualisation suggests that we look specifically at the interactivity between the user and technology for literacy

development, with interactivity involving not only skills but also learning, thinking and various modes of practicing.

Interactivity is a useful concept in its own right and has been theorised in disciplines that explore human–technology relationships. Szuprowicz (1995) identified three dimensions of interactivity: user-to-user, user-to-documents (or user-to-content/services) and user-to-computer (or user-to-technology). Similarly, McMillan (2002) talked about social interactivity (interactivity among users), textual interactivity (interactivity between users and documents/texts/services) and technical interactivity (interactivity between users and the system/medium/technology), while also directing attention to ‘the locus of control’. In turn, Rafaeli and Sudweeks (1997) argued that interactivity is a process-related construct, a continuum, a variable, not merely a condition or a characteristic of the medium, and that it can lead to multi-directional communication and various forms of cooperation.

In this sense, whereas the skills-based conceptualisation of digital literacy focuses on user ability, the concept of interactivity is central to understanding how users interpret, diverge from, conform to or recreate meanings in the process of engaging with digital media (Livingstone, 2008: 55). In this respect, user–technology interactivity assigns to literacy multiple layers of development, application and effects at the perceptual, knowledge and practical levels, suggesting the existence of a plurality of media literacies (Livingstone et al., 2012: 5). The idea of a plurality of media literacies challenges the prevalent perception of literacy as a static realm of skills, ability and expertise that determines experiences with technology before use.

Research questions, methods and data in digital research: the underlying significance of digital literacy

Such competing conceptualisations of digital literacy raise important questions not only for ordinary digital users but also for researchers in the fast-developing and ‘messy’ (Karpf, 2012: 645) digital research realm. These questions include: Is digital literacy important for digital researchers? How is digital literacy understood and experienced by digital researchers? And what are the implications of researchers’ digital literacy for the training or other support they need for the optimal use of digital means of work? This section presents digital research developments and associated practices and debates in relation to research questions, methodologies and data in digital research. In doing so, it briefly presents some indicative examples and areas of work, which do not provide an exhaustive account of such developments, nor do they undergo a detailed and evaluative discussion. This is so, as the aim of this section is not to provide a comprehensive discussion of digital research – an impossible task – but to briefly present some popular areas and practices of digital research that showcase the significance of and emerging trends in researchers’ digital literacy.

Digital research for inquiry into new and existing phenomena

In capturing existing phenomena in complex and rapidly evolving digital contexts, digital research revisits current and generates new research questions.

Examples of new research questions for the study of existing phenomena are questions concerning the role of digital technologies in citizen activism and digital facets of citizen mobilisation (e.g., Theocharis et al., 2015; Tremayne, 2014). For instance, Tremayne (2014) explored central players in and the framing of Twitter discourses relating to the Occupy Wall Street movement. To do so, he analysed the PeopleBrowsr archive of Twitter data for the hashtags #OccupyWallStreet and #OccupyWallSt, which yielded 4995 Twitter messages and a

dataset with 2699 vertices and 6573 unique edges. Then, he entered these data into NodeXL in order to perform a network analysis and coupled this with qualitative content analysis (Tremayne, 2014: 114–115).

Scholars have also studied the role of digital technologies in existing phenomena that do not relate to technology in an obvious way. For instance, Gibbs et al. (2015) studied the use of Instagram in relation to death. Their study aimed to shed light on discourses and practices around death and funerary practices on social media platforms, as well as on how social media are increasingly entwined with the places, events and rituals of mourning. To do so, Gibbs and his colleagues manually downloaded all public images, associated user data, text and comments with the hashtag #funeral. In addition, through Instagram's API, they collected and analysed metadata, including the filters used and any geo-tags associated with the collected images.

