DIGE 2: STUDENT DIGITAL EXPERIENCE PROJECT 2 RESEARCH REPORT

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Document History

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19/10/15	1.0	Original
22/10/15	1.01	Section 5.3 expanded to include data on mobile learning on blended courses.
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EXECUTIVE SUMMARY

The Student Digital Experience 2 (DIGE 2) project was conceived as a follow-up to the Digital Experience Workstream of 2011–12 and was carried out between December 2014 and October 2015. Funded by the Education IT Board, DIGE 2 was led by the Academic IT Group in IT Services. Its aim was to build our knowledge and understanding in order to:

- make recommendations that can inform strategic decision-making by the Education IT Board; and
- increase the knowledge and understanding of development teams and service providers within IT Services such that their offerings are more likely to be relevant to students' digital needs and preferences.

More specifically, the project sought to find out:

- how students in the collegiate University use digital technologies to support their learning, including a sub-focus on students in transition from school to university, taught postgraduates, students on blended courses and disabled students;
- how the digital experience has changed, or has remained similar, between 2012 and 2015;
- the ways in which the University might foster effective practice among academic staff in technology-enhanced teaching and learning; and
- options for the ongoing collection of strategic data on the digital experience of Oxford students.

The rationale underpinning the project, its scope and research questions were formulated on the basis of a meticulous review and synthesis of a number of institutional documents, including emerging University strategies such as the Digital Education Strategy and IT Strategy. The research design and data analysis were additionally informed by the peer-reviewed research literature on the student digital experience and by sector studies such as the annual TEL survey conducted by UCISA (Universities and Colleges Information Systems Association).

The research team gathered data from approximately 300 students and over 50 members of academic staff through online surveys, interviews and 'digital diaries'. The principal findings can be summarised under four headings:

1. Mobile learning

The salient digital feature of students' learning in 2015 is the mobile device: primarily the smartphone, but with tablet technology also growing in popularity. In addition to the technological implications for wireless coverage, there are requirements to 1) optimise learning spaces, resources, tools and services for a mobile student population; and 2) provide pedagogic support to academics who wish to integrate mobile technologies into their teaching.

2. Students' digital literacy

Although incoming students may be *au fait* with social technologies, they need help in developing the digital literacy skills required for studying effectively at Oxford. These include their functional IT skills in key applications, the ability to conduct efficient and productive searches for texts and other resources, and the ability to manage their learning in the face of distractions from the internet.

3. Digital capabilities of academic staff

While growing numbers of academic staff are engaging productively with digital technologies in their teaching, there remains a strong need for focused professional education in technology-enhanced teaching and learning over and above training in essential IT skills. In addition, a case can be made for deploying learning technologists in all divisions (not merely Medical Sciences as at present) in order to complement and extend the work of the Academic IT group at the centre.

4. Endorsement of current and proposed projects

The DIGE 2 study has also collected evidence that strongly endorses a number of current and proposed capital projects. Chief among these are mobile interfaces for WebLearn; the redesign of departments' WebLearn sites by the WebLearn Improved Student Experience (WISE) project; and the transition of the RePlay lecture capture project into a full-scale service (which will also ease some of the challenges faced by disabled students).

RECOMMENDATIONS TO THE EDUCATION IT BOARD

The recommendations below are grouped thematically. Note that the recommendations relating to mobile technologies belong also to broader themes such as professional development and technology-enhanced learning spaces; they are therefore subsumed under those other themes rather than listed separately.

In addition to our recommendations to the Education IT Board for funding capital projects, we have identified activities which are germane to the research questions, but whose implementation lies outside the Board's remit. For these, appropriate stakeholders are suggested.

Cross-references are provided to the section(s) of the report from which each recommendation is derived.

Students' digital literacy

Sections 4.3.2, 4.4.1–4.4.7, 5.1, 10.2

1. Invest in a major programme to strengthen and expand existing support for the development of students' digital literacy, with the goal of transitioning this into sustainable, sustained provision. This programme should cover IT skills training, digital literacy and subject-specific skills training.

   Specific activities should include:

   - Develop cross-cutting online 'bridging' courses to provide incoming students with training in specific academic skills, such as statistics and programming, as well as general study skills.
   - Commission a pilot project, in conjunction with a small number of departments, to explore the feasibility of a support package to benchmark the digital literacy skills of incoming students and direct them to the appropriate training, including selected online courses from Lynda.com made available through course WebLearn sites.
   - Develop an online course to support all students in managing their learning, particularly in dealing with distractions from the internet. This course should be co-designed with students who have adopted successful study strategies.

Digital capabilities of academic staff

Sections 4.3.1, 6.1.2, 7.3, 10.1, 10.3

2. Invest in a major programme of focused professional education for academics in technology-enhanced teaching and learning, with the goal of transitioning this into sustainable, sustained provision. A collaborative approach should be adopted involving the Academic IT group, Oxford Learning Institute, Libraries and departments. Possible tasks and activities include:

   - Create a cross-departmental programme team, including staff from the Academic IT Group and the Oxford Learning Institute.
   - Create and promote an online resource for academic staff to access and share guidance on technology-enhanced learning, research findings, case studies of innovative practice and teaching resources. Topics addressed should include incorporating mobile technologies into tutorials, seminars and lectures, and integrating lecture capture into students' learning.

- Provide a consolidated list of sources of funding (ie divisional and departmental schemes in addition to the Innovation Challenge Fund) to which academics can apply in order to have the time and resources to develop their teaching with technology.
- Sponsor an annual 'teaching and learning' conference for Oxford academics, including a specific strand for technology-enhanced learning. The conference could also include the ceremonies for the University Teaching Awards and OxTALENT.[1]
- Fund the initial run of an annual programme of seminars and workshops for academics interested in using digital technologies to enhance teaching and learning. This programme should be co-designed and co-led by the Academic IT Group and Oxford Learning Institute.[2] [3]

Funding and/or endorsement of existing initiatives

Sections 4.1 (Mobile WebLearn), 4.2.1–4.2.2 (WISE), 6.2.6 (RePlay)

DIGE 2 has provided strong evidence to endorse a number of existing and proposed projects and services:

3. Develop mobile interfaces for WebLearn and other heavily used institutional websites, providing apps for common tasks.
4. Following on from the WISE project, implement a service for units to develop or revitalise their WebLearn presence by providing a support package for 'DIY' and/or paid-for support from learning technologists.
5. Extend the RePlay lecture capture pilot into a full opt-in service, coupled with teacher education in the effective embedding of lecture capture into their pedagogy.

Recommendations for the Digital Education Strategy

Sections 7.3, 8.1, 8.2, 10.1
Key stakeholder: Digital Education Strategy Group

6. Establish, in conjunction with relevant units, a group to review the Digital Education Strategy in light of the findings of the DIGE 2 project and to draw up an implementation plan for the strategy.
7. Implement support, as a service and/or toolkit, for divisions and departments to interpret and implement the Digital Education Strategy locally, including benchmarking the digital capabilities of their staff and carrying out regular reviews.[4]
8. Deploy learning technologists within the Humanities, MPLS and Social Sciences divisions (with 'dotted' reporting lines to the Academic IT Group in IT Services) who can curate digital resources and support academics in finding and using the appropriate digital tools.
9. Co-opt students as active partners into the implementation of the strategy where feasible and appropriate.

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[1] This was also a recommendation (no. 32) by the DIGE 1 project.

[2] The format of such a programme could be based on the existing 'Engage' programme for online presence and public engagement, designed and led by the Academic IT Group and the Bodleian Libraries.

[3] This was also a recommendation (no. 32) by the DIGE 1 project.

[4] Benchmarking toolkits are available from Jisc, including a tool developed in collaboration with the NUS (http://repository.jisc.ac.uk/6140/1/Jisc_NUS_student_experience_benchmarking_tool.pdf) and outputs from the Digital Student project (https://www.jisc.ac.uk/guides/enhancing-the-digital-student-experience).

Technical projects for enhancing access to online resources and general information

Sections 4.3.1, 10.1, 10.3

Commission new project requests for the following:

10. Improved integration between WebLearn and third-party services to which it is gives access through the Learning Tools Interoperability (LTI) standard: eg Lynda.com.
11. A student portal: ie a personalised authenticated service, configurable by the user and offering access to appropriate University (central and local) services (see also DIGE 1 recommendation 3/ES3, which refers to this service as a 'multi-access gateway').

Learning spaces

Sections 4.1, 6.2.5–6.2.6, 10.1, 10.3
Key stakeholders: Digital Education Strategy Group; IT Services

12. Commission a set of guidelines for optimising all learning spaces (especially shared facilities such as the Examination Schools) for the use of digital technologies, both static equipment (eg data projectors) and mobile devices.

Metrics and analytics

Sections 8.1, 10.2
Key stakeholder: IT Services

13. Investigate the potential for the targeted use of analytics in order to identify, and better understand, patterns of behaviour in students' use of particular tools and services (eg recorded lectures), so that appropriate advice can be given to students and/or teaching staff.

Development methodologies for tools, systems and services

Sections 4.4.8, 8.2, 10.1
Key stakeholder: IT Services

14. Factor the involvement of learning technologists into the design and development of all new tools, systems and services that impinge on teaching and learning, in order to ensure that these are informed by knowledge and understanding of the needs and preferences of students and academic staff.
15. Adopt, wherever possible, participatory methodologies that include a role for students as active and equal partners in the development (or revision) of tools, systems and services that affect their digital experience

Disabled students

Sections 5.4, 6.2.6
Key stakeholders: Disability Advisory Service; OLI; IT Services; IT and disability support officers in colleges

16. Formulate a co-ordinated approach, with a clear demarcation of responsibilities, between central services and the colleges for helping disabled students to identify and use appropriate assistive technologies.
17. Provide awareness-raising and training for academics in teaching and supporting disabled students, both in tutorials (eg through being prepared to interact with assistive technologies) and in lectures (eg capitalising on the potential of the lecture capture service to provide audio recordings and transcripts).

CONTENTS

ANNEXES

These are available at https://weblearn.ox.ac.uk/x/0sqlwj (single sign-on may be required).

1. CORE PRINCIPLES
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1. INTRODUCTION

1.1 RATIONALE AND BACKGROUND

The DIGE 2 project was conceived as a follow-up to the DIGE (Student Digital Experience) workstream, which was conducted jointly by OUCS (as was) and the Student Systems Programme in 2011–12 (Lee et al., 2013). At the end of the original project there was a consensus between the project team and its advisory board that the exercise should be repeated after an interval of two to three years, in view of the rapid pace of technological development and its uptake by students and staff. Empirical work was led by the Academic IT Group in IT Services during the first half of 2015; the research team included one person who had worked on the previous project.

The rationale underpinning the project, its scope and research questions were formulated on the basis of a meticulous review and synthesis of a number of documents, including emerging University strategies such as the Digital Education Strategy and the revised version of the University's IT Strategy, that were available to the research team in December 2014. This preliminary work defined the core principles guiding the project (see Annexe 1). The documents indicated a number of primary areas of activity for the University in the period to 2018, both in general and in relation to IT. Our synthesis suggested that the mechanisms for IT to become a strategic enabler for the University include:

- an understanding of the ways in which students prefer to learn, especially how they use the material made available by the University, in order to inform curriculum design and planning; and
- an understanding of the University functions that might benefit from technology.

