Journal of Siberian Federal University. Humanities & Social Sciences 2 (2016 9) 517-524
~ ~ ~

УДК 130

A Computational Turn in the Humanities? A Perspective from Science and Technology Studies

Sally Wyatt*
Humanities group, Royal Netherlands Academy of Arts and Sciences
PO Box 94264, 1090 GG Amsterdam, The Netherlands

Received 01.01.2016, received in revised form 10.02.2016, accepted 20.02.2016

This article examines the implications of the use of computer-based tools and techniques within the humanities, a phenomenon which has exhibited considerable growth and popularity over recent years. The first section provides some historical context for understanding these developments, and the second section assesses the meaning of these developments for the research practices of humanities scholars. The final section raises further questions and challenges facing those wishing to deploy and promote 'digital humanities'. The article is informed by insights and perspectives from another interdisciplinary field, namely 'science and technology studies' (STS). STS is concerned with, among other things, the material basis of knowledge production, and thus has much to offer to understanding the use of digital technologies within the humanities.

Keywords: digital humanities, science and technology studies, Mode 2.

DOI: 10.17516/1997-1370-2016-9-2-517-524.

Research area: culture studies, sociology.

Introduction

Over the past decades, digital technologies in all their forms have affected the ways in which scientists, scholars and researchers go about their work. Some changes are profound, not only in the heartland of computer science itself but also more widely. For example, the application of computational tools and methods has led to the emergence of new fields, such as bio-informatics, and radically affected physics and other disciplines, leading to new insights and generating new research questions. Other applicationsmay appear at first sight to be quite mundane, such as sending email to colleagues instead of letters, and using word processing software instead of manual typewriters to prepare manuscripts, but even these can have profound implications for the nature of scholarly work and the division of labour. Considerable attention has been paid to what such changes mean for the STEM (science, technology, engineering, medicine) disciplines, but relatively less to what they mean for the humanities and social sciences. Nonetheless, such technologies are also being taken up in the humanities, and digital humanities is beginning to demonstrate many of the features of a discipline, with its own conferences, journals and professional associations, such as the annual

* Corresponding author E-mail address: sally.wyatt@ehumanities.knaw.nl

conference organised by the Alliance of Digital Humanities Organizations (ADHO), and the journal *Digital Scholarship in the Humanities*. (SeeWhitley(2000) for an analysis of how disciplines emerge.)

In this article, I examine what these changes could mean for the humanities, drawing on insights from science and technology studies (STS) and the history and philosophy of scienceabout the nature of knowing and of knowledge. First, I provide some historical context for situating these changes before proceeding to examine some of the definitions of digital humanities (DH). I then turn to outlining some of the challenges facing those doing and promoting digital humanities, before concluding with some suggestions for achieving the kinds of technologies needed to support open and pluralistic humanities research. The focus of this article is on research. Of course, these same technologies can and are being used in teaching, the other main task of universities.

Knowledge production in the post-war period

In western countries, since the end of the Second World War (1939-1945), long-established hierarchies and practices of scholarly knowledge production have been challenged by wider societal developments. Elsewhere (Wyatt et al, 2013), I have referred to these as growth, accountability, network effects, and technology. 'Growth' refers to the overall expansion of the university system, accompanied by an increase in overall numbers of students, staff and subjects. This increase was accompanied by greater diversity in students and staff, with more women, ethnic minorities and working class people gaining access to what had traditionally been a privileged site of learning for white men from the middle and upper classes. This greater diversity of people resulted in the emergence of new fields of enquiry of direct concern to the new participants, such as gender, ethnicity and sexuality studies. Other fields emerged that were associated with the emergence of new objects of study, such as television and later the internet in the case of (new) media studies. By the end of the 20th century, there was a growing commitment by universities and funding agencies to interdisciplinary topics and approaches, often supported by importing instruments from one field into another.

'Accountability' refers to the growing involvement of non-academic social actors in setting the research agenda for academic-based researchers. Not only government bodies, but also for-profit corporations and civil society groups, are increasingly involved in steering and assessing academic output. Researchers are often expected to justify their research questions and outputs in terms of their societal impact, sometimes reduced to economic valorisation.