At the same time, digital technology generates new phenomena, trends and practices that comprise new objects of research inquiry. Social media and their attributes, as well as the motivations and patterns of their use, are examples of this (e.g., Kwon et al., 2014; Lee and Kim, 2014). For instance, Kwon et al. (2014) studied user acceptance of Facebook and Twitter and motivational factors in the use of social networking services. For their study, they posted a survey on the forums of ten social networking services in eight different nations. Others, such as Lee and Chen (2015), have studied the recent phenomenon of 'digital creativity' and how digital technologies support works of art in digital representation (text, layout, images, sounds, 3D objects, etc.). Lee and Chen identified 19 research themes in four categories of digital creativity through a complex study design in which they applied data-crawling techniques, used the intellectual structure technique developed by the information scientist, employed factor analysis to find the Pearson correlation coefficient matrix, and used the pathfinder scaling algorithm for data mapping.

Others have clearly introduced methodological novelty in the study of online trends or phenomena (e.g., Ceron et al., 2014; Chorley et al., 2015). For instance, Ceron et al. (2014) analysed social media to assess whether Internet users' attitudes could forecast the voting behaviour of the population. To do so, they measured online public opinion and applied statistics to perform sentiment analysis on blogs and online social networks. Another example is Chorley et al. (2015), who conducted an open online experiment in order to study human content filtering on Twitter. Their experiment asked Twitter users to choose between quantitative and qualitative metadata that described two pieces of Twitter content, without users being shown the actual content of the tweet. Such methodological novelty suggests a combination of mainstream and digital methodological approaches alongside the generation of both quantitative and qualitative data, assigning to digital research a high level of complexity.

Digital methods, data and expertise

The above examples of the study of new and existing phenomena challenge traditional research literacies, since researchers examine emerging and multi-faceted phenomena and, in doing so, they often employ novel research designs and hybrid methodological strategies.

At the same time, methodological novelty and complex data extraction, retrieval and analysis techniques are important trends in digital research. Specifically, 'digital methods' of research (Rogers, 2013) have been praised for generating new possibilities for broadly known and already widely used methodologies (Hewson, 2014). They give rise to novel approaches to research such as 'computational social science' (Lazer et al., 2009) and prompt interdisciplinary and cross-disciplinary research (Ruppert et al., 2013). On the other hand, many scholars have problematised digital methods, and Karpf (2012) has suggested that new research methods that are implemented in 'Internet time' are untested and often rely upon incomplete and systematically flawed online data sources. Some have even looked into specific methodological issues in digital research, such as sample representativeness and the study of hard-to-reach

populations (Barratt et al., 2015). Others have reflected on complex ethical issues in digital research, such as that of safeguarding participants' anonymity when digital communication is subject to surveillance (Barratt et al., 2015; Lyon, 2014). Such critical voices clearly indicate the literacy challenges that researchers encounter in relation to the conduct of interdisciplinary research, the quality control of online data sources, online population sampling and online research ethics.

Furthermore, digital data production, availability, retrieval and analysis can comprise literacy challenges for researchers. One main trend is the rapid generation and widespread availability of vast amounts of digital data (Floridi, 2012; Ruppert et al., 2013), such as social data (Kennedy et al., 2015: 172) and big data (boyd and Crawford, 2012; Kitchin 2014a; Mayer-Schonberger and Cukier, 2013). Some have praised big data, arguing that they comprise a revolution with broad consequences at all levels of social living (Mayer-Schonberger and Cukier, 2013). However, an increasing number of scholars have expressed their scepticism about whether big data and their analytics can enable new epistemological approaches to research practices (Kitchin, 2014a). Some question the innumerable volumes of big data available and the difficulty of digging into their qualitative aspects. Scholars have also problematised the ephemerality of digital data, their limited accessibility and the commercial interests that prevent the public and organisations from using them (Baym, 2013; boyd and Crawford, 2012; Karpf, 2012; Kennedy et al., 2014, 2015). Accordingly, others have pointed out the need for 'democratisation of [digital data] analytics' so as to end the exploitation of the public's data (Kennedy et al., 2014).