It was consequently decided to focus DIGE 2 on the ways in which Oxford students learn (or prefer to learn) with digital technologies, rather than on the systems and services used by students and staff – although data about these were collected for contextual purposes and for comparison with the original DIGE project (henceforth, 'DIGE 1').

The second reason for not investigating students' experience of specific technologies was the number of projects already under way or undergoing approval that would quickly render obsolete a substantial proportion of our findings. These projects included parts of the Student Systems Programme (SITS:eVision), GOWN (which ran an extensive survey of students' attitudes to the University's wireless provision in December 2014), C3E (which gathered perspectives on a cloud service in autumn 2014) and WISE (WebLearn Improved Student Experience, for which funding was approved in January 2015).

The overall aim of DIGE 2 was to build our knowledge and understanding in order to:

- make recommendations that can inform strategic decision-making by the Education IT Board; and
- increase the knowledge and understanding of development teams and service providers within IT Services such that their offerings are more likely to be relevant to students' digital needs and preferences.

Our interest lay primarily in the digital experience of undergraduate and taught postgraduate students in the collegiate University, whom we considered to be the main target beneficiaries of education IT projects. Nevertheless, the perspective of research postgraduates is valuable in contributing to the picture of students' intellectual and academic development as they progress through their university education.

1.2 RESEARCH QUESTIONS

The research questions around which the DIGE 2 research was designed were formulated from a number of influences. Research question 1 was derived from the primary areas of activity for the University which we identified during our review of strategic documents. Research question 3 was a natural one to investigate in order to explore change over time and to verify some of the projections made in the DIGE 1 report. Research questions 2 and 4 were formulated at the request of specific individuals who have strategic roles in relation to digital education at Oxford. The research questions were additionally informed by the peer-reviewed research literature on the student digital experience and by sector studies such as the annual TEL survey conducted by UCISA (Universities and Colleges Information Systems Association).

The research questions were:

1. How do students in the collegiate University use digital technologies to support their learning? More specifically:
   - 1.1 What choices do they make regarding the use of University-provided systems and services and systems and services that they find themselves? What governs these choices?
   - 1.2 What role do mobile devices play in their learning?
   - 1.3 How do they discover, evaluate and use learning resources, both those that are provided by the University and those that they find themselves?
   - 1.4 How does their use of technology evolve over their period of study at Oxford?
2. What role does digital technology play in supporting students' learning among the following demographic groups?
   - 2.1 students in transition from school to university
   - 2.2 taught postgraduates
   - 2.3 students on award-bearing blended courses
   - 2.4 students with disabilities
3. In what respects do students' needs and preferences differ in 2015 from 2012 (ie the first DIGE study) and in what respects are they similar?
4. What might be effective mechanisms for:
   - 4.1 fostering the implementation of effective practice in technology-enhanced teaching and learning among Oxford academics?
   - 4.2 maintaining the currency of our knowledge and understanding of the student digital experience at Oxford, and for communicating that knowledge and understanding to key stakeholders (eg Education IT Board, Education Committee)?

1.3 ACKNOWLEDGEMENTS

The members of the research team extend their thanks to the students and staff who participated in the project, and to the administrative staff who helped to recruit them. We also acknowledge the support of the Education IT Board in funding the project.

The principal author thanks Dr Stuart Lee and Kate Lindsay for their comments on the draft report.

2. APPROACH

2.1 METHODS

The project adopted a mixed methods research design. This enabled us to gather rich, in-depth qualitative data from a relatively small number of students and staff, and to set those data within a broader context by conducting larger-scale surveys which yielded a combination of quantitative and qualitative data.

The research activities were undertaken between December 2014 and October 2015 and are summarised in Table 2.1.

Table 2.1 Timetable of work, together with the research questions addressed by each activity.

Activity/method	RQs addressed	Dec 2014	Jan 2015	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct
Formulation of core principles	N/A											
Research design incl. review of lit.	N/A											
Online survey of students	1, (2,) 3											
Student digital diaries & interviews	1, (2)											
Focus group for disabled students	2.3											
Online survey of staff	1.2, 1.3, 1,4, 4.1											
Staff interviews	1, 2.1, 2.2, 2.4, 4.1											
Data analysis and reporting	N/A											

Research question 4.2 was addressed in part through the participation of two team members in Jisc's Digital Student Data Collection and Analysis Workshop on 29th April 2015 and activities associated with it: a preliminary interview and a follow-up paper-and-pencil exercise conducted over Skype.

We did not write up our findings from our review of the research literature, but a comprehensive bibliography of the major works consulted is provided in Annexe 7.

2.2 STUDENTS

2.2.1 RECRUITMENT

The student survey aimed to reach students in the collegiate University at all levels: undergraduate, taught postgraduate and research postgraduate. It was publicised with invitations and a link to its URL through a number of routes, including the Student Gateway, the fortnightly Student News email, the OUSU mailing list and posters in colleges. The 'digital diarists' were largely recruited through an email invitation to the Student Advisory Group; we also sent direct invitations to some of the students who had been employed as interns in IT Services during the summer of 2014. Participants for the focus groups were recruited with the assistance of the Disability Office.

2.2.2 DATA COLLECTION

The **online survey of students** was hosted on SurveyMonkey and collected both quantitative and qualitative data. The questions were derived from the project research questions and from the DIGE 1 student survey. They additionally addressed issues of contemporary interest relating to students'

digital capabilities in HE as a whole, including managing their learning and the University's responsibility *vis-à-vis* students' 'employability'. The questions were piloted with students on the MSc in Learning and Teaching and revised in the light of their feedback. The survey questions and quantitative data are available in Annexe 2.

The purpose of the **digital diaries** was to capture students' use of digital technologies during the course of a single day in their life, in both their academic and social pursuits. The approach followed a similar activity in the DIGE 1 project, but this time the diaries served as a springboard for more in-depth semi-structured **interviews** with the students. A standard interview protocol was devised, which was adapted for each interview in order to follow up any points of particular interest that the interviewer had found in the interviewee's digital diary. The instructions for writing the digital diaries, sample diaries and the student interview protocol can be found in Annexes 3 and 4.

Focus groups were planned for two sub-populations of students: disabled students and taught postgraduates. Because of time constraints we were only able to meet with the disabled students. The focus group opened with an activity in which students, working in pairs, were asked to rate the usability of the principal University-provided systems: for example, Nexus email, WebLearn and the SOLO library catalogue. Two guided discussions followed, in which students were invited to share their thoughts on 1) the support that the University gives them to use assistive technologies and 2) their experience of different forms of learning: for example, tutorials, lectures and practicals.

In return for their contributions survey respondents had the option to enter a draw for one of four £50 Amazon vouchers; the digital diarists each received a £30 Amazon voucher; and the focus group participants each received a £10 Amazon voucher.

2.3 ACADEMIC STAFF

2.3.1 RECRUITMENT

As in DIGE 1, we additionally solicited the perspective of academic staff on the student digital experience. We expected that, among other things, this would enable us to understand better the gaps and overlaps between students' stated needs and preferences on the one hand, and academics' pedagogical goals and personal disposition towards digital technologies on the other.

The staff survey was promoted through the Staff Gateway, advertisements in the University *Gazette*, a direct invitation to the members of the Education IT Board and mailing lists including ITSS. Interviewees were recruited both directly, through personal acquaintance or for their known involvement in areas of interest to us (eg bridging programmes), and indirectly, through an invitation in the staff survey.

2.3.2 DATA COLLECTION

The **online survey of academic staff** and the semi-structured **interviews** with staff covered very similar topics to each other. Where interviewees had been recruited through the survey, this enabled us to use the interviews to probe their survey responses in more depth. The topics covered were informed by current trends both within the University and in the wider HE sector. They included interviewees' current use of digital technologies in their teaching, attitudes towards the presence of students' mobile devices in classes (BYOD: 'Bring Your Own Device'), students' preparedness (or lack thereof) to study with digital technologies, the 'employability' question and a University-wide digital education strategy.

The staff survey questions and data are available as Annexe 5; the interview questions are available as Annexe 6.

2.4 ETHICAL CONSIDERATIONS

The research required ethical approval from the Social Sciences and Humanities Inter-divisional Research Ethics Committee; this was granted on 11th February 2015 (ref. SSD/CUREC1A/15-013).

Participants are identified in this report only by their role,[5] the division of the University in which they study or work,[6] and a sequential number. Even so, despite our best efforts, it was not possible to guarantee that an individual could not be identified (particularly where a member of staff has a unique role), and we made this clear to all interviewees. Respondents to the staff survey were offered the option not to have their words quoted verbatim or to approve any such quotations first. Only a few took up either of these options.

2.4 DATA ANALYSIS

The responses to each of the two surveys were imported from SurveyMonkey into Excel spreadsheets for aggregation and analysis. All but one of the interviews were audio-recorded, and each interviewer produced her own unfocused indexical[7] transcripts.

The data from the student surveys, digital diaries and interviews were analysed by three members of the research team, each person taking responsibility for specific research questions and writing a short report. These reports were then collated to produce the interim project report published in June 2015.

The focus group for disabled students was also audio-recorded and the recording, together with the paper forms completed during the first activity, formed the basis of a short report written by the team member who had facilitated the event.

The data collected from staff were analysed by two other team members, with responsibilities allocated according to themes.

In reporting our findings, we have found it more fruitful to organise the data by theme rather than by research question. Where possible, we have also presented the student and staff data together (instead of separately), an approach which we believe results in a richer and more holistic picture.

[5] U = undergraduate student, T = taught postgraduate student, R = research postgraduate student, A = academic staff, D = administrative staff.

[6] H = Humanities, P = MPLS, M = Medical Sciences, S = Social Sciences, C = Continuing Education. Some participants have affiliations to more than one division and this is reflected in their code: eg UPH11 = undergraduate on a course taught by both MPLS and Humanities.

[7] That is, *unfocused* in that they created 'a record of "what happened" within a given recording of speech' and *indexical* in that the data were organised in relation to the interview questions: Gibson & Brown (2009, p. 113).

3. DEMOGRAPHIC DATA

3.1 STUDENTS

Table 3.1 summarises the numbers of participants involved in our work with students. Participation rates in the first DIGE project are included for comparison.

Table 3.1 Targeted and actual numbers of student participants in DIGE 2.

Method	Participant numbers		
	Target	Actual	DIGE 1
Online survey	600	276[8]	687
Digital diary & interview	20	21	7
Focus groups for disabled students	6–8	12	4

3.1.1 STUDENT SURVEY

Using the overall student population data as at 1st December 2014 as a baseline,[9] we computed a response rate of 1.2% to the survey. This is less than half that of DIGE 1 (3.2%); however, as discussed in section 10, we are confident that the data are sound when set against our other sources of data in DIGE 2 and the DIGE 1 findings.

Mapping levels of study to the overall population data yields the percentages shown in Table 3.2.

Table 3.2 Student survey respondents by level of study.

