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1 Digital, Networked and Open

‘Dad, you know that book you’re writing, what’s it about?’ my daughter asked, as I walked her to school.

The ‘elevator pitch’ is always difficult for academics, who prefer to take their time to explain things in depth and give all sides to an argument. An elevator pitch for a nine-year-old is almost impossible.

‘Well,’ I pondered, ‘it’s about how using technology like the Internet, dad’s blog, and Wikipedia is changing the way people like daddy work.’ Having recently completed a school project, she was well acquainted with Wikipedia.

She considered this and then concluded, ‘da-aaaaad, *no one*’s going to want to read that!’

I fear she may be right, but I realised I have been writing this book for the past four years, mainly through my blog, which I have been using to explore what the advent of technologies, which offer new ways of communicating, collaborating and creating knowledge, mean for higher education. I figured if it had kept me interested for this long, it might be useful to share some of that with others.

A tale of two books

So what are these new ways of working that I had hinted at to my daughter? I’ll start with an example that is in your hands now – the process of writing this book. Six years ago I wrote my last book, and halfway through writing this, I thought I’d compare the two processes. Below is a list of some of the tools and resources I used to write this book:

- Books – they were accessed via the library but increasingly as e-books, and one audiobook.
- E-journals – my university library has access to a wide range of databases, but I also made frequent use of others through tools such as Google Scholar and Mendeley.
- Delicious/social bookmarking – as well as searching for key terms I would ‘forage’ in the bookmarks of people I know and trust, who make their collections available.
- Blogs – I subscribe to more than 100 blogs in Google Reader, which I try to read regularly, but in addition I have cited and used many posts from other blogs.

- YouTube, Wikipedia, Slideshare, Scribd, Cloudworks and other sites – text is not the only medium for sharing now, and for certain subjects these ‘Web 2.0’ services offer useful starting points, or overviews, as well as insightful comment.
- My own blog – I have kept a blog for around five years now, and it provided a useful resource for items I have commented on and drafts of sections of this book. I also keep a scrapbook-type blog using Tumblr where I post any interesting links or multimedia and revisited this for resources I had harvested over the past few years. The blog was also a means of posting draft content to gain comments and feedback, which could then be incorporated into further iterations of writing.
- Social network – my Twitter network is especially useful for gaining feedback, asking for suggestions and, on a daily basis, as a filter and collection mechanism for sharing resources.
- Work and personal network – undoubtedly working in an intellectually lively environment and having face-to-face discussions with colleagues have been invaluable.
- Google alerts – I have set up alerts for a few key phrases which would then provide me with daily email updates on new content containing these keywords. This allowed me to find new resources, track conversations and stay abreast of a field which was changing as I wrote the book.
- Seminars and conferences – my attendance at face-to-face conferences has declined due to other commitments, but I regularly attend or dip into conferences remotely (see Chapter 10 for a more detailed exploration of the changing nature of conferences).

If I compare this with the tools I used when I wrote my last book in 2004, then many of these services did not exist or were in their infancy. Of this list I probably used books, journals and face-to-face conferences, with maybe some initial exploration of blogs.

In many ways the changes are not dramatic – books and journal articles still constitute a large part of the information sources I draw upon, although inspection of the references section will reveal the significance of blogs in particular. And the output of all this is still that most traditional of information sources, a book. But the changes are also significant for three reasons, I would suggest. First, the quantity of this information that is available online has increased considerably. I could access nearly all of it from my desk at home; there was no need to visit a physical library or

bookstore. The digitisation of relevant content was almost total for the information sources I required for this book, compared with about half of that in 2004. The second factor is the significance of my online network in the writing process. I have around 3,000 followers in Twitter and around 2,000 subscribers to my blog (often they are the same people), which represents a wide pool of experience to draw upon. Sometimes I would put out a direct call to this network, along the lines of 'Does anyone have a good example of ...'. In other cases I would post drafts of the content to my blog and receive comments and links to relevant material. Even without these direct appeals this distributed, global peer network represents an invaluable information source, comprising links to resources, commentary on issues, extended debate, use of new methods and technology, and contributions in the form of blog posts, videos and audio. This last item leads me to the third significant difference from the previous book, which is the range and variety of content that I drew upon. Even six years ago the type of content was largely limited to journal articles and books. Now, this has diversified to include blog posts, videos, draft publications, conference presentations and also the discussion, comment and debate surrounding each of these. The change from 2004 is partly a result of the first factor, quantity. There is just more of this stuff around. But it is also a result of a shift in attitude (at least on my part), in the legitimacy of these other forms of output and their central, vital role in everyday scholarly activity.