Recent accounts have also drawn upon technical and organisational barriers that prevent researchers from benefiting from online data. Such barriers include the narrow scope of datasets; limited access; poor data quality, veracity and fidelity; ill-defined lineage; poor interoperability; suspect analytics and ecological fallacies; and a weakly developed skills base and organisational

receptiveness (Kitchin, 2014b). In particular, scholars' scepticism concerning skills barriers goes hand in hand with their claims about expertise-related barriers to the use of digital, social or big data by individuals and organisations (Bassett, 2015; Kennedy et al., 2014, 2015). For instance, in their study of public sector organisations' use of digital data analysis tools, Kennedy et al. (2014, 2015) found a skills and expertise divide in data generation and collection, use of data-collection tools and data analysis. However, do skills and expertise divides of this nature comprise the core of the literacy challenges that researchers encounter in digital research? The following section takes a closer look at existing evidence on researchers' digital literacy and whether literacy is just about skills and expertise.

Researchers' digital literacy: just about skills and expertise?

Whereas the above examples of digital research practices showcase the significance of emerging trends in researchers' digital literacy, there has been limited insight into researchers' views on and evaluations of their digital literacy and associated challenges. Most of the existing scholarship focuses on the research usage of specific digital platforms and examines researchers' skills only peripherally and as part of their broader platform-specific usage experience (e.g., Budge et al., 2016; Quan-Haase et al., 2015). For instance, Budge, Lemon and McPherson's study of Twitter use within academic practices draws upon digital identities, academic literacies and digital scholarship, but it does not engage with questions of digital literacy.

Furthermore, references to researchers' digital literacy tend to give precedence to the conceptualisation of digital literacy as skills or abilities. Specifically, the few existing accounts of the role of digital literacy in the conduct of scientific research focus on digital skills and expertise and examine these parameters in relation to specific research activities, such as data

retrieval and analysis (e.g., Kennedy et al., 2014, 2015; Kitchin, 2014b). Kennedy and her colleagues (2014, 2015), for instance, found that the use of digital data analysis tools is more complex than what celebratory discourses suggest, as such tools require expertise and it is not always clear how they work.

Overall, it can be argued that there is a lack of insight into researchers' views and evaluations of the status of their digital literacy when they employ digital tools and, consequently, a lack of insight into their associated training needs. Literacy is an integral element of and a key factor in the various stages of the research process (e.g., research planning and design, fieldwork, dissemination and knowledge exchange). It is therefore imperative that we examine researchers' experiences with digital means of work as well as their views on and evaluations of digital literacy and their associated training or other support needs. The remainder of this paper aims to contribute towards this goal.

Methods

The study examined ten cases of UK-based research in the disciplines of business, education, history, literature and politics (see Appendix). Two research cases were selected from each discipline so as to explore analogous and dissimilar patterns in the appropriation of digital technologies within each discipline and across disciplines.

Unlike disciplines such as (new) media studies, informatics and computer science, the five studied disciplines are not directly related to or dependent on the development of digital technologies. This is in line with the study's broad aim to reflect, first, on levels of use of digital technologies for research purposes and, second, on researchers' views on and evaluations of their digital literacy in disciplines where digital technology is not an integral part or the very object of research. The studied cases comprised UK-based and externally funded research and

they satisfied the following conditions: firstly, they employed digital means of work – at least to an extent – so that they offered insights into the employment of digital tools in the research process; and secondly, they were ongoing research (at the time), so that timely insights into the use of digital means in research could be extracted. The selection of the research cases was not affected by either the extent of use of digital means of work or the research phase in which such means of work were employed, since the study aimed to explore various levels of use of digital technologies in various research activities.

Similarly, the sampling did not take into account variations in researchers' digital literacy or the aspects of literacy they were most interested in, since the study aimed to take an open and bottom-up approach that would reflect the researchers' potentially varying understandings and evaluations of their digital literacy. Thus, the study focused on researchers' reflections on their experiences with digital technologies and the meaning and state of their digital literacy rather than on the specific research activities for which the researchers' digital literacy appeared to be of importance. Lastly, it should be noted that the majority of the studied research cases came from London, the Midlands, Scotland and, more broadly, the northern UK. This was not deliberate and the cases were selected on the basis of the abovementioned criteria; besides, this was a qualitative study and thus geographical spread and representativeness in the sample of research cases were not required.