	UG[10]	PGT	PGR	VRO
% of survey responses	51%	16%	29%	4%
% of student population	52%	20%	25%	2%

PGRs and VROs are slightly over-represented in the survey relative to their proportions within the overall population; PGTs are somewhat under-represented. Note that the analysis in subsequent sections only takes account of VRO data when reporting aggregate figures.

Table 3.3 shows the proportional spread of survey respondents across the divisions.

Table 3.3 Representation of survey respondents across divisions.

	Humanities	MPLS	Medical Sciences	Social Sciences	Continuing Education	VROs
% of survey respondents	36%	31%	13%	26%	2%	4%
% of all students	26%	27%	14%	26%	5%	2%

The percentages for survey respondents add up to more than 100% because we allowed respondents whose course is taught in two divisions to state their affiliation to both. The very low proportion of respondents in Continuing Education was not considered a concern, given our focus on students in the collegiate University.

[8] 300 responses were recorded in SurveyMonkey. We discarded 23 in which respondents had only answered question 1; the remaining response was discounted because it was from a postdoc.

[9] As reported in Supplement(1) to the *University of Oxford Gazette*, no. 5083, 28th January 2015.

[10] The standard University abbreviations for the different course types shown in the table headings are used throughout this report.

3.1.2 DIGITAL DIARISTS

The digital diaries and interviews comprised the centrepiece of our work with students in DIGE 2 (in DIGE 1 the diaries had merely provided a supplementary source of data). The breakdown of the 21 participants by level of study and division is shown in Table 3.4.

Table 3.4 Participants contributing a digital diary and interview.

	Humanities	MPLS	Medical Sciences	Social Sciences	Total
UG	6 + .5 + .5	3 + .5	1	3 + .5	15
PGT				3	3
PGR			1	2	3

The fractional data are accounted for by two students whose courses are taught in two divisions: Humanities and MPLS, and Humanities and Social Sciences respectively. The preponderance of UGs was favourable to our research interests, which lay mainly with this group.

A few digital diarists also completed the survey. Where they had given their email addresses in the survey (ie to enter the prize draw) we were able to identify them and avoid counting their qualitative survey responses and interview data twice.

3.1.3 FOCUS GROUP

The 12 participants in the focus group for disabled students comprised 8 UGs, three PGTs and a single PGR. The divisions were represented as follows: Humanities – 5.5, MPLS – 2.5, Medical Sciences – 1 and Social Sciences – 3 (one participant's course is taught in both Humanities and MPLS).

3.2 STAFF

We gathered data from 55 staff. Of this total, 14 people took part in both the survey and an interview, 32 responded to the survey only, and 9 took part in an interview only. We exceeded our expectations both for survey respondents (actual = 46; target = 35) and for interviewees (actual = 23; target = 15). In the case of interviewees recruited via the online survey we eliminated qualitative data collected in the survey where these were duplicated (and in some cases amplified) in the subsequent interviews.

The 55 staff were spread across the University as follows (some had more than one affiliation):

Humanities[11]	20%
MPLS	32%
Medical Sciences	6%
Social Sciences	35%
Continuing Education	5%
College only	2%

In terms of roles, 53 participants had teaching responsibilities and/or supervised research students. They represented a range of experiences: 32.1% had taught for five years or less, 26.4% for 6–10 years, and 37.7% for 11 years or more. The remaining two participants were administrative staff, one of them a survey respondent and the other an interviewee with a role in the MPLS maths bridging programme (relevant to research question 2.2).

[11] Includes one person whose primary role is in UAS.

4. DIGITAL TECHNOLOGIES IN STUDENTS' LEARNING

Although this section concentrates on students' experience as directly reported by them, we interweave relevant data collected from staff in order to complement or supplement students' evidence. The principal sources of data are indicated below the heading of each section. A summary in tabular format of the student survey data is provided in Annexe 2. A similar summary of the staff survey data is provided in Annexe 5.

4.1 DEVICES

Student survey Q 7

To set students' use of digital devices in context, Figure 4.1 includes data from the equivalent question in the DIGE 1 survey and relevant data from two questions in the 2014 Freshers' Fair survey alongside the DIGE 2 survey data.

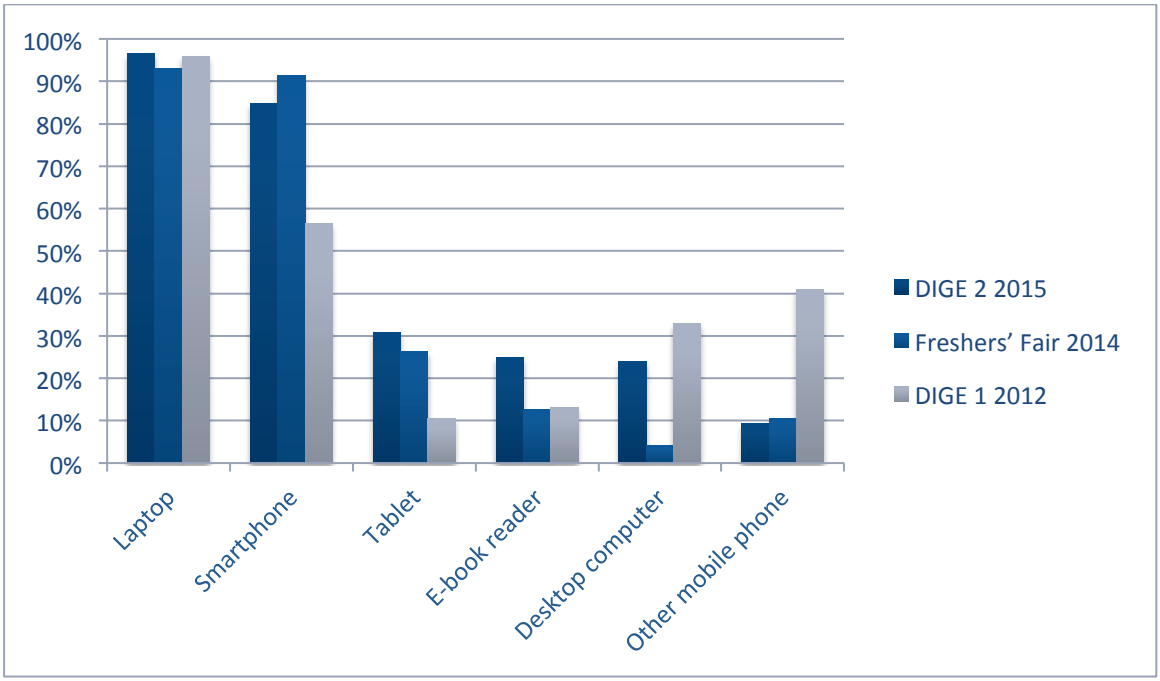

Figure 4.1 Proportions of all survey respondents using the most common digital devices: comparison across time.

Laptop use has remained fairly constant since 2012, the most marked changes being the increase in smartphone and tablet usage. Desktop computer use remains highest among research students: 46% of PGR survey respondents stated that they use one, mainly in MPLS and Medical Sciences.

Qualitative data from the DIGE 2 student survey reinforce the central role that mobile devices now play in students' lives across all subjects and all levels of study. Further evidence of this mobility comes from survey question 5: 18% of respondents cited a café, pub or other public place as one of their preferred places of study, while 5% liked to work while on the move. Mobile devices can play a particularly important role for PGTs on professional development courses: see section 5.3.

Laptops are not always considered to be 'mobile' devices; some students find them too heavy to carry around and rely on desktop computers in departments or libraries and on their smartphones for on-the-fly use. Tablets are particularly used for reading articles.

Generally, smartphones appear to be used for quick reference (eg in lectures) rather than for in-depth reading on account of their small screens and keyboards; slow download speeds (especially of email); and the unsuitability of University-provided systems for use on mobile devices:

> Not to read things, because it's too small, but I use it [for] timetabling things. Also for checking emails from tutors and responding immediately. Also small queries, not really for studying (UH01).

It should be noted, however, that up to 10% of students may not have a smartphone, sometimes through choice (eg because they find it distracting). Indeed, about 9% of survey respondents appeared not to have a mobile phone of any kind.

A higher percentage of survey respondents reported making use of assistive technologies in 2015 (7%) than in 2012 (2%); the reasons for this were not explored.

4.2 APPLICATIONS, WEBSITES AND SERVICES

Our interest in the applications, websites and services that students use to support their learning lay in four areas: institutionally provided websites and services; the kinds of applications, websites and services that they find particularly useful; the role of social media in their learning (as distinct from their personal and social lives); collaborative activities; and the extent to which they keep their academic and social uses of technology separate.

4.2.1 INSTITUTIONAL PROVISION

Student survey Qs 9, 26–31

Question 9 of the student survey asked respondents for their use of a range of websites and services provided by the University either centrally or through colleges and academic units. Figure 4.2 shows the 12 websites and services that were used by the highest proportions of respondents.

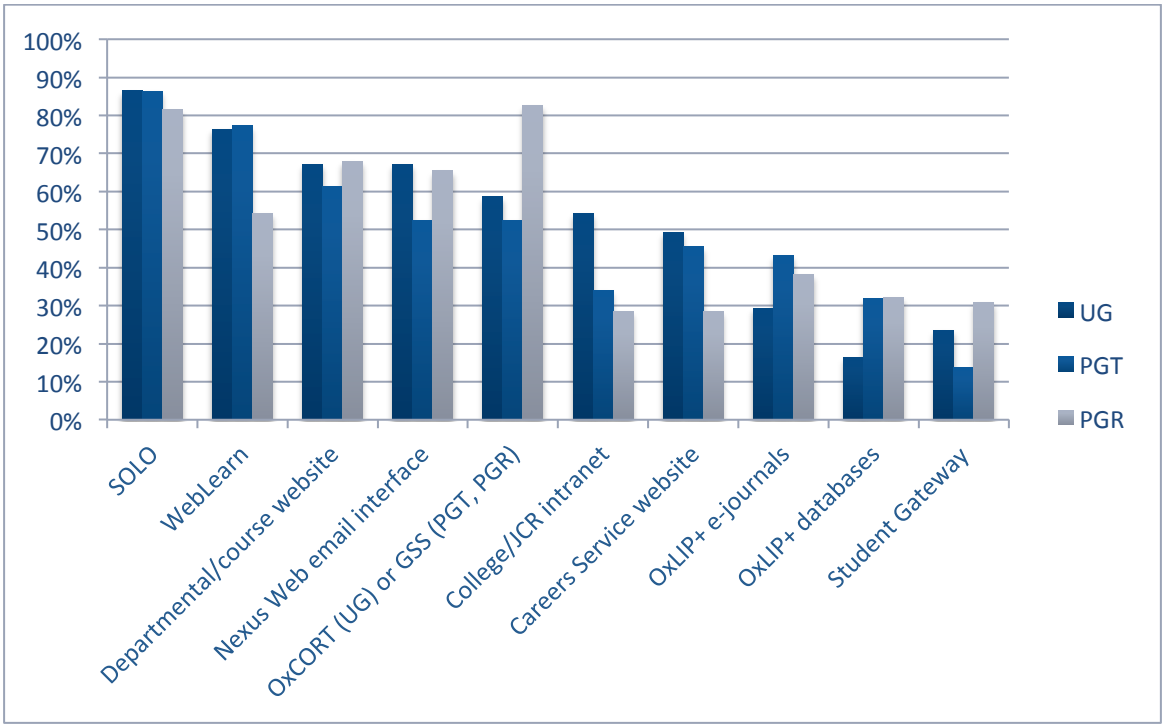

Figure 4.2 The most commonly used institutional websites and services.

