

Digital Futures. Expert Briefings on Digital Technologies for Education and Research: Introduction

Hall, M., Harrow, M., & Estelle, L. (Eds.). (2015). Introduction. Digital Futures. Expert Briefings on Digital Technologies for Education and Research. Chandos Publishing.

The UK academic sector is successful on a global scale. It not only contributes more than £73 billion to the national economy each year, but also produces some of the most groundbreaking research undertaken anywhere in the world, and is highly effective in the commercial exploitation of that research, leading to significant economic return and societal impact. While the UK represents just 0.9% of the global population and 4.1% of the world's researchers, it produces 15.9% of the world's most highly cited articles.¹ The sector excels not only in research but also in teaching, with a world-class reputation across teaching, research and knowledge transfer.

A contributing factor to this success is undoubtedly the investment made by UK funding bodies in a world-class shared digital infrastructure, which includes a secure network dedicated to the needs of research and education. At the research level, this enables large data storage and high-performance computing facilities to be linked both nationally and internationally. The infrastructure also includes eduroam, the worldwide single sign-on secure network which provides Wi-Fi connectivity to more than 600,000 Internet-enabled devices in the UK. The UK national infrastructure encompasses not only technology but also digital content, with negotiation and licensing for academic journals and databases along with the national provision of digital archives to support innovative research and education.

However, the academic sector faces many challenges if the UK is to sustain its position as a world-leading research and education nation. In preparing this book, we were keen to ensure that it covered all the major aspects of the digital technologies that will enable the UK higher education sector to remain a global leader. Thus, we have chosen authors who are not only leading experts in their fields but who are also proactively engaged in developing those technologies that both support the sector and enable innovative change.

website:	www.martinhall.org
email:	martinhall@martinhall.org
LinkedIn:	www.linkedin.com/in/martin-hall-connected-learning-studio/

INTRODUCTION

The UK academic sector is successful on a global scale. It not only contributes more than £73 billion to the national economy each year, but also produces some of the most groundbreaking research undertaken anywhere in the world, and is highly effective in the commercial exploitation of that research, leading to significant economic return and societal impact. While the UK represents just 0.9% of the global population and 4.1% of the world's researchers, it produces 15.9% of the world's most highly cited articles.¹ The sector excels not only in research but also in teaching, with a world-class reputation across teaching, research and knowledge transfer.

A contributing factor to this success is undoubtedly the investment made by UK funding bodies in a world-class shared digital infrastructure, which includes a secure network dedicated to the needs of research and education. At the research level, this enables large data storage and high-performance computing facilities to be linked both nationally and internationally. The infrastructure also includes eduroam, the worldwide single sign-on secure network which provides Wi-Fi connectivity to more than 600,000 Internet-enabled devices in the UK. The UK national infrastructure encompasses not only technology but also digital content, with negotiation and licensing for academic journals and databases along with the national provision of digital archives to support innovative research and education.

However, the academic sector faces many challenges if the UK is to sustain its position as a world-leading research and education nation. Global competition from emerging nations is a significant threat. The volume of research outputs from China is increasing at an exponential rate and the indications are that the quality of those outputs (measured by citation impact) is also rising.

Other pressures on the sector come from competition in the provision of education, both within the UK and globally. International

¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-UK-research-base-2013.pdf.

students are important to the higher education sector and to the country, contributing more than £7 billion to the UK economy. A recent report by Universities UK points out that international higher education is an increasingly competitive market: ‘the governments of the UK’s competitors – including the USA, Australia, Canada, New Zealand and Germany – are each implementing bold strategies and policies, backed by investment, in an attempt to attract more international students to their own universities’.²

The introduction of student fees is having an impact on the expectations of UK students. Kandiko and Mawer have shown that ‘UK students across all year groups, institution types and subjects have a consumerist ethos towards higher education, wanting “value for money”’.³ These students expect technology to provide access to resources and to support their studies.