The study employed qualitative methods and the data collection consisted of two phases. The first consisted of collecting observation data (primarily) and demonstration or unstructured reflective data (secondarily) through nonparticipant observation and interactive communication with the participant researchers, respectively. The second consisted of collecting interview data via in-depth semi-structured qualitative interviews with the principal investigator (PI) and, in some cases, one or more other researchers in the studied research case.

The nonparticipant observation consisted of unobtrusive observation of one or more research activities (e.g., research group meetings, research events, production of research resources), depending on the action plan of the studied case and the researchers' own preferences. It involved the PI in the studied case and, depending on the nature of the observed activity, one or more other – senior or junior – researchers (e.g., when observing research team meetings). It took place before the in-depth interviews and aimed to establish how the researchers practically employed digital technologies and their associated experiences. One might challenge the decision not to conduct participant observation. However, researchers participating in the activities of other researchers could result in the latter acting non-spontaneously.

In a couple of research cases, the PI refused to consent to nonparticipant observation due to unsuitable timing, availability constraints or personal reservations. In such cases, the PI was offered the alternative of providing either a purposeful demonstration of one or more research activities or an unstructured reflective account of the research case as a whole. Thus, the data collected in this first phase were either written observation notes produced during non-participant observation or reflective notes generated during researchers' demonstration of a specific research activity or their unstructured reflective account of the research case as a whole. This is to say that the data collected in this phase varied in volume and nature, which was not seen as a problem, as it reflected the bottom-up approach of the study and the preferences and/or limitations of participant researchers.

In the second phase of data collection, semi-structured interviews were carried out. The number of interviews for each case depended on the size of the research team and the availability of the individual researchers. In total, 19 interviews were conducted and the sample of interviewees covered a range of research roles and seniority levels. The interview topic guide contained open-ended questions, which were informed by the aims of the study, the research

case review work conducted before the data collection, and the insights gained from the observation, demonstration and unstructured reflective data collected in the first phase.

NVivo 10.0 was used for data analysis, with analysis outputs consisting of textual and graphic analytic reflections on the key themes of the study. A coding framework was designed for the NVivo interview analysis, while new and revised codes were added throughout the analysis. The NVivo analysis was complemented by insights from the observations, demonstrations and unstructured reflective data, which enabled the study to reflect upon, unpack and even challenge some of the interviewees' words and evaluations as well as to draw out examples of activities and experiences that informed the interview insights further.

Overall, the data analysis ran at three levels:

- *Case level*: the main trends in each research case; similarities and differences across the participant researchers in each case.
- *Disciplinary level*: the main trends in each discipline; similarities and differences between the two research cases in each discipline.
- *Cross-disciplinary level*: the main trends across all five disciplines; their similarities and differences.

Findings

Researchers' views and evaluations of (their) digital literacy

As shown in Figure 1, the study examined the researchers' views of digital literacy, broadly speaking, and their digital literacy, both in general and in relation to the studied research case. Furthermore, it examined the researchers' views of other researchers' literacy within the same discipline so as to gain an insight into the role of disciplinary traditions and practices.

Figure 1: 'Digital literacy' model

Most of the researchers were satisfied with their knowledge and skills in using digital technologies in their research activities. While some acknowledged that there is a lot to learn and some appeared quite keen to learn more, skills per se did not seem to be of concern, as many suggested that digital technologies have a relatively low threshold of required skills for some research activities. The words of the PI of the history case at University College London (UCL) are indicative, suggesting that online databases and digitised historical materials make certain research tasks easier: 'One thing that it [an online version of materials or online database] does is to allow researchers to get access to these materials with a much lower level of specialist knowledge than was it was needed before, when it was just printed editions.'

Interestingly, when the participant researchers discussed their digital literacy in general, they referred to subjective perceptions and interpretations rather than to concrete evidence of their digital skills. In presenting their perceptions, the role of age was mentioned extensively, as senior researchers (mostly PIs) in particular assessed their digital literacy as lagging behind due to their being older and used to working on paper. On the other hand, when they discussed their

digital literacy within their respective research cases, they referred to facts rather than to subjective perceptions. Researchers in the same research case appeared to have dissimilar levels of digital literacy, as their literacy seemed to correlate with the extent to which use of digital technology was required to fulfil their research role(s) in the case.