The data generally follow expected patterns, in that research-oriented services such as e-journals and databases are used more by postgraduates, while WebLearn is most used by students on taught

courses. PGTs make less use of the Nexus email interface than students on other course types; possible reasons for this are discussed in section 5.2.

The most striking difference between course types lies in the use of the reporting systems OxCORT and GSS. As one of our staff interviewees pointed out, UGs' access to OxCORT depends on the policies of individual colleges. It may also depend on departmental practices and/or individual tutors' preferences; a student interviewee commented that he does not receive feedback through OxCORT while his peers on some other courses do.

A small amount of interview data was collected on the use of technology for submitting assignments and receiving feedback methods. Email appears to be a commonly used channel for submission, with WebLearn and Turnitin also mentioned. Some tutors still require submission on paper; this may be more common in maths and the sciences, where students need to write equations and formulae (indeed, some interviewees reported that they find these easier to write by hand than in a specialist word processor such as LaTeX). Where an assignment is submitted digitally, feedback may be given either digitally or on a printed copy. In the experience of at least one student, feedback is more prompt when it is given digitally.

In survey questions 26–31 which asked students for their 'top 3' applications, tools and websites, institutionally provided websites and services account for 37% of mentions (see section 4.2.2). UGs appear to value them the most (47% of all mentions by UG students), followed by PGRs (16%) and PGTs (11%).

4.2.2 DIGITAL RESOURCES CONSIDERED USEFUL TO STUDENTS' LEARNING

Student survey Qs 26–31

The survey questions asking students to name the three applications, websites and services that they found most useful to their studies yielded 654 mentions from 86% of survey respondents. These mentions were then analysed into genres, defined mainly according to their function. Figure 4.3 shows the 12 genres containing the highest proportions of mentions overall.

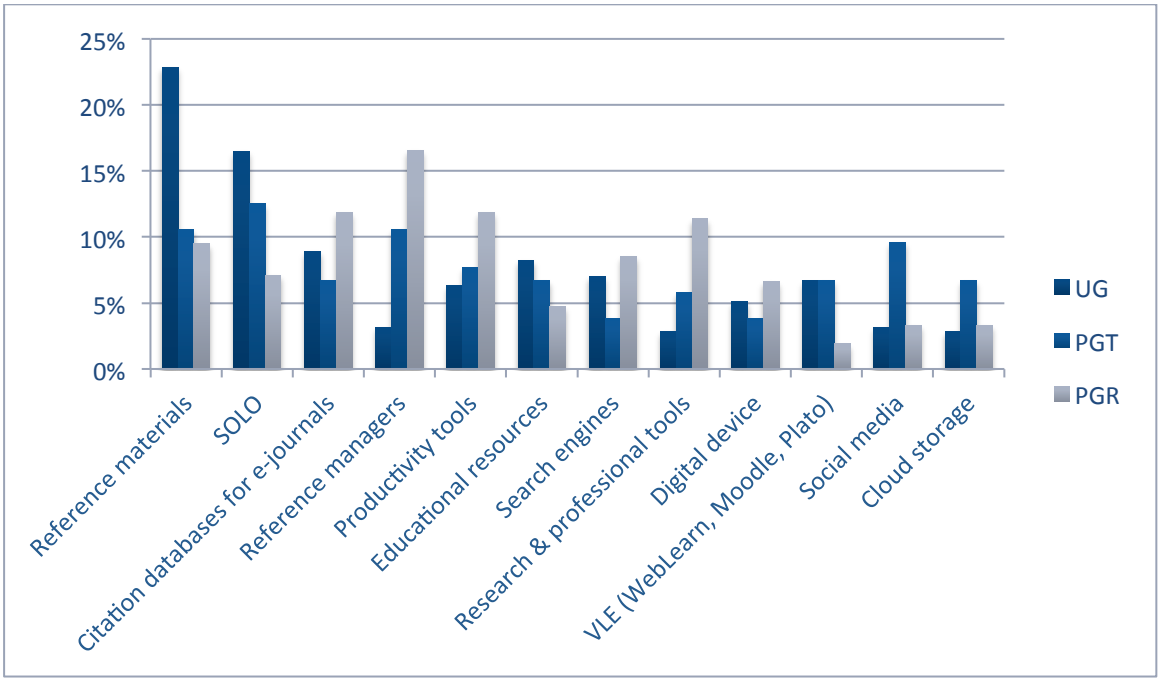

Figure 4.3 Students' 'top 3' digital resources for learning, summarised by genre.

The dominance of the SOLO library catalogue as a widely used service (section 4.2.1) is matched by its perceived usefulness to taught students in particular.

As in the previous section, there is a direct relationship between usefulness and course type, with reference managers (eg EndNote, Mendeley) and tools used by the research and/or professional communities (eg R, MatLab, 3D CAD modelling, APE plasmid editor) coming to the fore in higher degrees. PGTs appear to make greater use by use of the Cloud to store their documents than students on the other two course types.

The comparatively low showing of WebLearn may result in large part from the sub-optimal design of sites in a number of departments (survey respondents and interviewees alike reported usability issues). Moreover, evidence from other survey questions and from the interviews suggests that students value WebLearn highly where effort has been made in the design of the department's WebLearn presence, and where it is used consistently to upload lecture notes and other learning resources.

A comparison with data from the equivalent questions in the DIGE 1 student survey is complicated by the fact that DIGE 1 participants were asked about tools in their social life as well as their studies. Even so, a superficial comparison of the data by eye suggests more similarities than differences in the genres of tool considered most useful to their learning.

4.2.3 SOCIAL MEDIA

Student survey Qs 10, 11, 26–31

The data from survey Q 10 in particular shows that social media are now more extensively co-opted into students' learning than in 2012 (DIGE 1), as shown in Figure 4.4.

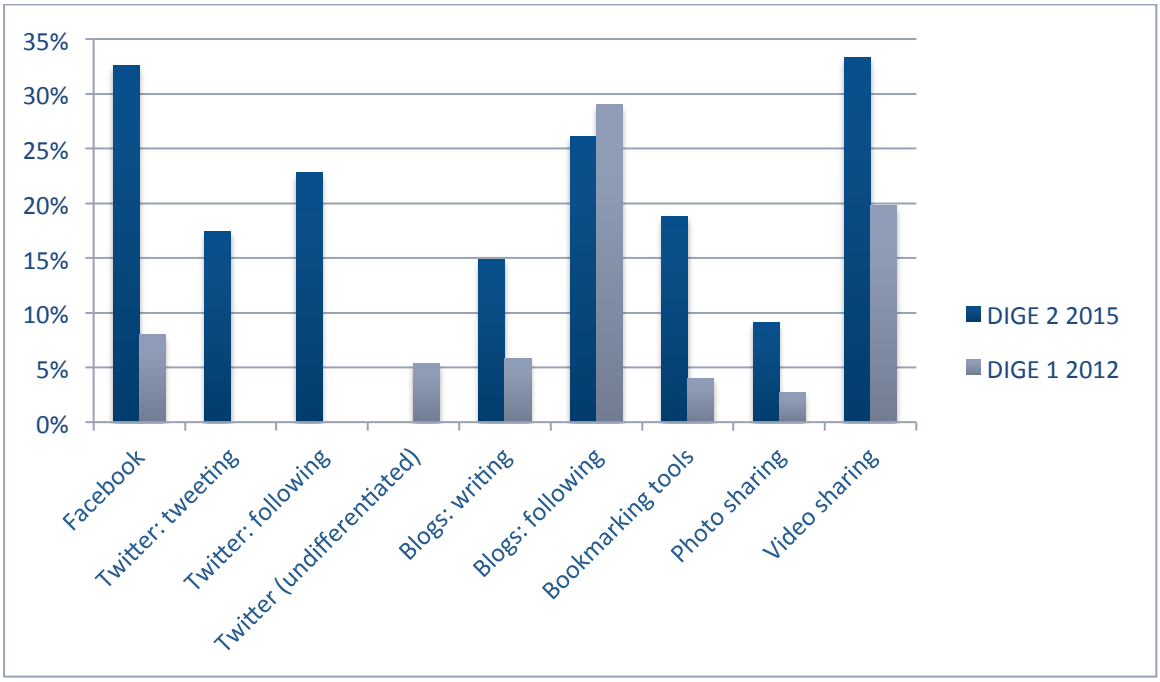

Figure 4.4 Proportions of all survey respondents using social media in their studies: comparison between DIGE 1 and DIGE 2. The DIGE 1 survey question did not differentiate between tweeting oneself and following others on Twitter.

Breaking down the DIGE 2 data by course type reveals PGT respondents to be the biggest users of Facebook to support their studies, although privacy issues and personal disposition deter some students. PGRs were the most active tweeters and bloggers, which may reflect the general growing engagement with social media as a scholarly activity. PGTs and PGRs also appeared to be bigger users of bookmarking tools (eg Delicious, Reddit, Tumblr, Pinterest).

4.2.4 COLLABORATIVE ACTIVITIES

Student survey Q 23

Most of the data on digital technologies in formal collaborative learning activities came from PGTs. Third-party tools were used the most, such as Google Docs, Facebook, Dropbox and GitHub, for sharing information and ideas, storing work in one place, organising meetings, and connecting with people and communities at a distance. There was, however, also evidence that a WebLearn forum had been used for discussion and sharing files.

Collaborative learning activities also appear at undergraduate level. One of the UG interviewees from MPLS talked about a group project in which he was involved, and which was being coordinated by email and Facebook. The communication was largely for co-ordinating and scheduling the work (rather than for analysis), and the interviewee characterised his group's use of digital technologies as instinctive.

Informal collaboration, for peer support, sharing and collaboration, is a notable feature of UG and PGT student life (and was observed also in DIGE 1). This contribution from a UG survey correspondent is typical of the descriptions provided by both survey respondents and interviewees:

> WhatsApp and Facebook chat are helpful for communicating with my college group about essays etc. We also have a shared Dropbox for revision and essays. My year group in department also set up their own group to organise tutorials, share lecture notes etc.

4.2.5 THE ACADEMIC/SOCIAL DIVIDE IN TECHNOLOGY USE

Student interview data

Most participants reported that they strive to separate their academic and social uses of digital technologies. In most cases this is achieved by having multiple email accounts and/or using different platforms to contact different people in their life: for example, SMS, Facebook or WhatsApp for messaging friends and Nexus email for communicating with tutors. This separation enables some students to take a break from the stresses of academic study:

> I just don't like the two mixing … I have two email addresses, one for social and one for work … you want to be able to shut it down (UH04).
>
> I don't want the emails from my friends … being caught up in my 'secretary stream' of 30 emails a day. I can shut down everything that is Uni work and just chill (UH06).