The developments and innovation that digital technologies provide could have a crucial role in enabling UK universities to respond to competitive pressures and remain world-leading across teaching, research, knowledge transfer and international outlook.

In preparing this book, we were keen to ensure that it covered all the major aspects of the digital technologies that will enable the UK higher education sector to remain a global leader. Thus, we have chosen authors who are not only leading experts in their fields but who are also proactively engaged in developing those technologies that both support the sector and enable innovative change.

MOOCs

The first massive open online courses (MOOCs) were launched in 2008 and MOOCs have grown rapidly since. Currently, UK institutions offer around 60 MOOCs. These online courses attract thousands of participants, are open to anyone to join, are free to undertake and are delivered fully online, thus transcending the spatial limitations of a

²Universities UK, The Funding Environment for Universities, International students in Higher Education: The UK and its completion. Available from: <<http://www.universitiesuk.ac.uk/higher-education/Documents/2014/InternationalStudentsInHigherEducation.pdf>> (accessed 22.02.15.).

³Kandiko, C.B., Mawer, M., 2013. Student Expectations and Perceptions of Higher Education: Executive Summary. London: King’s Learning Institute. <<https://www.kcl.ac.uk/study/learning-teaching/kli/research/student-experience/QAASummary.pdf>> (accessed 22.02.15.).

traditional classroom. MOOCs are usually fairly short in duration, running from between 5 and 10 weeks, and require limited lecturer input. Participants are able to study anywhere at any time and at their own pace. If they wish, participants can also benefit from interaction with other learners, through message boards.

The benefits of MOOCs are not confined to those studying on them. The mass of data gathered from observing and recording learners' online behaviours, discussions and assessment scores has the potential to help educators to improve courses and plan interventions that will support learners. These learning analytics may provide insights not only for improving teaching through MOOCs, but also those taught through a 'flipped classroom' pedagogical model which blends online teaching and learning with more traditional methods. Use of the flipped classroom in the UK has seen Jisc do pilot work with institutions to produce 'video lectures' which students watch in their own time to free up valuable tutor contact time for more interactive teaching.

Some MOOCs report impressive completion rates. Take, as an example, Edinburgh University's Equine Nutrition MOOC, one of first to be offered by the university. From an initial enrolment of 24,000 people, it achieved an 80%+ conversion rate from enrolment to active participation, with a completion rate of 30%.⁴ However, other MOOCs report retention rates as low as 7–9%.⁵ In a globally connected world, even such low conversion rates provide universities with a potentially huge marketplace. MOOCs offer an opportunity to rethink the possibilities of education and the business models that underpin it. For example, higher education institutions could make their teaching and teaching materials free, but charge for assessment, accreditation and, possibly, optional extras such as one-to-one tutoring. Such models would open up franchising opportunities, enabling strong brands to maximise their global potential with local provision for participants. Universities may, of course, also use MOOCs to drive recruitment to their more traditional campus-based courses, or to more selective and paid-for online courses.

⁴Murray, J., 2014. Participants' perceptions of a MOOC. *Insights* 27 (2), 154–159. doi:<http://dx.doi.org/10.1629/2048-7754.154>.

⁵<http://knowledge.wharton.upenn.edu/article/moocs-on-the-move-how-coursera-is-disrupting-the-traditional-classroom/> (accessed 22.02.15.).

MOOCs also present potential challenges to the established education sector in terms of new entrants. For example, educational publishers with their vast banks of learning materials could enter the market. Some companies already derive considerable income from K–12 level online testing and may seek to expand into higher education.

In his chapter on MOOCs, David Kernohan discusses many core issues around pedagogy and business models that are yet to be resolved and asks if MOOCs can prepare institutions for the wider challenges they now face or if there may be more effective ways forward.