In talking through both their perceptions and factual evidence of their digital literacy, the participant researchers reflected on their interactivity with various forms of digital and non-digital (e.g., print) means of research. In this sense, they indicated that interactivity can either suggest advancement of their digital literacy or keep them fond of older, non-digital means of conducting research:

I won a phenomenal grant, so I had to create a video for it, and I learned that you can sort of cheat by just putting your power point slides... but it's a bit flat and you have to use music... but I'm getting better because I've just created one for my company, so now I have to work with graphic designers to do that and part of the grant is to correct a clip... if I get more confident, I will bring in those skills of media or graphic designers to make it look a bit better, YouTube-y rather than a typical academic one. (PI, Education, University of Edinburgh)

To me the kind of flicking through, browsing is much easier in a physical version than a pdf one. So, if, let's say, I've got to upload ten documents and there's one I want to look right away, I might well print it out and then flick through it... I do feel that it's [a pdf] less accessible in a kind of psychological way almost. I mean, I know [print] it's accessible, I can read it. So maybe, in a way, that's a bit of a disadvantage for me. (PI, Politics, University of Edinburgh)

While only a few participant researchers discussed other researchers' digital literacy, they were quite critical of the state of digital literacy in their respective disciplines. For instance,

the education researchers at the Institute of Education argued that other education researchers, such as education philosophers, are digitally illiterate and do not integrate digital technologies into their research work. Furthermore, some participant researchers problematised whether technical skills ensure the efficient employment of technology in their respective disciplines and encouraged a reflective and contextualised use of digital technology that goes beyond technical skills and allows researchers to reframe their research questions:

I still think that the way that researchers are using it [technology] is relatively conventional... I'm not just extracting more information... it isn't just about masses of data. It's about thinking about how this, how the technology might reframe research questions or reposition you in relation to the research that you're undertaking and also allow you to think about the categories that already exist.
(PI, History, University of Leeds)

At the cross-disciplinary level, the study found that the education researchers (primarily) and the history, literature and politics researchers (secondarily) were more concerned with digital literacy than the business researchers (see Table 1). As shown in Table 1, the business researchers appeared to be rather uninterested in discussing literacy, as they made no references to their own digital literacy and only a couple of times referred to literacy-related matters in the studied research case or in relation to other researchers. At the same time, though, the study found that the business researchers were very confident about their use of digital technologies, but whether there is a correlation between confident digital use and level of concern with digital literacy is something that this study cannot conclude. One could also assume that the education researchers referred to digital literacy more than the other researchers (as shown in Table 1) because the concept of literacy is more typical of their discipline and, therefore, they are more familiar with it than the other researchers. While this is one possible explanation, the study

examined just two research cases in each discipline, which does not allow for safe or strong conclusions. Therefore, evidence at this level of analysis should be treated with caution.

Table 1: Occurrences of the theme of digital literacy by discipline

Digital literacy model	Business	Education	History	Literature	Politics	Total
Digital literacy in general	0	3	3	0	1	7
Digital literacy in the research case	3	9	7	2	2	23
Perceptions of other researchers' digital literacy	2	0	1	4	0	7
Perceptions of own digital literacy in general	0	2	2	4	5	13
Perceptions of own digital literacy in the research case	0	4	1	1	1	7
Total	5	18	14	11	9	

The next section sheds light on how researchers' views of their digital literacy might be linked to the training they have undertaken or need, and whether such training is or is not about skills enhancement.

Researchers' training experiences and needs

As shown in Figure 2, the study examined the training researchers had undertaken and their views on their and other researchers' training needs. Furthermore, the researchers reported on the level and quality of institutional training provision, and they identified possible gaps in such provision.

