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4 The Nature of Scholarship

Having examined broad changes in other sectors that have been shaped by the aspects of open, digital networks, in this chapter, the focus will be on the practices of scholarship.

Scholarship

There are different interpretations as to what constitutes ‘scholarship’ and different methods for representing it. For example, is scholarship best expressed as a set of actions that are common to all disciplines, or is it best viewed as the outputs it produces? Are all practices of equal significance? Are there commonalities across all disciplines? Research on the nature of scholarship has sought to answer these questions, and from this work we can then begin to consider how practices may be changing. The term digital scholarship has gained some currency recently, but the definitions of this are also varied.

Before we consider definitions of digital scholarship, we should look at concepts of scholarship which they build upon. Unsworth (2000) suggested seven ‘scholarly primitives’. His work was focused around humanities, but he argues that

Primitives refer to some basic functions common to scholarly activity across disciplines, over time, and independent of theoretical orientation ... These primitives are the irreducible currency of scholarship, so it should, in principal, be possible to exchange them across all manner of boundaries of type or token. (Unsworth 2000)

His list of primitives is as follows:

- 1 discovering – knowledge either through archives or research;
- 2 annotating – adding layers of interpretation;
- 3 comparing – for example, texts across languages, data sets;
- 4 referring – referencing and acknowledging;
- 5 sampling – selecting appropriate samples;
- 6 illustrating – clarifying, elucidating, explaining; and
- 7 representing – publishing or communicating.

Palmer, Teffeau and Pirmann (2009) build on this work to suggest an activity-centric categorisation of five key tasks: searching, collecting, reading, writing and collaborating, which they then subdivide. This further division reveals differences between the humanities and science disciplines; for example, searching is subdivided into browsing, which 'tends to be open ended with the searcher looking through a body of assembled or accessible information', and direct searching, which 'occurs when a scholar has a well-defined goal. For example, they may be looking for information on a particular chemical compound or trying to find a particular journal article'. They suggest that browsing is more prevalent in the humanities, while direct searching is more relevant to science.

Probably the most influential work on scholarship in recent years is that of Ernest Boyer. Using data gathered from more than 5,000 faculty members, Boyer (1990) classified the types of activities scholars regularly engaged in. This was partly a response to the research versus teaching conflict, with recruitment and promotion often being based on research activity, while it is teaching that is significant to most students and to more than 70 per cent of faculty. The report sought to place all scholarly activity on an equal footing: 'What we urgently need today is a more inclusive view of what it means to be a scholar – a recognition that knowledge is acquired through research, through synthesis, through practice, and through teaching' (Boyer 1990: 24).

In Boyer's definition of scholarship, there are four components, each of which, he suggests, should be considered as of equal value by universities and government policy.

Discovery – This is the creation of new knowledge in a specific area or discipline. This is often taken to be synonymous with research. This is probably closest to the public conception of scholarship, as universities are often the site of significant breakthroughs.

Integration – This is focused on interpretation and interdisciplinary work. It is moving away from the pure, 'genesis' research of discovery. Boyer states that it is 'making connections across the disciplines, placing the specialties in larger context, illuminating data in a revealing way, often educating non-specialists'.

Application – This is related to the concept of service, but Boyer makes a distinction between citizenship and scholarly types of service, and for the latter it needs to build on the scholar's area of expertise. It can be seen as engagement with the wider world outside academia, which might include

public engagement activities as well as input into policy and general media discussions. This can also include the time spent peer-reviewing journal articles and grant applications and sitting on various committees.

Teaching – Much of the interpretation of Boyer can be seen as an attempt to raise the profile of teaching. He argues that ‘the work of the professor becomes consequential only as it is understood by others. Yet, today, teaching is often viewed as a routine function, tacked on’.

Boyer’s work was influential and many universities sought to implement reward and development schemes based on his four activities. It is not without criticism, however, in that it focuses on the individual scholar and is therefore biased towards the humanities, where there is a higher incidence of lone scholars and a culture of ‘possessive individualism’ (Rosenzweig 2007). It may be less applicable in the sciences, which are characterised by large-scale, capital intensive collaborations (Galison and Hevly 1992).