However, this division can be difficult to sustain since 'the people you work with often become your friends' (UH05), and tools which are used for both purposes, such as Facebook, can blur the boundary:

> I can see the benefit of having a divide, like having a set academic life and a set social life; however, since the benefits I have gained from using Facebook for academic purposes [have] been so immense I wouldn't want to divorce the two (US14).

As found in the DIGE 1 project, there is a general resistance to the participation of academic staff on the 'community' pages that course cohorts create on Facebook:

> I suppose because there is a certain amount of authority, which requires a formal email, whereas Facebook is very much an informal thing. The idea of getting a message from your tutor saying 'tute tomorrow at this time' seems completely inappropriate (UH01).

One by-product of the academic/social divide may be the temptation to take less seriously learning activities that are perceived to have a social feel. Interviewee UH01 commented on a tutor's attempt to set up an online forum:

> Quite a lot of people felt like that was a bit of a joke, probably because they associated a forum with online social comments about general things … I actually found it very

> interesting to kind of try [to] bridge the boundaries, or whatever, but a lot of my friends didn't enjoy it at all and felt it was a pointless exercise that took away from a serious academic discipline.

4.3 POSITIVE AND NEGATIVE ASPECTS OF LEARNING WITH DIGITAL TECHNOLOGIES

Comparison with the equivalent data collected in the DIGE 1 study suggests that these views are largely unchanged.

4.3.1 THE POSITIVE IMPACT OF DIGITAL TECHNOLOGIES

Student survey Qs 15, 25; student interview data

The most frequently cited positive impact on students' learning is **access**: access to academic journals and databases, to online learning resources in WebLearn and beyond, to rare historical texts in online archives, and to a wide range of critical ideas and perspectives enabling them to develop their understanding of their subject at greater depth; for example:

> Being able to access materials eg books that are not available in college libraries, particularly for subjects which do not have faculty lending libraries like Law (UG survey respondent).

> [The] internet also provides access to secondary and tertiary sources which are not published allowing greater exposure to a wide range of ideas; can get help on online forums etc. which give support and guidance and assist understanding (UG survey respondent).

E-books reduce competition for scarce printed copies in libraries, and specialised software can be run remotely. Where online articles and resources are provided in WebLearn or a depository like Dropbox, students can access content all in one place. Some commented how being able to draw upon these materials had helped them to catch up on things they had missed, lost or needed to consolidate as part of their essay preparation or exam revision: 'being able to catch up on things like lectures; eg some being recorded and put on Weblearn' (UG survey respondent).

Another benefit students attributed to using digital technology in their learning is the **speed** at which certain tasks can now be performed, including accessing online resources and texts, searching within a text for particular key words and quotes, and contacting tutors and classmates. This can be of particular value in research-based activities: 'It can speed up the collection of data/reading required, allowing for more time to assimilate information' (PGR survey respondent).

The convenience of being able to employ technology to adopt a **flexible** approach to their learning is also highly valued by students; for example: 'If a book is online I can read it anywhere any time. If I'm in the library and I get kicked out at 10pm I can still read it at 2am in [my] room if [I] need to' (UH01).

Flexibility in place as well as time is reflected in students' choices as to where they study, which include public venues (such as cafés and pubs), outdoors and while travelling (data from student survey Q 5). It also enables them to change their location in response to needs or circumstance; for example:

> I prefer to work in the library, and I have a small portable laptop which I take with me there to make notes. However, sometimes when I'm doing a lot of writing I find that I need to use my laptop with a larger screen/my ergonomic keyboard, in order to avoid eye/wrist strain – which therefore requires me to work at home (PGR survey respondent).

A number of students considered **support for grasping difficult concepts** and performing **complex data analysis** to be an important benefit of digital technology to support their learning. This was also apparent from responses to survey question 25, which asked them for examples of the effective use of technology by teaching staff (see section 6.1.4). These included:

- illustrative videos to enable students to see an entire process in action;
- sound recordings of medical patients and music samples;
- plotting software to show behaviour of mathematical functions; and
- visualisation tools.

4.3.2 THE NEGATIVE IMPACT OF DIGITAL TECHNOLOGIES

Student survey Q 16; student interview data

By far the most cited negative effect of digital technology on students' learning was **distraction**, mentioned by 119 of the 193 students who responded to survey question 16. The internet provides multiple and tempting opportunities for them to procrastinate rather than focus on a particular piece of work. The following is the most strongly worded response:

> THEY HAVE MESSED UP MY LIFE as I am on the internet/looking at my photos/writing s**t then deleting it ALL THE TIME. Maybe you think I am making this up – but I have spent the day trying to work and not working as I have been distracted by one technological device after another. I am actually being serious. Capital letters and all (UG survey respondent).

Another UG survey respondent summed up the situation as akin to 'sitting in a library window watching a carnival go on outside.'

The temptations are heightened where students have a smartphone. Two interviewees mentioned reaching for their smartphones if they get bored, despite being aware that apparently unproductive time can in fact provide an opportunity for reflective learning.

Interviewee RS20 pinpointed what she perceived to be the driving force behind the these temptations:

> The main detriment is the fact you're always thinking, 'Well I could just check it for a couple of seconds and find out about what my friends are up to, events' – the whole fear of missing out thing – and then it NEVER is [just a couple of seconds].

Intellectual laziness can arise from reliance on the internet to seek instant answers: for example, 'It makes me Google the answer to a question instead of solving it for myself'; 'No-one uses their imagination for research any more – rather let Google do that instead.' Another form of laziness is the tendency to resort to digests of articles or books instead of reading the entire works.

A **plethora of information** (the converse of ease of access to online resources) can lead to 'a feeling of inadequacy … because you can always search and find a paper where someone's argument is better than yours. Whereas if you limit yourself to three physical books that it, whereas online you can always find something else' (UH01: interview data).

Additionally, some students felt that a heavy usage of computers could lead to the **underdevelopment of cognitive skills** such as deep, concentrated reading; critical reading; and memorisation.

Other drawbacks emerging from the data include vulnerability to technology breakdown (eg wireless connections), the poor usability of some software (perceived to disadvantage students with lower general IT skills even further), and health risks including loss of sleep.

4.3.3 CONNECTIVITY AND THE PRESSURE TO BE ONLINE

Student interview data; digital diaries; student survey Qs 20, 21

The near ubiquity of wifi and/or 4G, together with the high level of mobile device usage, means that students feel under strong pressure to be always online: 'There is an expectation to be constantly contactable and because you have internet everywhere it is coming up on your phone all the time and it [is] very difficult to ignore it' (UH04). This pressure to be online and instantly contactable is reflected in the digital diaries. Most began with students checking email, messaging apps, and social networks immediately after waking up, periodically throughout the day, and one last time shortly before going to sleep (see Annexe 4 for examples).

The sources of pressure are perceived to be the University as well as students' social connections. A humanities undergraduate felt that, because of the assumption that students can respond on the move, more emails are sent out that assume a quick response: for example, last-minute rescheduling of tutorials and room changes are announced through email. Furthermore, some of the books and articles that they need to access may only be available online.

The pressure to be online is experienced both positively and negatively by survey respondents. One the one hand, 'contacting tutors and classmates is much easier' (UG). On the other hand, the boundary between work and leisure is at risk of being eroded: 'Students can be expected to be in work-mode all the time, with emails on phones and work being constantly accessible' (PGR).

4.4 LEARNING TO LEARN WITH DIGITAL TECHNOLOGIES: STUDENTS' DIGITAL LITERACY

This section of the report brings together data collected from both students and academic staff in order to explore, within the Oxford context, the contemporary wider concern over students' digital literacy.[12] As a recent online publication from Jisc comments, 'Many students are not well prepared to study with digital technologies, perhaps because they lack skills and experience or find it difficult to apply existing skills to university and college learning, or because they simply have not thought about the role that digital technologies might play' (Jisc, 2015).

The themes covered in this section either were identified during the research design phase or emerged through our analysis of the data: students' IT skills, how they choose between the digital and non-digital, how they manage their use of technology, and their information literacy. We also consider students' and academics' opinions on the extent to which the University should help students to develop the skills that are perceived to be necessary for living and working in a digital world.

4.4.1 FUNCTIONAL IT SKILLS

Student survey Q 12; staff survey Q 12; student & staff interview data

On average, 86% of respondents to the student survey felt they had adequate skills for their course; this aggregate figure masks a slightly greater confidence in PGTs than in the other two course types. However, they often consider their skills to be no more than adequate and to be largely restricted to common applications (eg Word and PowerPoint), media sites and social networks, as the digital diaries and interviews indicate:

> I can't code or anything like that, but I'm very comfortable in using a computer and other technologies (UH02).

[12] ie 'those capabilities which fit an individual for living, learning and working in a digital society': https://www.jisc.ac.uk/guides/developing-digital-literacies.

> I wouldn't say I'm a pro but I know how to email and use Word. The bits I need to use I can do (TS17).

However, some are dissatisfied with their rudimentary skills and wish to develop their expertise: 'I have the basics (so, I'm "adequate"), but I would like to improve in several areas' (PGR survey respondent).

The greatest concern among students who were uncertain about their skills lay in the area of specialist applications, particularly in the sciences and social sciences (eg Matlab, SigmaPlot, SPSS and programming in general) and in reference management software (eg EndNote, Mendeley). Other digital skills in which students believed they were deficient were specialised word-processing packages (eg LaTeX), databases, data management, website creation and design, and spreadsheets. These concerns were echoed by a respondent to the staff survey: 'Students are now arriving with good PowerPoint skills, but may or may not be good at using databases, reference managers, digital analytical tools etc.' A survey respondent suggested that the need is less to teach students how to use the tools, than to teach them how to use the tools *well*.

The necessity for science students in particular to have good IT skills was emphasised by interviewee AP13 in a response to the staff survey: '…many students, especially at the beginning of their courses, lack even the basic knowledge of IT. In the sciences this is almost like having illiterate students to start with – it can make things very difficult.' Two other academics from MPLS pinpointed the need for programming skills: 'if you will be a physicist, or any scientist these days, you need a really solid programming abilities' (AP10).

4.4.2 FINDING OUT ABOUT TOOLS AND APPLICATIONS

Student survey Qs 26–31; student & staff interview data

Data on how survey respondents found out about their 'top 3' applications, websites and services (see section 4.2.2) suggest that teaching staff and librarians play a leading role in introducing them to new tools for their learning (22% and 15% respectively of the 654 'top 3' mentions). Peers within the University, and friends and relatives outside, account for roughly 12% of new 'top 3' discoveries.

Personal discovery (eg through Google or Twitter) accounted for approximately 11% of the 'top 3' items cited by UGs and PGTs, and for 19% of PGRs' 'top 3'. However, some of the staff interviewees cast doubt on students' ability to find the optimal tools for their work by themselves. For example, AH02 reported finding postgraduate students 'quite limited' in their thinking: 'if they have only ever used Microsoft Word all their lives, they have no idea that there are other text processors out there, or that there are even other ways of handling text'.

4.4.3 LEARNING TO USE NEW TOOLS AND APPLICATIONS

Student survey Q 13

Respondents to the student survey demonstrated an independent streak when it came to learning how to use a new software tool, website or application. Nearly all (94%) respondents stated that they are very likely or somewhat likely to try to learn how to use a new resource by themselves, albeit with the possible aid of a help system, user forum, or manual. As one UG respondent put it, 'In my experience I've found I pick up on how to use software quite fast, and having other people teach me can be a slower process.'