OPEN ACCESS

Free and open access to publicly funded research offers significant social and economic benefits. In the last few years, the UK government and UK funders of research have been at the forefront of supporting a transition to open access, helping to ensure that publicly funded research outputs are not only widely available to other researchers, but also to potential users in the business, charitable and public sectors and to the general public. The publication of the report of Dame Janet Finch's working group, *Accessibility, sustainability, excellence: how to expand access to research publications* (often colloquially referred to as the Finch Report) in June 2012 was instrumental in driving this change towards making all UK-funded research outputs open access. Most significantly for UK higher education, this report recommended 'a clear policy direction in the UK towards support for "gold" open access publishing, where publishers receive their revenues from authors rather than readers, and so research articles become freely accessible to everyone immediately upon publication'. These author payments for immediate open access publication are known as article processing charges (APCs).

As a direct result of the recommendations in the Finch Report, Research Councils UK (RCUK) issued its policy for open access with a preference for gold open access and provided block grants directly to research organisations primarily in order to help them meet the extra cost of APCs. The extra cost of meeting APCs (in an environment in which the research outputs from most of the rest of the world are still behind paywalls) is a contentious one. Estimates of how much the

potential cost of transition to open access will cost the UK higher education sector vary. Steven Hall, a member of the Finch Group, calculated that using an average APC of £1,727 (as estimated by Finch modelling), the bill for publishing the 31,000 papers RCUK estimates it funded in 2010 would be in the region of £53.5 million. Hall suggests ‘it would require several other major countries to make the same commitment [towards gold], for the balance to tip irrevocably towards an OA publishing model’.⁶

The cost of implementing open access policies is not limited to the payment of APCs. Engagement with stakeholders and the development of new workflows and standards are required to make open access a reality. Frank Manista and Jo Lambert have been working with UK higher institutions as they face these challenges. Their chapter discusses how authors, universities, funders and publishers can support open access implementation in order to make it a success.

MANAGING DIGITAL RISKS

As discussed above, a significant factor in the success of the UK higher education sector to date has been government investment in a secure academic network. Most recently, this has included investing in Janet6, an upgrade to the UK’s academic network, to ensure it has the capacity, resilience and flexibility for research and education, across the UK, for the next 5–10 years. The functionality of Janet6 will enable the research and education sectors to make the most of technological advances, and to address the political and financial challenges of the future. These advances will likely include greater use of cloud technologies, so that data storage can be outsourced, resulting in reduced financial and environmental costs.

Our national network provides a route for the information most critical to the functions of educational organisations, whether for teaching, research, administration, employment or funding to be secured, stored and shared using cloud technologies. The effective operation of all those functions depends on reliably accurate information being available when it is needed by those who are authorised to see it, and equally reliable security to ensure that such information is

⁶Hall, S., 2012. What does Finch mean for researchers, librarians and publishers? *Insights* 25 (3), 241–245, doi:<http://dx.doi.org/10.1629/2048-7754.25.3.241>.

not disclosed to those who are not authorised to see it. Andrew Cormack's chapter takes a broad view of the risks to these aspects (accuracy, availability and confidentiality of information security); examines the origin of these risks in behaviours, processes, physical, technical and environmental factors; and considers how policies can be used to mitigate and manage the risks.

OPEN DATA

Just as the open access publication of research outputs has the potential to increase the reach and impact of publicly funded research, open data has the potential to break down traditional barriers, enable transparency and the use and reuse of data and allow for new types of research. Organisations of all types are opening up their data and harvesting it in interesting new ways to make it more useful for education, research and administration. Gavin Starks, CEO at the Open Data Institute (ODI), recently said: 'A smart country requires open data. The UK is a world leader in higher education and it is an obvious step to use open data to improve outcomes for both universities and students. Universities need to understand, embrace, and publish open data – using transparency to both improve and create new services, to pave the way for open innovation, and enhance their existing work'.⁷ However, the Royal Society report on open science argued that openness itself has no value unless is 'intelligent openness'. Prof. Geoffrey Boulton, chair of the Royal Society's science as an open enterprise working group, said: 'Science is vital to many of the dilemmas that confront us, but needs to be communicated intelligently, by which we mean it must be supported by evidence, which must be accessible, intelligible, assessable and usable. The internet and other digital technologies offer great ways for scientists to feed these wider demands for information and evidence'.⁸