The comparison of writing these two books is instructive, I feel, because it gets to the heart of what we might term 'digital scholarship': it is both a profound change and a continuation of traditional practice. This can be seen with the final output also: the previous book existed only in traditional, paper format, and the copyright to this was owned by the publishers. This book is available not only in the traditional format but also online, freely accessible under a Creative Commons licence. In addition there is a set of resources, such as videos, presentations and blog posts, which relate to the book, with comments and reaction to these. The boundary to what constitutes the book is blurred; it is both the physical object and its complementary material. And this is becoming more common: my colleague Grainne Conole is writing a book by blogging chapters and gaining feedback in a site called Cloudworks (<http://cloudworks.ac.uk/cloudscape/view/2155>). Conor Gearty, a Professor of Law at the London School of Economics, is writing a book by posting a weekly video which sets out his theme and encourages discussion (<http://therightsfuture.com/>). The boundary between Gearty's book and a course, and the comments of the participants is deliberately blurred.

This conflict between what, from one perspective, seems a substantial change in practice and, from another, what appears to be a conservative, minor adjustment to standard approaches characterises not just book production but any aspect of scholarly activity, including research, knowledge dissemination, public engagement

and teaching. Both radically different and yet familiarly traditional seem to be the story of digital scholarship at the moment, and it is the tension between these two forces that this book sets out to explore.

What is digital scholarship?

In Chapter 4 the concept of scholarship, and digital scholarship, will be addressed in detail, but it is worth providing an example now to illustrate the scope of this book.

‘Scholarship’ is itself a rather old-fashioned term. Whenever I ask someone to think of scholarship they usually imagine a lone individual, surrounded by books (preferably dusty ones), frantically scribbling notes in a library. This is somewhat removed from the highly connected scholar, creating multimedia outputs and sharing these with a global network of peers. Scholarship is, though, a sufficiently broad term to encompass many different functions and so has the flexibility to accommodate new forms of practice. It is not only focused on teaching, or research, but also on a wide range of activities. In fact, a rather tautological definition of scholarship is that it is what scholars do. And a ‘scholar’ can be defined as a learned person or a specialist in a given branch of knowledge.

Traditionally we have tended to think of scholars as being academics, usually employed by universities. This is the main focus of this book; it is the changes to university and higher education practice that will form the main discussion and research. However, digital scholarship broadens this focus somewhat, since in a digital, networked, open world people become less defined by the institution to which they belong and more by the network and online identity they establish. Thus a well-respected digital scholar may well be someone who has no institutional affiliation. The democratisation of the online space opens up scholarship to a wider group, just as it opens up subjects that people can study beyond the curriculum defined by universities.

A simple definition of digital scholarship should probably be resisted, and below it is suggested that it is best interpreted as a shorthand term. As Wittgenstein argued with the definition of ‘game’ such tight definitions can end up excluding elements that should definitely be included or including ones that seem incongruous. A digital scholar need not be a recognised academic, and equally does not include anyone who posts something online. For now, a definition of someone who employs digital, networked and open approaches to demonstrate specialism in a field is probably sufficient to progress.

Perhaps more fruitful is to consider an example of a particular technology-based approach, to demonstrate the issues that digital scholarship raises. At the outset of this chapter it was mentioned that I had been writing this book, although I hadn’t conceptualised it as a book, for several years through my blog. We can take blogging

as a microstudy of all the issues in digital scholarship, although almost any of the new internet technologies would suffice. First, it has the digital, networked and open approach in its DNA – these are not attributes that have been grafted onto it as an afterthought. The significance of these three factors is outlined below. Bloggers link to each other and usually have open comments; blogs have been responsible for driving the success of many other tools such as YouTube and Flickr as bloggers embed content to make their posts multimedia; they are democratic and easy to set up.

Blogs are also the epitome of the type of technology that can lead to rapid innovation. They can be free to set up, are easy to use and because they are at the user's control, they represent a liberated form for expression. There is no word limit or publication schedule for a blog; the same blog may mix posts about politics, detailed subject analysis, sport and personal life. Blogs can remain unread or have thousands of subscribers.