However, as a basis for examining changes in scholarly practice, it is well established and captures the range of scholarly activity sufficiently for the broad impact of new technologies to be seen. Subsequent chapters will look at each of Boyer’s activities in more detail and outline how some practices are changing and what the possible implications are.

Digital scholarship revisited

The term ‘digital scholarship’ can be viewed as a convenient shorthand to contrast with traditional, ‘analogue’ forms of scholarship, although as set out in Chapter 1, ‘digital’ is only one aspect of a trilogy, the convergence of which makes for significant change. Digital scholarship itself has differing interpretations, in one flavour it refers to the curation and collection of digital resources, which places it in the information sciences, whereas others use it in a broader sense to cover a range of scholarly activities afforded by new technologies. It is this more wide-ranging interpretation that is the focus of this book.

As the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities & Social Sciences observes, there are multiple interpretations of digital scholarship.

In recent practice, ‘digital scholarship’ has meant several related things:

- 1 building a digital collection of information for further study and analysis,
- 2 creating appropriate tools for collection building,
- 3 creating appropriate tools for the analysis and study of collections,

- 4 using digital collections and analytical tools to generate new intellectual products, and
- 5 creating authoring tools for these new intellectual products, either in traditional form or in digital form (<http://www.cnx.org/content/m14163/latest/>).

Christine Borgman (2007) discusses digital scholarship with a focus on data and somewhat addresses the humanities bias in Boyer's work by emphasising the significance of teams: 'The internet lies at the core of an advanced scholarly information infrastructure to facilitate distributed, data and information-intensive collaborative research'.

Borgman argues that the sharing of data and data itself constitute knowledge capital, comparable with published articles. This tension between Borgman and Boyer may indicate that there is no one interpretation of digital scholarship that encompasses all disciplines, as the work of Palmer *et al.* suggests. Similarly Fry (2004) suggests that the adoption of technology will follow different patterns in disciplines: '[academic] fields that have a highly politicized and tightly controlled research culture will develop a coherent field-based strategy for the uptake and use of ICTs, whereas domains that are pluralistic and have a loosely organized research culture will appropriate ICTs in an ad-hoc localized manner'.

Borgman's focus is on developing an information infrastructure that will facilitate the exchange of data and scholarly activity. She suggests that '[p]reservation and management of digital content are probably the most difficult challenges to be addressed in building an advanced information infrastructure for scholarly applications'.

While preservation and management are undoubtedly important, the focus of this book is on changes in the practice of scholars, particularly in how they communicate, the types of outputs they produce and the networks they operate within. As proposed in Chapter 1, it is the 'fast, cheap and out of control' technologies that perhaps have the greatest impact on scholarly practice. These are often tools produced outside of education, and their ease of use encourages innovation and exploration. Much of the digital scholarship work is centred on the curation and preservation of digital artefacts or the digitisation of content. The sort of changes we are seeing around open access publishing, development of blog communities, use of Twitter at conferences and easy sharing of content are driven not just by their digital nature but by the convergence of the three characteristics of digital, networked and open.

Before exploring the impact of such approaches on each of Boyer's four functions in subsequent chapters, the remainder of this chapter will provide some brief indicative examples of changes in them.

Discovery

Boyer's first function of scholarship is the discovery of new knowledge in a specific discipline or area, what is often termed 'genesis research'. An open, digital, networked approach to discovery could relate to the sharing of data. Particularly in scientific research, access to powerful computing tools at relatively low cost allows researchers to both generate and analyse unprecedented amounts of data. The development and adoption of digital data has led to the establishment of new (sub)fields so that '[a] growing number of sciences, from atmospheric modelling to genomics, would not exist in their current form if it were not for computers' (Foster 2006).