'Network effects' is another way of capturing not only interdisciplinarity, already mentioned under 'growth', but also increased size more generally. The apparent success of 'big science' in physics and biology in the post-war period has led many research policy makers and managers to believe that large teams working across national, institutional and disciplinary boundaries is the ideal way of organizing research. Large-scale collaborations, building on complex social and technical networks, are strongly promoted by national and transnational bodies, including the European Commission. CERN (European Organization for Nuclear Research) and the Human Genome Project are paradigm examples of this phenomenon.

Finally, 'technology', especially computer-based network technologies, have been taken up in all fields and in all stages of research. Moreover, such technologies are implicated in the above, as they are used to reach new audiences (in teaching and research), to facilitate collaboration

between researchers, and to process the data used to monitor and evaluate research output.

These developments have already received a great deal of attention in the literature, particularly as they affect the STEM disciplines. Various labels have been assigned to them, including 'Mode 2 knowledge production' (Nowotny, Scott and Gibbons, 2001), 'post-normal science' (Funtowicz and Ravetz, 1993), 'technoscience' (Latour, 1987; Haraway, 1985) and the 'triple helix' (Leydesdorff and Etzkowitz, 1998). In the next section, I turn to what these developments mean for the humanities, and to some extent also for the social sciences.

Defining digital humanities

Given my own background in another post-war, interdisciplinary field, namely science and technology studies (STS)[1], it is hardly surprising that I focus on technology, the fourth development mentioned above. But there are good, independent reasons for doing so, beyond my own knowledge and training. Technology offers a valuable analytic starting point when aiming to understand DH. It is not the technical tools as such that provide this starting point, but the ways in which technology stimulates reflection about research objects, methods and practices. I suggest that there remains a need for greater reflexivity within the DH community about what digital technologies mean for how knowledge is produced and represented.

As mentioned above, there are already some concepts in wide circulation to capture the broad changes that the western research and university system underwent in the second half of the 20th century. But there are also many concepts being used to capture more specific changes, such as cyberinfrastructure, e-science and virtual research environments. Table 1 presents two lists, one of all the possible descriptors, such as cyber and virtual, and the other of all possible objects, including infrastructure and science. Some of these are in wider use than others, and their popularity changes over time and across countries. Of course, the possible combinations are also language dependent, with *mosaïque* and *numérique* being more usual in French. Words are never neutral, and each combination carries particular connotations. The terms are used not only to denote objects in the world but also to carry the promises of change and improvement that so often accompany technological innovation (Brown, Rappert and Webster, 2000).

Table 1. Possible terms for capturing digitally supported forms of knowledge production

Adjective	Noun
virtual	science
cyber-	research
data-driven	knowledge
e (electronic)	scholarship
e (enhanced)	social sciences
e (executable)	humanities
i (interactive)	infrastructure
computer (mediated)	methods
online	tools
big	models
distance	objects
tele-	publications
computational	data
p (personalized)	hermeneutics
digital	simulations
smart	interpretations

Other scholars have recounted some of the histories of different terms, including Christine Borgman (2007) for cyberinfrastructure and digital scholarship, and Christine Hine (2008) for cyberscience. Nicholas Jankowski (2009) has addressed the debates around e-science and e-research, particularly acute in the English language. E-science connotes data-intensive, quantitative pursuits of knowledge, dependent

on high-performance computing. E-research, on the other hand, can be interpreted more openly, to include the humanities and social sciences and other ways of using digital technologies to support the production and distribution of knowledge, via mailing lists and blogs, for example. Based on his analysis of the policy documents surrounding the development and promotion of networked computers in knowledge production in the US and the UK, Jankowski suggests that 'taken as a whole, these features suggest that e-research is a form of scholarship conducted in a network environment utilizing Internet-based tools and involving collaboration among scholars separated by distance, often on a global scale' (Jankowski, 2009, p.7). This resonates with the description of 'network effects' given above, about how knowledge production has increased in scale and scope, is interdisciplinary and international. The *Digital Humanities Manifesto 2.0* appeared in the same year, and defines the field as follows:

> Digital Humanities is not a unified field but an array of convergent practicesthatexplore a universe in which: a) print is no longer the exclusive or the normativemedium in which knowledge is produced and/or disseminated; instead, print findsitself absorbed into new, multimedia configurations; and b) digital tools,techniques, and media have altered the production and dissemination ofknowledge in the arts, human and social sciences. (Schnapp, Lunenfeld and Presner, 2009, p.2)