This freedom of expression is both their appeal and problem for scholarship. The questions one might ask of blogs in relation to academic practice are true of all digital scholarship:

- 1 Do they represent 'proper scholarship' (however that might be defined)?
- 2 Are they central or peripheral to practice?
- 3 Are they applicable to all domains?
- 4 Are they more applicable for some scholarly functions than others, for example, teaching?
- 5 How do we recognise quality?
- 6 Do they complement or replace existing channels?
- 7 Should we reward them through official routes such as tenure?
- 8 Should bloggers use institutional systems or separate out their blogging and formal identities?
- 9 What is their impact on academic communities?

If any of these questions interest you, then I hope you will find the remainder of this book relevant as I seek to unpack some of these issues.

Digital, networked and open

I suggested that the three ways in which my book-writing process differed from that of a few years ago were in terms of the quantity of digital content, the role of

the social network and the types of information sources. What the combination of these three factors creates is a shift in the practice of writing. These three factors are representative of three characteristics, which when they intersect provide fertile ground for the transformation of practice.

The concept of digital scholarship will further be explored in Chapter 4. It is a term which has gained some currency and one which has an immediate appeal. It is something of a shorthand term though, since 'digital' is only one aspect. It is necessary, but not sufficient, for any substantial change in scholarly practice. Almost all scholars are 'digital' now, as they will invariably use a word processor to produce their articles and Powerpoint (or a similar tool) for presentations. If they are publishing these articles in a traditional journal and teaching via Powerpoint in a standard lecture model, it would be difficult to argue that this is worthy of particular interest; instead this represents a 'business as usual' model.

The impact of the digitisation of content should not be underestimated, however. What it provides is a common format for all types of media: image, text, video or audio. They are all just digital files, which means that they can all be shared by the same method. Much of the scholarly process we have currently can be viewed as a product of the medium in which they are conducted. A journal article is a certain length, and the journal publication cycle is determined as much by the economics of printing as it is by any considerations of the best methods for sharing knowledge. The size, location, length and format of a conference are influenced by the considerations of bringing together a group of people to one location and making best use of their time, within certain financial restrictions. But once these become digital then many of the current restrictions are removed: a journal article can be as long or as short as it needs to be, a journal can be published whenever the articles are ready or a continual publication of articles, conferences can be online and discussion can be asynchronous and distributed over any time frame, the format can be based around multimedia instead of presentations and so on, for almost any example of scholarly practice you care to consider. I will explore later in this book that this does not mean all existing practices *should*, or will, be replaced but that the range of alternatives is now greatly increased. This is a direct product of the shift to digital.

The second key feature for transformative practice is for it to be networked, as digital content that sits isolated on an individual's machine may represent a change in her own practice but does not constitute one for the community. It is the easy distribution of digital content over a global network that has led to the dramatic changes we have seen in many content industries. The possible lessons that can be drawn from these are examined in Chapter 3. Just as much of scholarly practice was shaped by the format of analogue systems, so has the distribution of

these been influential. Prior to the Internet, academic knowledge was restricted to academic libraries, conferences, seminars or courses. Some of these may have been open, or have systems for sharing such as inter-library loans, but they all had a relatively high inbuilt threshold to accessing that knowledge. Once that content is digitised and made available online, that threshold to access effectively disappears and becomes a mouse click or a search term away.

It is not just the Internet that is significant in terms of networks but, more recently, the advent of social networks that is having an influence on scholarly practice. Networks of peers are important in scholarship – they represent the people who scholars share ideas with, collaborate with on research projects, review papers for, discuss ideas with and get feedback from. Prior to the Internet, but particularly prior to social networks, this kind of network was limited to those with whom you interacted regularly. This could be via letters, but usually it meant people you worked with and met at conferences. Maintaining a large network of peers requires a lot of effort, which is why Dunbar's (1992) research on friends and group size suggests that it has a capacity of around 150. It necessitates keeping in touch with a lot of people, often reinforcing that contact with physical interaction. In academic terms this kind of networking was most often achieved by being on the 'conference circuit'. Online social networks allow interaction with a wide group of peers (I won't go into the question here of whether online connections or relationships are inferior to face-to-face ones), often through relatively light touch mechanisms, such as Twitter, Delicious, blogs, and Flickr. Without having to attend every conference in their field, it is possible for scholars to build up a network of peers who perform the same role in their scholarly activity as the networks founded on face-to-face contact. Whether these are different in nature or are complementary to existing networks is still unknown, but for those who have taken the step to establishing an online identity, these networks are undoubtedly of significant value in their everyday practice.