Figure 2: 'Training in digital technologies' model

Many of the researchers, especially those involved in social media/bloggging and website-related work, appeared to have undertaken training. At the same time, many appeared to have resorted to informal knowledge exchange and skills-sharing with other researchers from within or outside their discipline. For instance, the PI of the education case at the University of Edinburgh had developed skills in computer programming, video data production and YouTube video production through collaboration or by simply asking other knowledgeable researchers for help. Similarly, the research assistant in the business case at the University of Manchester stated that researchers in the same institution had assisted him with the use of advanced software, such as IBM Content Analytics, Stata and web-scraping software. Furthermore, self-guided learning appeared to have helped researchers engage with targeted learning practices. The PI of the history case at UCL, for instance, had used the manual *Teach Yourself HTML* to develop his project website, while the postdoctoral researcher in the business case at the Open University had used self-guided learning and webinars to become familiar with NVivo.

The study did not find any major technical training gaps or unmet needs among the participant researchers. Although the researchers acknowledged that there is a lot more out there that they could learn, they were quite careful about what they chose to learn, as they considered training an investment of time and effort that must offer tangible and worthwhile gains. In assessing other researchers' training needs, they referred to disciplinary traditions and the different training needs of different disciplines. For instance, the PI of the literature case at the University of Leicester argued that researchers in humanities are in greater need of training than science researchers, as 'people in science are probably more likely to be trained up in sophisticated IT skills through their undergraduate degree'. Furthermore, some brought up the need for non-technical training to change researchers' mentality towards technology. For instance, the PI of the education case at the Institute of Education mentioned the need for awareness-raising in education research in order to change education researchers' resistant mentalities and enhance their understanding of the research value of technology.

Regarding institutional training provision, some researchers expressed their satisfaction with its range and quality: 'there are seminars around big data and new tools such as R... the school is very good with that kind of training' (research assistant, business case, University of Manchester). However, as noted above, many had sought informal help from colleagues or engaged in self-guided learning and were critical of standardised, non-bespoke training provision. Furthermore, most pointed to the dominance of rigid institutional practices and institutional bureaucracy, which arguably deprive researchers of the opportunity to make independent decisions about the digital content, services and tools they can use in their research.

Accordingly, and in line with their view of digital literacy as tending to be enhanced through informal knowledge-sharing, some researchers referred to the need for institutions to bring researchers together to share knowledge and develop communities of practice. In this sense, training was largely conceived as a set of practices that goes beyond the development of

technical skills and involves informal knowledge reflection, exchange and sharing with other researchers. This understanding of training goes hand in hand with and, in fact, raises the need for the existence of a culture of co-learning and sharing across the research community. At the same time, it greatly supports the conception of digital literacy as a process wherein user interactivity with digital technology results in certain experiences, reflections and lessons, rather than being a mere reflection of users' technical skills.

Conclusion

This paper has examined the concept of digital literacy and provided insights into its understanding and evaluation within the context of digital research, building on data derived from researchers in five social science and humanities disciplines who use digital technologies in their research. First, it discussed two competing conceptualisations of digital literacy. Second, it demonstrated the significant presence of literacy in a series of study areas and practices in digital research, and it noted the lack of evidence regarding researchers' views of their digital literacy. Then, the paper reported on a qualitative study of ten research cases in the five studied disciplines and presented findings on the researchers' views of their digital literacy and how such views might be linked to associated training, either undertaken or needed.

Regarding the first research question (i.e., researchers' views on the meaning and state of their digital literacy), the findings suggest that researchers' understanding and evaluation of their digital literacy unfold on two levels: the factual and the perceptual. At the factual level, researchers draw upon their experiences of using digital technology to fulfil specific research roles and report on events that occur during usage. At the perceptual level, they draw upon subjective perceptions and interpretations of their digital literacy rather than concrete evidence of their digital skills. Overall, researchers' understandings and evaluations of their digital

literacy appear to involve not just technical skills but also experiences, emotions and complex processes of learning, practicing and self-development when interacting with technology. This challenges the skills approach to literacy (e.g., Carvin, 2000; Gilster, 1997; Kim and Yang, 2016) and suggests that digital users in the research community take a reflective approach to their interaction with digital technologies, and as per Livingstone's argument (2004, 2008).