While the creation and analysis of digital data (like the digitisation of content we saw in Chapter 3) has been with us for a while now, it is the combination of the global network that is really beginning to alter research practice. This means that data forms can be easily shared with colleagues and the wider academic community in a way that was not possible previously, so that data sets can become part of scholarly communication:

Datasets are a significant part of the scholarly record and are being published more and more frequently, either formally or informally ... In short, they need to be integrated into the scholarly information system so that authors, readers and librarians can use, find and manage them as easily as they do working papers, journal articles and books. (Green 2009: 13)

Scientists, institutions, data centres, users, funders and publishers all have a part to play in the management of data (Lyon 2007), and increasingly the open provision of data is a required outcome from funding bodies.

A recent international collaboration has been set up with the aim of facilitating easier sharing through enabling organisations to register research data sets and assign persistent identifiers to them, so that research data sets can be handled as independent, citable, unique scientific objects. Combining data sets also encourages meta-analysis, so, for example, sites such as <http://www.realclimate.org> collate data sets from climate change studies which are open for others to process and use.

As well as raising the profile of data itself as a project output, this also changes the timescale and management of a project. Instead of waiting until data have been verified and analysed to be released, many projects are pre-releasing data with the specific intention of letting others work with it. The Human Genome Project was one of the forerunners in this respect, and as this discussion in *Nature* demonstrates (Birney *et al.* 2009), it is a practice many wish to be adopted more widely:

One of the lessons from the Human Genome Project (HGP) was the recognition that making data broadly available prior to publication can be

profoundly valuable to the scientific enterprise and lead to public benefits. This is particularly the case when there is a community of scientists that can productively use the data quickly – beyond what the data producers could do themselves in a similar time period, and sometimes for scientific purposes outside the original goals of the project.

This 'liberation' of data has a number of implications for research practice which are summarised below.

The application of grid computing or crowdsourcing analysis

In *Wikinomics*, Tapscott and Williams (2006) give numerous examples of how sharing data sets allows multiple users to analyse data and return their results. SETI (the search for extraterrestrial intelligence, <http://www.seti.org>) is one of the best-known examples, with users downloading and analysing data sets on their own computers, but the example of the gold mining company in Canada is perhaps more telling. They set a prize fund to locate gold on their site and shared all the data they had available. The result was unexpected methodology being brought to bear and a number of successful new sites they had no previous intention of exploring.

Unexpected applications

Releasing data sets means that they can be applied in contexts that the original users would not have envisaged. Just as Twitter did not predict the different applications that can be built on top of it, so the providers of data sets do not predict or control the different uses to which they will be put. For example, in the United States, the Centre for Disease Control was able to monitor the spread of influenza more effectively by analysing Google search queries (Ginsberg *et al.* 2009).

Data visualisation

Related to the previous point, open data allow people to visualise it in different formats, thus making a statement, telling a narrative or revealing a trend from the data that may be otherwise hidden to a larger audience. The blog *Information Is Beautiful* gathers many of these together, and data visualisation is set to be a skill researchers will increasingly develop expertise in and seek to deploy (<http://www.informationisbeautiful.net/>).

Combination

This also applies to Boyer's next aspect of scholarship, integration, since open data allow researchers to combine data from different fields to produce new insights. This is addressed in Chapter 6.

It is the combination of openness, in terms of sharing data sets, digital provision of the data and sharing via a network, that allows these benefits to be realised; any one of these approaches in isolation would not be sufficient. The open, digital, networked approach then complements the use and development of free, easy-to-use tools, such as ManyEyes, Google Analytics and Gapminder, which in turn encourage an open, digital, networked form of dissemination and communication as these results are shared via blogs and social networks.

A second way in which scholars are utilising new technologies to adapt research practice is through the formation of networks and communities. What the global, social network allows everybody (not just scholars) to do is connect with those with similar interests. By establishing oneself in a network and sharing, a scholar connects with others working in the same field. This can be through blogging (where linking and commenting on others' blogs as well as blogging regularly is seen as an important function in a community), social networks or more structured community sites with forums, where one establishes a reputation by answering questions and engaging in discussion. For some subject areas it is in these distributed online communities that much of the relevant discussion in a subject takes place and not via the traditional forums of journals and conferences.