However, teaching oneself does not guarantee success. One PGR respondent wrote: 'I tried to figure out how Oxford offers Turnitin and I couldn't, so I've never used the program.' The data indicate a clear role for training provided by academic units and central departments, although uptake differs according to course type and provider. PGTs appear more likely to rely on their department to teach them how to use a needed software tool, website or app in comparison with UGs and PGRs. Both

PGTs and PGRs are more likely than UGs to seek training from a central University department such as IT Services or the Bodleian Libraries.

Several survey respondents felt their department was either reluctant to provide IT training ('I find the department is not very open to providing training for technical information': PGR) or was offered too late (one UG reported receiving training in SOLO after the deadline for the first essay).

4.4.4 CHOOSING BETWEEN DIGITAL AND NON-DIGITAL METHODS

Student interview data

For student interviewee UP08, 'digital is radically becoming the default and … when we do something non-digital it tends to be because there is an obstacle rather than there being something positive about doing that way.' Such obstacles might include the difficulty of typing scientific and mathematical symbols, the unreliability of technology which drives students to handwriting notes lest their laptop batteries run down, or the ability to see the 'big picture' of one's schedule in a paper-based calendar.

For others students, '[doing] something non-digital' is the outcome of a deliberate choice, which can be influenced by a number of considerations.

The **practicalities of the task** are one factor; for example, writing lecture notes by hand as practice for handwritten exams *versus* using a laptop to consolidate personal notes with quotations from online sources. When reading, some students balance the speed and convenience of accessing texts online against the physical relief from the screen provided by printed materials.

The nature of the **cognitive task** is another determinant. Writing notes by hand is considered to promote greater focus, memorisation and reflection, but the computer makes it easier to search one's notes for the required information and to structure and reorganise one's work. This extract from the interview with UH01 illustrates the interplay between tasks and the media in which they are performed:

> If I'm reading something that I'm putting into an essay, I tend to take notes on my laptop because it's much quicker to transfer. But if I'm trying to understand the concept I take notes on paper … so that I can spend more time thinking about it. When I'm taking notes from my laptop either from a physical book or an online copy it would tend to be because I want to be efficient with it and produce something final. If I try to think about stuff I tend to take notes because it's aesthetically [sic] easier to draw arrows or mind map and those kinds of things.

Still other decisions are determined by one's **personal style or disposition**. One student reported feeling a greater sense of commitment to an appointment which has been handwritten in a paper diary. Another finds the experience of holding a book and leafing through pages more pleasurable than reading online: 'I'm kind of, like, traditional. I like to turn over pages. I have a Kindle, but I will never use my Kindle to read … I feel like the speed of my Kindle doesn't match the speed of me looking at a book and being able to flick forward' (UH01).

4.4.5 MANAGING CONNECTIVITY

Student survey Qs 5, 20, 21, 26–31; student & staff interview data

In sections 4.3.2 and 4.3.3 we reported how distraction from the internet and the pressure for constant availability online are a major issue for students. Responses to survey questions 20 and 21, which elicited students' approach to tasks involving course-related reading or researching and preparing a piece of written work, indicate that only a minority (roughly 10%) close down their email inbox and social networks in order to concentrate fully on the task at hand. Approximately 60% reported that they check their email and social networks every 30 minutes or so, and an average of

16% do so every few minutes. This prompts the question 'what strategies do students adopt to manage their connectivity?'. An analysis of data from across the student survey and interviews yields the following techniques:

- reading non-digital resources, including printing online documents;
- using productivity apps and browser extensions such as StayFocusd, SelfControl and Cold Turkey (reported among students' 'top 3' productivity tools) to block websites that might distract them;
- allowing devices to receive 'push' notifications of emails and reading the whole message only if it appears important;
- choosing a place to work where the risk is minimised. This can vary from a library to departmental postgraduate study room or research group office and, even, to one's room, as illustrated by these differing survey responses:

  > The atmosphere of a library is better for study than my own room, where there are too many distractions (UG).
  >
  > Access to others researching similar areas, access to department PC (software licences), access to a large screen PC, peace and quiet (PGR, giving reasons for working in a postgraduate study room).
  >
  > I like being alone when I'm working, or I get distracted talking to people (UG, explaining a preference for working in their room).

- using separate devices for study and social activities;
- withdrawing from participation: eg by closing (or at least ceasing to use) one's Facebook account or getting rid of one's smartphone;
- cultivating self-discipline:

  > …the idea of downloading something that does something that I could do myself if I was just self-disciplined, seems a bit strange. Lots of my friends use the blockers and stuff, but me personally I would rather be, like, I don't need technology to stop me from using technology. I should be able to do that as an individual (UH01).

Finding an appropriate strategy is not easy, as some distractions may be more acceptable than others:

> At the moment my email on my MacBook will tell me every time I get an email … I was thinking about whether I should turn that off so that I can choose when to start doing my emails. … I kind of feel that is an OK distraction because it serves a purpose, whereas Facebook tends to not serve a purpose (UH01).

Academic staff can also fall victim to distraction, and there is a suggestion that institutional initiatives might be needed:

> These new self-control challenges have appeared quite recently, like 10 years old, and we still haven't developed some coping mechanisms. Well some people did, but the knowledge is more word of mouth, it's not institutionalised, but I think it will [be] in time … Turning off all automatic email checks and alerts and limiting email checking to predefined times should also be taught to all students and faculty (AS23, interview and response to survey Q 14).

4.4.6 INFORMATION LITERACY: SEARCHING FOR, EVALUATING AND USING RESOURCES

Student survey Qs 17, 18, 19; staff survey Q 12; student & staff interview data

Information literacy[13] is a fundamental component of digital literacy, which we knew (from interviews with staff in the DIGE 1 project) to be a problem with incoming students in particular. We therefore took the opportunity in the DIGE 2 student survey to find out 1) how students have acquired the requisite skills, 2) what reference sources they consult when conducting a literature search and 3) the rough proportion of their reading that they access online.

As Figure 4.5 shows, most of the survey respondents across all course types are at least partly self-taught, and nearly 50% have benefited from training provided the libraries. Academics had provided support to UGs in particular during tutorials or seminars, and online materials recommended by a member of staff had been used by an average of 27% of respondents.

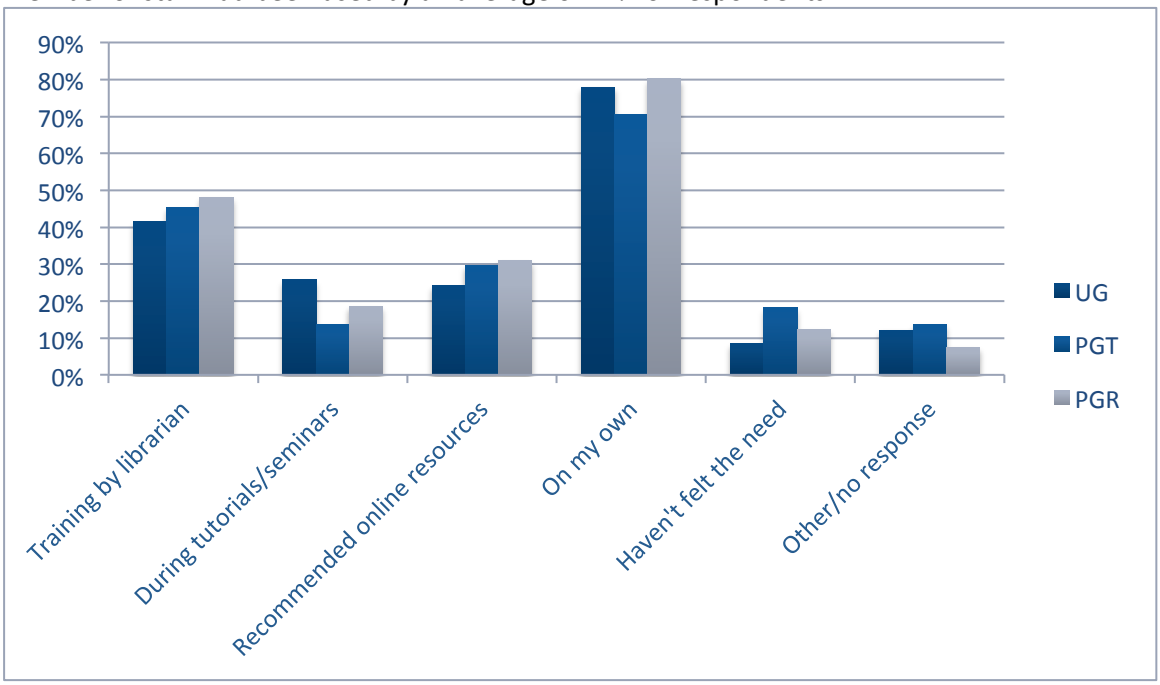

Figure 4.5 Methods by which students have been helped to develop information literacy skills during their time in Oxford.

The interview data flesh out this picture; six interviewees referred to developing their information literacy through 'trial and error', practice or experimentation. For example, interviewee UH05 had been given 'tailored' online study resources online at school, but found at Oxford that 'there is nothing specific to help with your 3rd-week Classics tutorial at Balliol'. She had to learn how to conduct effective web and library searches [to] find reliable results. She also had to manage the jump between reading textbooks at A Level to working through academic journals and articles, and using technology to help with this. Only one interviewee seemed to have received adequate training in information search skills at school which had stood them in good stead on arrival at Oxford.

The main sources of reference employed by students when conducting a literature search for an essay, report or dissertation (Figure 4.6) are the reading list for their course, followed by a library catalogue such as SOLO and then Google Search. Peer-sharing also appears to play a substantial role, which reflects the data on informal collaboration and students' use of Facebook and other social media for circulating references (section 4.2.4). Closer analysis of the data showing in Figure 4.6

[13] 'knowing when and why you need information, where to find it and how to evaluate, use and communicate it in an ethical manner': http://www.cilip.org.uk/cilip/advocacy-campaigns-awards/advocacy-campaigns/information-literacy/information-literacy

suggests a gradual shift towards more scholarly sources as students undertake more research and look for peer-reviewed literature and build up their own personal collection of references.