This definition also highlights the diversity of practices and media, but nonetheless focuses on the importance of the digital in the production of knowledge. In his analysis of the myriad definitions produced during the annual 'Day of Digital Humanities' (when self-identifying DH scholarshave been invited not only to share what they do on a particular day but also to provide a definition of digital humanities), Fred Gibbs (2013) finds that the overwhelming majority of definitions is unsurprisingly a 'variation on "the application of technology to humanities work"' (Gibbs, 2013, p.290). This emphasis on the digital raises an important epistemological question, namely whether it is always necessary to transform the object of research into digital form in order to do digital humanities, or e-research? In turn, this raises questions about the relationship between the digital and the physical worlds, and the implications for research questions, methods and results, particularly in the humanities, where large quantities of archival material have not yet been digitised. In Europe,23% of material in cultural heritage institutions is available in digital form (Nauta and van den Heuvel, 2015, p.4), but some of that has been scanned in a way that makes it not easily amenable for scholarly analysis.

In his comprehensive history of styles of thinking in European thought, Alistair Crombie (1994) identifies six main styles: deductive reasoning, experimental, taxonomical, analogical-hypothetical, statistical, and historical-evolutionary. I will not discuss each of these in detail here, but a few general points do need to be made. First, every style introduces a new 'world' in the form of objects of research, and criteria for truth and falsity. Second, styles go beyond particular micro-social contexts of labs or groups. Third, these styles provide a framework for doing historical and philosophical research. And, fourth, while these styles have emerged at particular historical moments, a new style does not completely replace the old ones (Hacking, 1992; Kwa, 2011; Radder, 1997). The question currently facing us is whether we are witnessing the emergence of a seventh, computational style that is data-driven and algorithm-driven, reliant on high-performance computing, or whether

digital technologies are being enrolled to supplement existing styles creating hybrids such as a computational-taxonomical style. Of course, both could be possible.

Together with other colleagues working at the Virtual Knowledge Studio (2006-2010), we put forward the concept of 'virtual knowledge' as a way of capturing some of the changes affecting the humanities and the social sciences. We chose 'knowledge' because it is even broader than science and research. As already mentioned, in the English language, science is largely used to denote the 'hard' areas of enquiry such as physics, chemistry and biology. Research can be interpreted as goal-driven, specialised activities undertaken in universities or commercial labs. Knowledge, however, is closer to the perception of scholarship familiar to those working in the humanities, and at the same time is familiar for a much wider range of people as knowledge is something used and produced in a variety of social settings. 'Virtual' is also an evocative term that aims to evoke more than the technological. Following Brian Massumi (1998), we think of the virtual as 'a mode of reality implicated in the emergence of new potentials' (Wyatt et al, 2013, p.11). Virtual knowledge is not simply that which is produced using digital tools or resources, but it 'invokes creativity, potential, and dynamism in combination with actual practices and understandings. It also /emphasizes the ongoing dynamics of change, both in the form and content of knowledge and in the craft of generating new knowledge' (Wyatt et al, 2013, pp.11-12).

In summary, digital humanities fits well within the broader trends which characterise the system of post-war knowledge production outlined in the previous section. But what we also know from the history and philosophy of science and from many studies in STS about the practices of science is that (virtual) knowledge is always inscribed in and by instruments, whether it be a telescope or a networked database. Such studies have also demonstrated that knowledge is deeply social, both in the context of discovery such as the lab or the library, and also in the context of justification, including the publications. Finally, as Paul Edwards (2010) has so convincingly shown in his work on climate science, infrastructures for the production of knowledge and the practices of producing knowledge influence one another. In other words, research infrastructures cannot be built, they always evolve, in tandem with the practices and expectations of researchers and research policy makers (see also Kaltenbrunner (2015) for an analysis of DH infrastructures).