In addition these 'virtual' networks are now sufficiently well established to have connections through into traditional practice, so they are spawning research projects, writing collaborations, conferences and influencing research agendas, which is explored in more detail in Chapter 10.

Integration

Boyer's second dimension of scholarship is integration, where the discoveries of others are put into context and applied to wider problems. Following on from the discussion about the impact of networks on discovery, we can see that the mechanisms through which scholars publish and communicate their findings and learn about the work of others are undergoing radical change. This section will focus primarily on the journal article, although the publishing model is addressed in more detail in Chapter 12. Journal articles can almost be seen as the battleground between new forms of scholarly activity and traditional systems.

There are a number of issues that are converging into what has been labelled a journals crisis (Edwards and Shulenburger 2003; Willinsky 2006; Cope and Kalantzis 2009). These include long lag times between submission and publication, increasing subscription costs, the practice of bundling large numbers of journals together and the growing resentment over the reliance of journals on the volunteered labour of the writers, reviewers and editors for the content, which is then sold back to their employers (Harley *et al.* 2010).

This is exacerbated by the tendency to replicate the limitations of paper publishing even in digital formats, such as word limits, restrictions on dynamic content and links to data sets. Experiments in the possibilities of the digital format are taking place, such as the Journal of Visualized Experiments (JOVE <http://www.jove.com/>) in biology, which is a peer reviewed, and PubMed-indexed journal consisting of videoed contributions, which might suggest a radically different future for multimedia journals, but as yet this is not common.

There is also a wider philosophical point about the dangers of restricting access to knowledge to those working within the universities and research institutes that can afford to pay the subscriptions, excluding those researchers in other institutions and in particular in lesser developed countries (Willinsky 2006). The proponents of open publishing argue that making knowledge freely available enhances scholarship to everybody's benefit.

Peer-review processes have also begun to be adapted from established traditions in light of changes in the technologies of publication and means of access to what is published. These changes arise from the ability of users to copy, append and comment on the content of an article through the medium of distribution – the online forms of publication. The shift from a series of discrete and disciplined steps in a publication process that ends in a finished product to an ongoing system of regular commentary and conversation raises interesting questions about the function of peer review. The process of peer review has functioned as a filter, a means of ensuring quality, but there is a sense in which the normative effect of peer review has come to signify the process as being an end in and of itself, rather than the means to an end.

There are a number of modifications to peer review, such as open peer review and publishing or acknowledging the contributions of reviewers to the final text (Cope and Kalantzis 2009; Harley *et al.* 2010). In 2006 the journal *Nature* ran a debate and experiment with open peer review (<http://www.nature.com/nature/peerreview/debate/index.html>); this involved making articles which were undergoing the traditional process of peer review available on a publicly accessible server for wider comment, with the reviewers and public comments taken into consideration when deciding on publication. This trial was not particularly successful, with a low take-up by authors and a lack of high-quality comments.

Despite the possibilities for open publication made possible through a move to digital formats, there is still an inherent conservatism fostered through the current system of recruitment and promotion of scholars which prioritises traditional outputs (Borgman 2007; Harley *et al.* 2010). This is explored in Chapter 11.

The area of publication and dissemination is one that I will revisit in this book as it occupies a central role in scholarship and demonstrates several of the issues in

digital scholarship, including the range of alternatives now available, the tensions with existing practice and the possible impact of adopting new approaches.

Application

Academics have been enthusiastic users of many new communication technologies in order to participate in wider global debates relevant to their field. Academic bloggers, for example, can gain large audiences and through this reach, engage with new audiences. We are seeing the development of a 'personal brand' amongst academics as new technologies allow them to establish an audience that is complementary to their institutional one. For example, Open University philosophy lecturer Nigel Warburton has achieved more than 5 million downloads of his podcasts, and Kansas State University professor Michael Wesch (2007) has had more than 10 million views of his YouTube video 'The Machine Is Using Us'.