This brings us onto the last feature to influence practice, namely openness. This is both a technical feature and what might be called a 'state of mind'. Technically, it can mean a number of things, including open source software, which is developed by a community for anyone to use, open APIs (application programme interfaces), which allow other software programs to interact with it (such as the applications in Facebook), or open standards (which are not owned by any one company and any software can adhere to, such as the IMS standards for metadata). All of these have been significant in creating a more general culture of openness, which has been fostered by many of the Web 2.0-type tools. At the heart of this has been what Tim O'Reilly (2004) calls 'an architecture of participation', an infrastructure and set of tools that allow anyone to contribute. It is this democratisation and removal of

previous filters that has characterised the tools which have formed the second wave of web popularity, such as YouTube, Wikipedia, Flickr, blogs, Facebook and Twitter.

Openness then refers not only to the technology but also to the practice of sharing content as a default. Content in the scholarly context can mean data, journal articles, teaching material, presentations, discussion, seminars and comment. The removal of limitations inherent in analogue systems and their distribution has meant that the type of things people share has changed – if the only means of disseminating knowledge is a costly print journal then the type of content it contains tends to be finely worked and refined material. If there are almost cost-free tools for instant sharing, then people can share ideas, opinions, proposals, suggestions and see where these lead. More significantly perhaps the audience for the well-considered research publication is greatly increased by it being made open to all.

Digital content, distributed via a global network, has laid the foundation for potential changes in academia, but it is when the third element of openness is added in that more fundamental challenges to existing practice are seen, as I hope to demonstrate throughout this book. Let us take an example to illustrate this combination of a digital, networked and open approach, that of the life of a journal article.

The authors, let's call them Frank and Sally, know each other through a combination of commenting on each other's blogs, being part of the same network on Twitter where they share many of the same contacts and some email exchanges. Following a blog post by Frank on pedagogy for networked learning, Sally posts a long piece in reply. They decide to collaborate on a paper together and work in Google Docs to produce it. Sally gives a presentation about the subject to her department and shares the presentation on Slideshare. She posts the link to this on Twitter, and it gets retweeted several times by people in her network, some of whom comment on the presentation. Frank posts a draft of their chapter on his blog and again receives a number of comments which they incorporate into the paper. They submit it to an open access journal, where it is reviewed and published within two months. They both tweet and blog about the paper, which gets widely cited and has more than 8,000 views. As a result of the paper, they give a joint presentation in an open, online course on networked learning.

This example is fairly modest; I have not suggested the use of any particularly uncommon tools or any radical departure from the journal article format. It is also increasingly common (I could substitute many real people for Frank and Sally, including myself). As with the example of book writing, this scenario is both conservative and radical. It demonstrates the value of an individual's network as a means of distribution. This removes the authority of processes which had a monopoly on distribution channels for analogue content, such as publishers, libraries and book

retailers. The open access journal means that knowledge created by academics, who are usually publicly funded in some form, is now available to everyone. Others may take that content and use it in their own teaching, perhaps informally and outside of a university system. The collaboration between two academics arises outside of any formal structures and as part of a wider network. They share their outputs as they go along, with the result that the overall output is more than just the article itself.

For each of these factors one can say that this is simply an adjustment to existing practice and not in itself of particular relevance. When considered across the whole community, however, the potential impact of each factor on scholarship is revolutionary, as it could lead to changes to research definition, methodology, the publishing industry, teaching, the role of institutions and collaboration. This reflects the somewhat schizophrenic nature of digital scholarship at the current time.

Fast, cheap and out of control

Particular types of technology lend themselves to this digital, networked and open approach. Brian Lamb (2010) borrows the title from Errol Morris' 1997 documentary to describe the kind of technology he prefers and thinks is useful in education as being fast, cheap and out of control. As with digital, networked and open, it is the intersection of the three that is the area of real interest. These three characteristics are significant for education in the following manner:

Fast – technology that is easy to learn and quick to set up. The academic does not need to attend a training course to use it or submit a request to their central IT services to set it up. This means they can experiment quickly.