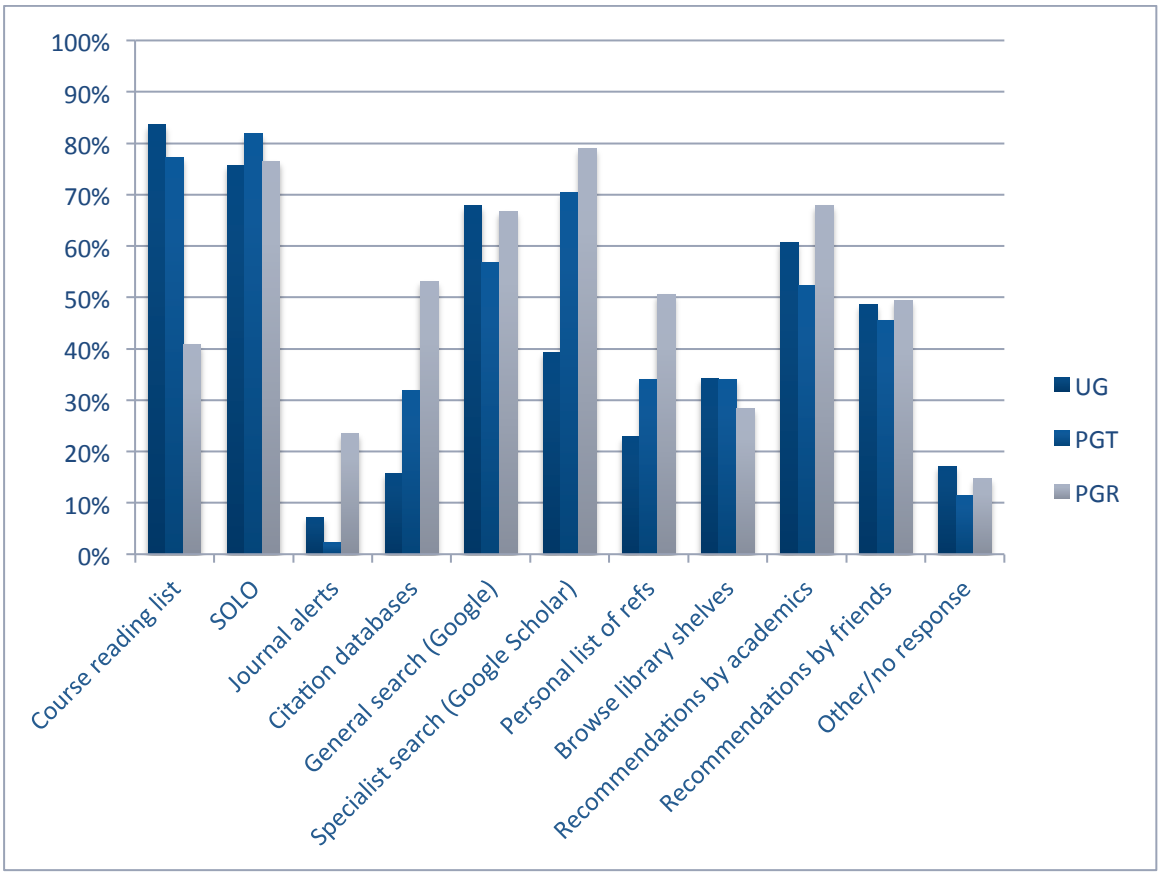

Figure 4.6 Sources of references used when conducting a literature search.

The survey and interview data from academic staff across the divisions reinforce the picture of first-year students' struggles with searching and evaluating resources painted by UH05 above. Some take steps to help the students in tutorials, such as this survey respondent from the humanities:

> I teach students how to evaluate, use and make digital resources, not least in a way that allows them to better use non-digital resources and to understand the history of knowledge. They aren't very aware of these issues when they get to me. They are, however, extremely curious about them and take pleasure in seeing issues around digital knowledge and media placed in context with the history and present state of their subject as a whole.

Another humanities tutor gives students an electronic reading list 'that they can just copy and paste into SOLO to find the copy' (AH04). Providing reading lists in electronic format that contain direct links, either to a publication itself or to its entry in the SOLO catalogue, can be a contentious issue among academics, as we found in DIGE 1. However, a DIGE 2 interviewee suggested that there may be a case for easing students' access to materials, in part because of the intensive nature of Oxford courses:

> I'm quite proactive in encouraging them to engage with primary sources where it's possible, which I realise can be difficult with the time-intensive nature of the course and the range of material we have to cover, but there are a huge amount of online deposits (AH04).

Turning to the question of digital vs 'physical' resources, the DIGE 1 project uncovered an assumption among staff that students prefer to obtain their reading matter online. We tested this assumption in the DIGE 2 student survey by asking how they actually obtain their reading. As Figure 4.7 shows,

although there is a strong tendency to obtain reading materials online, 'physical' materials (eg books taken directly from the library shelf or purchased) hold up well among students on taught programmes. The picture changes as students move into research and increasingly access e-journals.

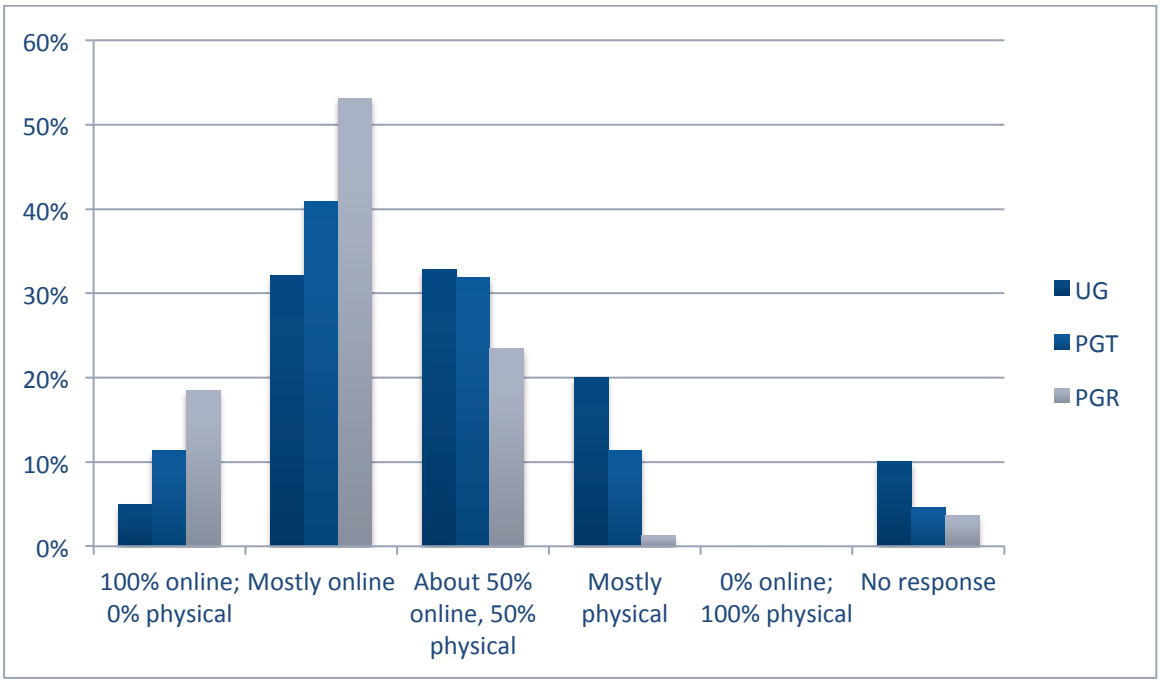

Figure 4.7 Proportions of reading materials obtained online (an online document which is printed in order to be read counts as an online source).

At least one student, and a number of staff interviewees, commented on the detrimental effect that obtaining most of one's reading matter online can have on one's intellectual development. In the experience of student UH01,

> …if I do a lot of reading online there is less of my own voice in an essay because I have just read so much stuff online I don't really know how to think anymore. Where as if I do selective reading of, like, three books, for example, it's much more easy to decide who I agree with, or whatever.

In a survey response, AS18 observed that 'students are so used to downloading material they have lost the ability to read large amounts of material and provide an accurate précis of the material. They rely on having the material in front of them.' In her interview, she added that it can be hard to make students to realise that they have to do more than simply have a document to hand on their laptop in the tutorial; they need to have already read it and made notes. She wondered whether embedding direct links to documents in the reading list may be hindering students' learning in this respect, since if the students had to search for a text themselves they might be more inclined to engage with it.

Interviewee AP11 expressed uncertainty whether students know how to make connections across the different information they find on the Web:

> When you look for information in the dusty library and you sit down you inevitably discover other things along the way. With electronic you find different sorts of connected information. I'm not sure students realise that they can make connections between this information.

He acknowledged a possible role for tutors in helping students to develop this capability: 'That is probably our fault for not teaching them. We can probably teach them a lot more how researchers find information.'

4.4.7 DEVELOPING A CRITICAL APPROACH TO TECHNOLOGY

Staff interview data

An issue touched upon by students when reporting the negative impact of digital technologies on their learning is the reliance on instant solutions from the internet rather than thinking for themselves (summarised in section 4.3.2 as 'intellectual laziness'). Letting Google or the computer do the thinking was also identified as a matter of concern by a number of staff interviewees, particularly in the sciences. AM05 referred to students' inability to refine a Google search that yields thousands of hits and to their failure to interrogate the assumptions underlying a calculation:

> …it is not sufficient to simply see a computer program which says 'I do this.' You have actually got to go back and say [to the program] 'what assumptions are you building in?' … Undergraduates tend to just leap [at] the equation and use it and never [think] about … whether the assumptions match the experiment that they've done.

Three other interviewees reported similar issues with students accepting the outputs from digital calculators and computer applications at face value. One, who teaches statistics to adult learners, starts with simple manual equations so that his students understand how the results are derived, and so in principle they should later be able to work out whether more complicated outputs generated by the computer output are plausible. Another tutor in the applied sciences provides Excel spreadsheets for calculations, so that students can see in detail how a calculation has been set up. For a colleague who teaches the same subject, the solution is a human one: repeatedly encouraging students to realise that merely entering numbers into the calculator is not sufficient, they must also ensure that the output makes sense.

AM05 considered that the origins of this 'black box' thinking lie in the ease of use of contemporary digital tools (in comparison with the past, when students would code their own programs to perform complex calculations). This has resulted in a trust in tools which, if unchecked, can persist into higher levels of study:

> It's because the current generation trusts the technology at every stage far more than we used to, and that trust has turned into faith, or is bordering on faith. And that's a little bit dangerous when you get to the level of graduate research.

For AH03, the cause lies in students' inability (initially, at least) to make the leap from the social to the academic in their use of digital technologies:

> …up until they come to university digital technology is mostly a social platform; they don't connect it to research, work and thinking. I think they just haven't made that leap yet. But I think that's partly what the three years is about. It's not the technical issue; it's cultural. It's not that they don't know how, it's because they don't think about it like that.

Other staff interviewees attributed the source of the problem to the structured and highly prescriptive nature of school learning, which militates against independent learning and the facility for devising strategies to cope with the unexpected. As a consequence, academics have to provide scaffolds to help students move towards independence. For example, in science practicals they may initially instruct students precisely what to record in their lab books, subsequently reducing the guidance to a point where students have to decide for themselves what results to note down.

Teaching students to approach their use of digital technology in a more critical and independent manner was considered by several respondents to be integral to an institutional digital education strategy:

> A tech[nology]-led educational strategy for the Uni[versity] would inculcate in students a higher level of critical and analytical learning, rather than just delivering learning materials through digital platforms (AS22 in response to staff survey Q 14).

For another academic in the social sciences, this might come at the expense of the tutorial – the centrepiece of students' learning at Oxford:

> The effective use of digital technologies may become more important to new graduates than the traditional skills of the Oxford tutorial. We may have to consider reducing the role (and costliness) of tutorials to accommodate better use of digital technologies (AS19, in response to staff survey Q 14).