Challenges facing digital humanists

Applying tools, methods and insights from computer and information sciences to humanities questions and concerns can clearly be very productive in addressing long-standing humanities research questions in innovative ways, and in generating new questions. But there are a number of challenges facing digital humanists. In 2011, based on four case studies, Monica Bulger and her colleagues (2011, p.73) identified a number of barriers to the use of digital resources by humanities scholars. These include a lack of awareness of tools and of the potential of even standard software, a lack of standardization of online databases and archives, inadequate annotation tools, unstable access to remote resources, and lack of institutional training and support. Furthermore, the pace of technological change means that scholars undergo multiple learning experiences as they develop and use tools or resources for particular projects and then come back to them a year or more later by which time crucial features or interfaces may have changed. There are other well-known challenges, including the difficulty of recognizing the work of digital humanists in the evaluations of individuals and groups, with potential negative consequences for

careers. Despite the rhetoric about the importance of interdisciplinarity, in many countries, scholars continue to be evaluated according to traditional disciplinary norms and expectations. Thus the single-authored monograph remains the standard by which scholars are measured in the humanities, leaving little space for the recognition of the work involved to create digital resources, software, or online-only forms of publication (Antonijević, 2015). Interdisciplinarity itself remains a challenge, as collaboration between those trained in the humanities and those trained in the computer sciences sometimes leads to a clash of epistemic cultures (Kaltenbrunner, 2015). Project-based funding for DH is not only problematic for individual careers, but can also lead to discontinuities in the availability of re/sources. We need to learn from failed projects, as well as celebrate the successful ones (Dombrowski, 2014).

Conclusion

There already exist many discussions and definitions of what constitutes digital humanities, including the collection edited by Melissa Terras, Julianne Nyhan and Edward Vanhoutte (2013), largely written from within the field. In this short piece, I have provided a different perspective, drawing on insights from another post-war disciplinary field, 'science and technology studies'. One of the driving questions in STS is about how knowledge is produced, and the material basis of that production. As such, it provides a valuable lens for examining how the intensification of digital technologies is affecting the humanities. It also helps those concerned with digital humanities, as practitioners, teachers, administrators, to locate the developments within broader trends affecting the academy. One of the common rhetorical tricks in STS is to ask the question, if this [technological device or system] is the solution, what was the problem? This can help one to think through the assumptions, norms and values underlying particular technological innovations. If one applies this in reverse to DH, we can think about what we want to achieve, and what technologies could help us to support that. If we start from values of openness (of data, metadata, code), of collaboration (between disciplines, and between universities and other possible partners), and of diversity (in all its dimensions) then we might be in a better position to evaluate critically the technologies on offer, and the systems of work and reward currently prevailing in universities and funding regimes.

Acknowledgements

This article is based on my presentation given at the Digital Humanities conference held at the Siberian Federal University in September 2015. I am extremely grateful to Inna Kizhner for the invitation, and to all of her colleagues for their efforts in creating such a memorable event. A more informal report, with pictures, of my week in Krasnoyarsk can be found here: http://ehumanities.leasepress.com/emagazine-6/featured-article/digital-humanities-in-siberia/

[1] STS also has its own conferences (annually organised by the Society for the Social Studies of Science), journals (such as *Science, Technology & Human Values* and *Social Studies of Science*), and national and international associations. It has a longer history than Digital Humanities, but also has been beset by questions of definition and scope over the years. One of the key debates in early years was whether the second S in STS stands for 'society' or for 'studies'.

References

Antonijević, Smiljana(2015) *Amongst Digital Humanists. An Ethnographic Study of Digital Knowledge Production*. New York: Palgrave Macmillan.

Borgman, Christine L. (2009)*Scholarship in the Digital Age. Information, Infrastructure and the Internet*. Cambridge, MA: MIT Press.

Brown, Nik, Rappert, Brian and Webster, Andrew(2000)*Contested Futures. A Sociology of Prospective Techno-Science*. Farnham: Ashgate.

Bulger, Monica, Meyer, Eric, de la Flor, Grace, Terras, Melissa, Wyatt, Sally, Jirotka, Marina, Eccles, Katherine and Madsen, Christine (2011) *Reinventing Research? Information Practices in the Humanities*. London: Research Information Network.

Crombie, Alistair Cameron (1994) *Styles of Scientific Thinking in the European Tradition*. London: Duckworth.

Dombrowski, Quinn (2014) 'What ever happened to Project Bamboo?' *LLC The Journal of Digital Scholarship in the Humanities* 29(3): 326-339.

Edwards, Paul N. (2010) *A Vast Machine. Computer Models, Climate Data and the Politics of Global Warming*. Cambridge, MA: MIT Press.

Funtowicz, Silvio and Ravetz, Jerome(1993) 'Science for the post-normal age', *Futures* 25: 739-755.