These new channels are also beginning to compete with traditional means of public engagement in terms of influence. For example, Clow (2009) compares the traffic generated to a site by a 'tweet' from British celebrity Stephen Fry, which led to more than 50,000 hits in one day, with a feature on the Radio 4 news which led to 2,400 hits on a different site. While not directly comparable this illustrates the power of new technologies in 'outreach'.

These kinds of figures exceed the sales of most scholarly books and journal article access, so we can see that new technologies are facilitating access to a new audience which is disintermediating many of the conventional channels. A key element to realising a strong online identity is an attitude of openness. This involves sharing aspects of personal life on social network sites, blogging ideas rather than completed articles and engaging in experiments with new media.

This role of public engagement is one that will be explored further in Chapter 7.

Teaching

It is arguably in Boyer's fourth function, that of teaching, where we see the biggest impact of digital technologies and open approaches. The digitisation of learning and teaching resources means that they are easily reproducible and shareable at a global scale, although doing this raises serious challenges for universities accustomed to being the gatekeeper to such knowledge.

The advent of MIT's Open CourseWare project in 2001 initiated the advent of Open Education Resources (OERs). This has led to a broad OER movement with many universities embarking on similar projects (such as the OU's OpenLearn). While there is debate as to the direction, sustainability and impact of the OER movement (e.g. Wiley 2009a), it has raised the profile of openness in education and questions

whether, as publicly funded institutions, universities have an obligation to release content freely. We will look at openness in education in more detail in Chapter 10.

With the advent of a wide variety, and high quality, of freely available academic content online, the individual student is no longer limited by the physical resources they can locate, and the lecturer is therefore no longer regarded as the sole source of knowledge, as the learner can pick and choose elements from a variety of courses provided by any number of diverse institutions and individuals.

Whilst there are institutional benefits to making its educational resources freely available, the large-scale projects such as OpenLearn have been made possible through significant external funding, and in the current economic climate some universities, such as Ohio State University, have backtracked from the Open Education agenda (McAndrew, Scanlon and Clow 2010).

The open, digital, networked approach also facilitates the creation of open courses, for example, Stephen Downes and George Siemens open course on Connectivism and Connective Knowledge. This course is open for both formally enrolled students as well as free learners, with approximately 2,200 participants taking the course in 2008 as free learners and 25 studying for credit. The course is open in terms of access, but also in digital and networked in terms of content, with students encouraged to create their own course components, including SecondLife communities, 170 different blogs, concept maps and Google Groups (Meiszner 2010).

Conclusion

It is clear from the preceding discussion that new technologies hold out very real possibilities for change across all facets of scholarship. In each case these afford the possibility for new, more open ways of working. Academic work has always contained a significant element of collaboration *within* academia, but now it is increasingly easy to collaborate with more colleagues within, and also beyond the academy, and for the varied products of these collaborations to be available to the widest possible audience. This reflects the kind of permeable boundaries seen in other sectors, as a result of digital network technologies.

In Chapter 3 the impact of digital and network technologies on other sectors was examined, but it is the third element of openness that is perhaps more significant for scholarship. Digital scholarship is more than just using information and communication technologies to research, teach and collaborate; it also includes embracing the open values, ideology and potential of technologies born of peer-to-peer networking and wiki ways of working in order to benefit both the academy and society.

The term 'open scholar' has also been used by some and can be seen as almost synonymous with digital scholar. The open scholar 'is someone who makes their intellectual projects and processes digitally visible and who invites and encourages ongoing criticism of their work and secondary uses of any or all parts of it – at any stage of its development' (Burton 2009). This is a significant and challenging step for scholars, especially when faced with norms and values which oppose, hinder or fail to recognise these forms of scholarship.

Chapters 5 to 8 will address each of Boyer's scholarly functions in turn. For each one I have selected just one perspective to demonstrate the possible impact of digital, networked, open approaches, which is not to suggest that this is the only, or even the most significant, impact but rather as illustrative of the potential changes and the issues.