Rachel Bruce and Andy McGregor have been working for many years on the standards that will contribute to 'intelligent openness'. In their chapter they point out that the government is ahead of the UK academic sector in terms of a coordinated open data strategy and its implementation, and discuss the issues that the academic sector must

⁷<http://theodi.org/news/odi-uuk-and-top-uk-universities-launch-project-to-unlock-open-data-potential-in-higher-education> (accessed 24.02.15.).

⁸<https://royalsociety.org/news/2012/science-open-enterprise/> (accessed 22.02.15.).

address in order to catch up. Although these issues are not insignificant, they argue that the potential for efficiencies and innovation are so great that the UK higher education sectors should ‘step up and grasp the nettle of open data’.

THE DIGITAL STUDENT EXPERIENCE

The way in which UK higher education meets the needs of students is fundamental to its ongoing success in the increasingly competitive global education market. It seems clear that the majority of students in UK higher education share the common expectations that their university will provide ubiquitous connectivity to a robust network, that they will be able to connect their own devices easily and that they will have access to digital content and software relevant to their studies. Beyond that it would seem that while student expectations are rising, they are more varied, depending on the subjects they are studying and their previous experience of ICT. Helen Beetham, in her recent Jisc blogpost, points out that every student she has spoken to in the last few years has made clear ‘that they don’t want technology to be a substitute for “the real people, in the same place, learning together”’.⁹ Sarah Knight supports this in her chapter on *enhancing the digital student experience*, arguing that working in partnership with students to engage them fully in the development of the digital environment is critical. She proposes seven key principles that universities and colleges can follow to fully realise the vision of a digitally enabled student experience.

INTERNATIONAL COLLABORATION

In a world in which many research challenges are too big for a single institution to tackle, and the best facilities attract the best researchers, institutions must collaborate in order to remain competitive. Furthermore, many of the issues we face, for example, changing patterns of human population and consumption, climate change and global pandemic health challenges, are global problems and require the input of international networks of scientists. The growth in the number of scientific papers published with international co-authorship points to the important role of collaboration among researchers.

⁹Jisc., 2014. Students’ experiences and expectations of the digital environment. Available from: <<http://www.jisc.ac.uk/blog/students-experiences-and-expectations-of-the-digital-environment-23-jun-2014>> (accessed 22.02.15.).

Digital technologies enable researchers to collaborate in cross-disciplinary, international teams by sharing resources such as research data, computing power and software over the Internet. In his chapter on *International collaboration and the changing digital world*, Matthew Dovey explains that a robust e-infrastructure is essential. He cites as examples initiatives such as GÉANT, which links Europe's National Research and Education Networks (NRENs), connecting users at over 10,000 academic institutions across Europe, and eduroam, which ensures access to wireless networks in campuses around the world. He also explains why virtual research environments (VREs), which sit alongside the e-infrastructure, are becoming increasingly important to enable collaborative research without regard to physical location. Dovey points out that while we are seeing increased collaboration enabled by technology, there are still challenges to be overcome, not least the interoperability of emerging technologies and the skills of researchers to use them effectively.

Collectively, these expert briefings provide a summary of the advantages that the UK higher education sector can gain through the effective use of digital technology for its own research, teaching and learning, the student experience and competitive positioning internationally. They highlight the role that digital technology can play as a driver for change in universities and as a useful enabler of better research and better learning rather than as just yet another challenge to be overcome. Universities will face immense challenges in the years ahead, but through harnessing the power of digital technology, and actively engaging with some of the developments outlined in this book, they will not just be able to survive, but to thrive.