Gibbs, Fred (2013) 'Digital humanities definitions by type', in Melissa Terras, Julianne Nyhan and Edward Vanhoutte (eds) *Defining Digital Humanities. A Reader*(pp. 289-297). Farnham: Ashgate.

Hacking, Ian(1992) '"Style" for Historians and Philosophers', *Studies in History and Philosophy of Science* 23: 1-20.

Haraway, Donna(1985) 'Manifesto for cyborgs. Science, technology and socialist feminism in the 1980s', *Socialist Review* 80: 65-108.

Hine, Christine (2008)*Systematics as Cyberscience: Computers, Change and Continuity in Science*. Cambridge, MA: MIT Press.

Jankowski, Nicholas W. (2009) 'The contours and challenges of e-research', in Nicholas W. Jankowski (ed.) *e-Research. Transformation in Scholarly Practice* (pp. 3-31). London: Routledge

Kaltenbrunner, Wolfgang (2015) *Reflexive Inertia. Reinventing Scholarship through Digital Practices*. PhD Dissertation. Leiden: Leiden University.

Kwa, Chunglin(2011) *Styles of Knowing. A New History of Science from Ancient Times to the Present*.Pittsburgh: University of Pittsburgh Press. [published in Dutch in 2005 as *De ontdekking van het weten*]

Latour, Bruno (1987)*Science in Action*. Milton Keynes: Open University Press.

Leydesdorff, Loet and Etzkowitz, Henry(1998) 'The triple helix as a model for innovation studies', *Science & Public Policy* 25(3): 195-203.

Massumi, Brian (1998) 'Sensing the virtual, building the insensible', in *Architectural Design* 68 (5/6): 16-24.

Nauta, Gerhard Jan and van den Heuvel, Wietske (2015)*Survey Report on Digitisation in European Cultural Heritage Institutions 2015*. Den Haag: DEN Foundation.

Nowotny, Helga, Scott, Peter and Gibbons, Michael(2001)*Re-thinking Science: Knowledge and the Public in an Age of Uncertainty*. Cambridge, UK: Polity.

Radder, Hans(1997) Philosophy & History of Science: Beyond the Kuhnian Paradigm, *Studies in History and Philosophy of Science* 28: 633-655.

Schnapp, Jeffrey, Lunenfeld, Peter and Presner, Todd (2009) *Digital Humanities Manifesto 2.0*http://www.humanitiesblast.com/manifesto/Manifesto_V2.pdf[accessed on 7 January 2016].

Terras, Melissa, Nyhan, Julianne and Vanhoutte, Edward (eds) (2013) *Defining Digital Humanities. A Reader*. Farnham: Ashgate.

Whitley, Richard (2000)*The Intellectual and Social Organization of the Sciences*. Oxford: Oxford University Press.

Wyatt, Sally, Scharnhorst, Andrea, Beaulieu, Anne and Wouters, Paul (2013) 'Introduction to Virtual Knowledge', in Paul Wouters, Anne Beaulieu, Andrea Scharnhorst and Sally Wyatt (eds) *Virtual Knowledge. Experimenting in the Humanities and the Social Sciences* (pp. 1-23). Cambridge, MA: MIT Press.

Вычислительный подход в гуманитарных науках с точки зрения научно-технических исследований

Салли Уайетт
Нидерландская королевская академия наук и искусств
PO Box 94264, 1090 GG Amsterdam, The Netherlands

В данной статье анализируется использование компьютерных технологий в гуманитарных науках – явление, получившее широкое распространение в последнее время и пользующее популярностью. В первой части приводится исторический контекст для понимания данного явления, во второй части оценивается значение этих разработок для исследований ученых в сфере гуманитарных наук. Заключительная часть включает в себя формулирование возникающих в этой связи вопросов и проблем, с которыми сталкиваются те, кто продвигают «цифровые гуманитарные науки». Статья основана на информации, представленной в другой междисциплинарной отрасли, а именно сферы «научно-технических исследований». Научно-технические исследования, кроме прочего, рассматривают формирование информационной базы, в связи с этим понимание использования цифровых технологий в сфере гуманитарных наук в данной области более полное.

Ключевые слова: цифровые гуманитарные науки, научно-технические исследования, режим 2.

Научная специальность: 24.00.00 – культурология, 22.00.00 – социологические науки.