Furthermore, the study found that digital literacy varies not only between individual researchers but also within the same research case and discipline, as well as across disciplines. Different researchers are involved in the use of digital means of work to different degrees and for different purposes, resulting in diverse experiences with and outcomes from the use of digital tools. At the level of discipline, the study found that the education researchers (primarily) and the history, literature and politics researchers (secondarily) were more concerned with their digital literacy than the business researchers. The latter were not only less interested in reflecting on their literacy but also more confident with digital technologies. Given that the study examined just two research cases for each discipline, generalisable conclusions could not be reached.

The study also generated insights that address the second research question (i.e., whether researchers' views on their digital literacy are linked to the training they have undertaken or need). Overall, the researchers' understandings and evaluations of their literacy appeared to drive their attitudes to training and what training they envisaged undertaking for the enhancement of their digital literacy, if any. Specifically, the participant researchers expressed mixed feelings about formal training as well as doubts about whether undertaking training in the future would be worth their time and energy. They even challenged the value of institutional training, as they did not appreciate the generic and prescriptive training that research institutions tend to provide. In contrast, they supported the development of informal communities of practice for the exchange of experiences and sharing of knowledge across the research community. In

this sense, the findings highlight the need to develop a research culture that encourages practices of informal and non-institutionally prescribed experience exchange and knowledge-sharing. In turn, this further supports the understanding of digital literacy as a process where interactivity with digital technology results in certain experiences, reflections and lessons and not just in technical skills, while having the potential to encourage the development of new relationships and forms of support in the broader research community.

Hence, the study suggests that digital literacy in digital research is not just about technical skills and involves researchers' experiences, emotions and complex processes of learning, practicing and self-development when they interact with technology. In this sense, it demonstrates the value of conceptualising digital literacy as interactivity with digital technologies, with interactivity resulting in the researchers who employ digital technology either advancing their digital literacy or remaining fond of older, non-digital means of research. The study makes an important scholarly contribution, as it problematizes popular conceptualisations of digital literacy as skills and capabilities, while it reflects upon and empirically informs the alternative conceptualisation of literacy as user-technology interactivity. In addition, this is the first study in the realm of digital research that explores the views of researchers of their digital literacy and associated training needs when they employ digital means of research work. Similarly, it is the first study that empirically explores researchers' digital literacy in five different disciplines, with its analysis running at the research project/case, disciplinary and cross-disciplinary levels.

While the study challenges the skills conceptualisation of literacy more broadly, it informs research funders, institutions and universities regarding the development of research capacity and of associated IT training and support provision. From a training perspective in particular, the findings highlight the need to depart from 'one size fits all' training provision and points out researchers' need to get together and create informal communities of practice so as to

share digital-technology-related knowledge and exchange experiences. Researchers appear to seek new ways to extend their knowledge and practices beyond rigid disciplinary boundaries, thus in a way practising interdisciplinarity, which is one of the foundations of digital research.

Nevertheless, this study is not free of limitations. First, a larger-scale study would be desirable, as the sample of ten research cases covered only certain parts of the United Kingdom and did not include regions such as Wales. As noted above, it only involved two cases of research for each of the five selected social science and humanities disciplines, thus precluding strong conclusions being reached at the disciplinary and cross-disciplinary levels of analysis. Furthermore, digital literacy in the context of digital research can mean many different things and involves a range of experiences and practices, which was not a factor that was fully addressed in the study. Although the aim of the study was not to offer a typology of research activities in which digital literacy is of importance, it would be useful if future studies were to elaborate on how researchers' understandings and evaluations of their digital literacy might vary by research activity and across phases of the research process.

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Author biography

Panayiota Tsatsou is an Associate Professor of Media and Communication at the University of Leicester. Her research interests lie in the broader field of digital media and her publications aim at intellectual and research advancement in the following areas: digital divides/digital inclusion, Internet studies, digital research, digital media and civic participation and digital policy and regulation. More info on her work can be found at <http://www2.le.ac.uk/departments/media/people/dr-panayiota-tsatsou>.

Appendix I

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