Cheap – tools that are usually free or at least have a freemium model so the individual can fund any extension themselves. This means that it is not necessary to gain authorisation to use them from a budget holder. It also means the user doesn't need to be concerned about the size of audience or return on investment, which is liberating.

Out of control – these technologies are outside of formal institutional control structures, so they have a more personal element and are more flexible. They are also democratised tools, so the control of them is as much in the hands of students as it is that of the educator.

Overall, this tends to encourage experimentation and innovation in terms of both what people produce for content services and the uses they put technology to in education. If someone has invested £300,000 in an eportfolio system, for example, then there exists an obligation to persist with it over many years. If, however, they've

selected a free blog tool and told students to use it as a portfolio, then they can switch if they wish and also put it to different uses.

There are, of course, many times when this approach may not be suitable (student record systems need to be robust and operate at an enterprise level, for example), but that doesn't mean it is *never* appropriate. Writing in *Wired*, Robert Capps (2009) coined the term 'the good enough revolution'. This reflects a move away from expensive, sophisticated software and hardware to using tools which are easy to use, lightweight and which tie in with the digital, networked, open culture. Capps cites the success of the small, cheap Flip video camera as an example:

The Flip's success stunned the industry, but it shouldn't have. It's just the latest triumph of what might be called Good Enough tech. Cheap, fast, simple tools are suddenly everywhere. We get our breaking news from blogs, we make spotty long-distance calls on Skype, we watch video on small computer screens rather than TVs, and more and more of us are carrying around dinky, low-power netbook computers that are just good enough to meet our surfing and emailing needs. (Capps 2009)

In terms of scholarship it is these cheap, fast and out-of-control technologies in particular that present both a challenge and opportunity for existing practice. They easily allow experimentation and are founded on a digital, networked, open approach. It is these tools, and more significantly, the ways of working they allow and facilitate, that this book will focus on.

Technology determinism

This talk of technology 'allowing', 'facilitating', 'affording' or 'suggesting' methods of working or approaches raises the issue of technological determinism. This subject arises in almost every discussion around technology and education, so it is worth addressing it early. Technology-related viewpoints tend to be dystopian or utopian in nature. Examples of such views are not only to be found in science fiction. Educational technology literature over the past twenty years shows the promises and fears that have been associated with a variety of technologies, including computers, CD-ROM, computer-assisted learning, artificial intelligence, virtual reality and videodisc. The Internet and social media are just the latest in this list.

What both the positive and negative viewpoints have in common is that they see the technology itself as shaping human behaviour, so-called technological determinism, a phrase first coined by American sociologist Thorstein Veblen. The technological deterministic viewpoint is that technology is an autonomous system that affects all other areas of society. Thus human behaviour is, to a greater or lesser

extent, shaped by technology. This seems to remove human will, or ingenuity, from the social process, and is thus usually rejected as excessively mechanistic. However, there seems to be such an anxiety about being labelled a 'technological determinist' that many people in education seek to deny the significance of technology in any discussion. 'Technology isn't important', 'pedagogy comes first', 'we should be talking about learning, not the technology' are all common refrains in conferences and workshops. While there is undoubtedly some truth in these, the suggestion that technology isn't playing a significant role in how people are communicating, working, constructing knowledge and socialising is to ignore a major influencing factor in a complex equation.

As this book seeks to explore the ways in which approaches founded in new technologies can influence scholarly practice, the charge of technological determinism may well be raised. It is not my contention that the presence of the technology will automatically lead to certain changes. Indeed, many of the interesting examples of digital scholarship are entirely unpredicted, what is often termed 'emergent use', which arises from a community taking a system and using it for purposes the creators never envisaged. This is particularly a feature of the kind of fast, cheap and out-of-control technologies that constitute much of the social media/ Web 2.0 collective. For instance, it has been well recorded that Flickr developed from a company which was aiming to manufacture an online game, and the photo-sharing application was just a simple tool to aid the game. As founder Caterina Fake commented, 'Had we sat down and said, "Let's start a photo application," we would have failed. We would have done all this research and done all the wrong things' (Graham 2006). Similarly, the proliferation of applications that have been built to interact with Twitter and Facebook were not predicted by the founders of those companies, nor the way in which people have used them (for a more detailed analysis of the development of the Twitter community norms, see Chapter 6).

A deterministic perspective would underestimate the role of people and the context in which the technology is used. Kling, McKim and King (2003) propose a 'sociotechnical interaction network', which emphasises the interaction between people, institutions and technologies. They analysed 'e-scholarly communication forums' to reveal the relationship between participants, resource flows, business models and other individuals and groups who do not participate in the network directly. Their work builds on what has been termed 'social construction of technology' (or SCOT), which is seen as a direct response to technological determinism (Pinch and Bijker 1984). In this perspective technology development is seen as the result of competition and negotiation between different groups or actors, rather than a finished artefact that is released (or inflicted) upon a rather submissive society.

SCOT is not without its critics, for example, Clayton (2002), and the detailed debate around the interplay between actors and technology is beyond the scope of this book. What the work of Pinch and Bijker and Kling *et al.* highlights is that it is possible to examine technology, technological influence and practice without falling into the trap of technology determinism. In this book it is the complex co-construction of technology and associated practice that is intended, with an iterative dialogue between the technology and the practices that it can be used for. Inevitably though, for the sake of simplicity and to avoid repetition, this complexity may be somewhat glossed over, and I will refer to a technology or an approach as if there is a direct line between them. For this I ask the reader's indulgence and request that it should not be taken to be demonstrative of a technological deterministic mindset, while at the same time recognising the significance of technology in the overall process.

The structure of this book

If I had given my daughter the full answer to her question regarding the nature of this book, I would have said it was essentially about three things: how the adoption of new technology *is* changing scholarly practice, how it *could* change practice and what questions does this raise for all academics?

This book has four main sections that seek to address these issues. The first section, comprising of Chapters 1 to 3, details the broad social context in which digital scholarship is taking place. Having made reference to the potential impact of new technologies and approaches in this chapter, Chapter 2 will look at some of the evidence for, and rhetoric surrounding, an imminent revolution in higher education. Chapter 3 examines other industries where digital, networked and open approaches have had a significant impact on established practice, including the music and newspaper industries. Possible similarities with higher education are examined and, significantly, the key differences are highlighted.

The second section forms the main section of this book and is concerned with scholarship. Chapter 4 draws on Boyer's 1990 study which proposed four scholarly functions, namely discovery, integration, application and teaching. Each of the subsequent four chapters explores one of these functions and how the digital, networked, open approach can impact upon practice. Each chapter focuses on just one demonstrative impact. For example, Chapter 7 explores how public engagement can be viewed from a digital scholarship perspective, but public engagement is only one form of the application function. Similarly, Chapter 8, which is concerned with Boyer's function of teaching, addresses the significance of a shift to abundant content and not all possible uses of technology for teaching. The aim of this section is to demonstrate that such technology-influenced approaches can

have an impact in all aspects of scholarship and are not restricted to one function, such as teaching, or a particular discipline. This section in particular addresses the question of how technology is changing practice.

The next section, consisting of Chapters 9 to 12, explores the scholarly context in more detail, focusing on key practices, and can be seen as addressing the question of how digital scholarship could change practice. Chapter 9 looks at the open education movement, the various definitions of openness currently in operation and some of the issues it raises. In Chapter 10, using the metaphor of 'network weather', I argue that even if an individual does not engage with new technology, its adoption by others is beginning to change the environment within which they operate, and the academic conference is an example of this. Chapter 11 is concerned with the process of reward and tenure, and the challenges digital scholarship raises for institutions. This theme is continued in Chapter 12, which is focused on the publishing industry and its process, and in particular how open access publishing and the use of free communication tools are changing this core academic practice. The intention of this section is to return to the context within which digital scholarship exists, which was addressed in a broad sense in the first section, but to focus more closely on the academic environment. There are a number of areas of tension for digital scholarship, for instance, between the use of new technologies and tenure processes which are based on traditional publications. We are also in a period during which new practices are being established, as the possibilities that a digital, networked and open approach offers are applied to existing practice, for example, in the creation of new publishing models or conference formats.

The last section is a concluding one and addresses the issue of questions digital scholarship raises for all academics. Chapter 13 examines some of the issues and concerns about the adoption of new technologies and approaches. Chapter 14 continues this by addressing some of the reasons for anxiety surrounding digital scholarship and proposes a perspective based on 'digital resilience'.