Less controversially, a role was also seen for bridging programmes such as the one run by MPLS; although they might be seen to be spoon-feeding students, 'it's probably better not just to leave them floundering when they arrive, because we have to accept that if there's nothing that can be done about the school system from the University side, then there needs to be some sort of help' (DP15). Even so, he continued, students cannot be expected to change their attitudes overnight; it is a gradual process.

4.4.8 PREPARATION FOR EMPLOYMENT IN A DIGITAL WORLD

Student survey Q 14; staff survey Q 13; staff interview data

In light of the contemporary interest of the HE sector in graduate attributes for employability,[14] we questioned both students and staff as to whether the University has a responsibility to help students acquire the general digital capabilities that they might need in the workplace (cf Hinrichsen & Coombs, 2013).

Postgraduate students felt strongly that the University should offer training in general IT skills needed for employment, with 77% of PGTs and 69% of PGRs in favour of the proposition. Undergraduate feeling was mixed, with only 44% favouring such support. Supplementary comments in UGs' survey responses followed two themes: students should already have these skills before coming to Oxford and, if not, they should be able to teach themselves these skills on their own.

Several undergraduates pointed out that IT training is offered in UK schools and should include the one employment-related skill mentioned repeatedly: viz. word processing. One student wrote: 'Oxford is not a professional university, it is a research university and people treating it as the former is part of its problem', and another criticised the proposition for 'misunderstand[ing] the point of a university education. Intelligent people should normally be able to gain the relevant skills themselves.' Some students adopted a more moderate stance; for example, 'If the University does provide courses to teach IT skills, that's good but not a necessity.' Others felt that 'We're paying enough money to actually attend university, so it would be nice if they were to set us up for the future should we feel the need to ask them for some help.' However, the voluntary nature of IT training was seen as crucial.

A more focused question was put to staff; specifically, whether academics have a responsibility to include, *as part of their teaching*, opportunities for students to develop digital skills that they might need in future employment. The quantitative data seem decisive, with 65% of respondents answering 'Yes'; however, the qualitative data from 13 survey respondents and several interviewees are more equivocal and illustrate a range of perspectives.

Although part of a tutor's role may be to ensure that their students are equipped for the world after graduation, two interviewees expressed the view that employability skills are a by-product of students' intellectual formation:

> I don't think of it as how I will make my student employable, I think about how I will make the student the best student they can be. That of course will make them more employable because of the type of skills we teach our students (AH03).

[14] ie 'a set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations' (Yorke, 2004, cited at http://www.employability.ed.ac.uk/What/).

> I'm not teaching students to have a better job prospect, I'm teaching them so they can learn to appreciate and love literature and perhaps broaden their minds (AH01).

A survey respondent from MPLS felt that 'practice in developing digital skills can be built in via targeted elements of the overall course.' This may be more straightforward in some disciplines than others. In applied science subjects – ie ones that have an industrial aspect to them – students can be introduced to the approaches typically adopted in industry. Indeed, in science generally, 'by and large, a digitally illiterate (science) graduate is useless in any real world environment, be it for research, development, teaching or any other industry they decide to work in' (AP13, in response to survey Q 13). Professional bodies may also dictate the matter: the Law Faculty's compulsory course on digital skills for first-year students is a response to requirements of the Law Society.

An interviewee from the social sciences reflected a comment in the student survey (quoted earlier in this section) regarding the distinctive nature of teaching in a research-intensive university:

> it's not a practical degree; we are not teaching them how to run a business: we are teaching them how business is run. That is a very different agenda. … I think a research intensive university should be about ideas, not about the vocational preparation (AS22).

In similar vein, a humanities academic (AH04) pointed out that Oxford academics, as leaders in their (research) field, 'won't necessarily know, and have an interest, with the outside world and the skills that are required.' He argued,'why make them responsible to teach students to be employable for something they themselves have not necessarily done?'

Regardless of their own responsibility in students' development as digitally literate graduates, a number of academics readily acknowledged the role to be played by the University as a whole:

> Universities teach transferable skills like logical thinking, argumentation, background research, and persuasive writing, and ICTs are part of these skills today' (AS23, in response to survey Q 13).

> If we are training people without reference to the right tools with which they will be living their lives, both their academic or professional lives, I think that is irresponsible (AS22).

A survey respondent with an administrative role at Oxford drew on her experience in the commercial sector in expressing her concern lest graduates be left behind in the workplace by colleagues who have not been to university:

> Everything is becoming digitalised and fairly soon it will be standard. Students must be prepared for this or they will be at a disadvantage against those who have not gone to University and have a solid understanding of digital methodology through employment.

In terms of how these digital skills should be taught, suggestions included online training for basic tools such as Word and PowerPoint, and face-to-face training should be offered centrally by specialists from IT Services or the libraries.

5. THE DIGITAL EXPERIENCE OF SPECIFIC DEMOGRAPHIC GROUPS

This section reports on our investigations into specific aspects of the student experience, carried out at the request of individuals with strategic roles in relation to digital education at Oxford. These aspects are: the transition from school to university, taught postgraduates, students on award-bearing blended courses and disabled students.

5.1 STUDENTS IN TRANSITION FROM SCHOOL TO UNIVERSITY

Staff interview data

The leading example of an online programme to support the academic transition from school to Oxford is the MPLS Maths bridging course, described in the DIGE 2 interviews by one of its lecturers and its administrator. The online course co-exists with a residential course, having been developed in response to the heavy demand for places on the latter. The two courses differ in a number of key respects:

- **Audience.** The online course is offered to all incoming students, not just a small number selected on the basis of need (who are invited to the residential course). It is therefore more inclusive.
- **Curriculum.** The residential course includes subject-specific lessons, an example tutorial and study skills training (eg time management); the online course does not, partly because of the lack of resources to develop them. One of the two interviewees also reported that it is harder to develop students' thinking skills online, particularly in chemistry.
- **Learning path.** The course covers all the maths topics that students will encounter in their first year. However, the sequence in which they will encounter the topics during that year will differ. On the online course the sequence in which students study the topics can be varied accordingly; on the residential course all students must take the topics in the same order.

Regarding uptake of the online course, the course administrator reported that about 75% of incoming students log into it at least once. However, because it is voluntary there is no guarantee that students who might benefit the most will take up the opportunity.

The course administrator also reported that MPLS does not attempt to measure the impact of the courses in terms of the end-of-year exam results, taking the view that the 24 weeks of the academic year will have a greater effect on students' performance than a short burst of tuition. Rather, the benefits are qualitative: getting students back into mathematical thinking and enabling them to get the same results at Prelims while feeling more at ease (as shown by students' feedback). There is also evidence that students continue to refer to the online course materials during the year.

Some individual departments and faculties run their own online transition activities. One of these is a the Biochemistry Department's online Maths course. This is made available to students before they sit their A Levels, so that they can obtain additional support (if needed) from their maths teachers. AM05 explained that this approach is preferred over waiting until August (ie when they know which students will be coming) and then 'springing' a bridging course upon students at that time, as students are likely to panic if they find the course difficult.

The Law Faculty offers a range of activities rather than an actual outreach course, since few schools offer Law as a GCSE or A Level subject. These activities are run through a programme unique to Law, called Pathways, and the University's UNIQ scheme. In addition, the Faculty provides online mock tests for the LNAT (Law National Aptitude Test).

Some individual college tutors offer online bridging-style activities for their incoming students. A Law tutor described an introductory course which she provides in WebLearn, including cases and statutes, and guidance on reading them. An attempt to present the material in interactive Q&A format had proved unsuccessful, in part because she sensed that the students were reluctant to talk to her online before meeting her in person.

5.2 TAUGHT POSTGRADUATES

Student survey (miscellaneous questions); digital diaries; focus group for disabled students; student & staff interview data

Because we were unable to hold a focus group for PGTs, we have relied in this section on data collected in our other work with students and on interviews with a small number of staff.

The principal digital interests of PGTs – including a ready connection to the internet and access to readings and learning – are the same as those of UGs although, as we have seen in earlier sections, the actual systems and services they use (and value) reflect their increasing orientation towards research. Reviewing the data reported in section 4, and drawing also on the findings of the 2007-8 Thema project (Masterman, 2009; Masterman & Shuyska, 2012), we note that PGTs' perspective on their digital experience at Oxford is influenced by two other factors: the brevity and intensity of their courses, and comparisons with their previous university. For example, students may be less inclined to adopt a new email service for just one or two years, and instead have their Oxford email forwarded to a personal account such as Gmail or Hotmail. Or, they may prefer to store their documents in the Cloud so that they can be sure of accessing these materials beyond the end of their course.

Interviews with academics who teach PGT courses revealed another persistent finding from the Thema project: difficulties with the transition to PGT study, particularly for students who are returning to study after a period in employment and/or who come from a different educational culture. They are often additionally prey to assumptions on the part of the institution that 'Oh they're grads, they'll be fine' (AS18).

Staff on the BCL (Law) course have experimented with digital technologies to facilitate this transition, recording podcasts to help students choose their options before they arrive and publishing reading lists early. However, because many students only finish work a few days before they start the course they may have little or no time to prepare, even by reading online.

In contrast, an interviewee who teaches on a residential postgraduate programme in the Department for Continuing Education reported some success in prefacing it with an online induction. She felt that it enables her to ease students back into studying, foster a sense of community, provide some basic training in statistical methods and also tackle the challenges posed by the different educational cultures to which students have been exposed in the past. She also feels that the less visual environment helps students to feel at ease with each other, and that asynchronous communication benefits non-native English speakers who need more time to craft their contributions.

5.3 STUDENTS ON AWARD-BEARING BLENDED COURSES

Staff interview data

There is a strong overlap between this section and the previous one, as all of the evidence collected is from interviewees teaching on postgraduate programmes in the Department for Continuing Education.

Three interviewees teach on a blended MSc programme for medical professionals. One of them suggested that transition may be less of a problem as the students are used to taking courses to further their career development. The taught part of the programme is segmented into eight-week

modules. Two are fully online; the remainder consist of an online 'pre-Oxford' week, and then an 'Oxford' week of face-to-face learning, followed by six weeks of further online study culminating in an assignment. One of the tutors described how he keeps didactic teaching to a minimum. During the face-to-face week he breaks students into small groups to give more of a tutorial flavour. He describes his approach in the online weeks as 'more a question of "here's the task; post it online and use the forum to discuss about that task."' Tasks are released weekly, but forums are kept open so that time-pressed students have the flexibility to work on the task and post their forum contribution later.

All three interviewees described how they actively encourage independent learning and peer support. They prefer the students to interact mainly with each other on the forums, with the tutors monitoring the discussion for most of the week and only joining in towards the end in order to give their commentaries and identify the outstanding issues. Two of the tutors felt that the extent to which students participate in the forum has an impact on their performance in the assignments.

One of the interviewees described the importance of mobile learning to students on professional development courses, particularly where they have to fit their studies around busy work schedules or are frequently on the move. They therefore value being able to access their reading materials or to check the discussion forums quickly on their mobile devices. As a tutor, the interviewee stated that she would herself appreciate the ability to monitor the forum on her smartphone. Since the course uses WebLearn as a VLE, the interviewee was keen for mobile-friendly interfaces to be developed for the tools.

The question whether some subjects lend themselves to online learning more than other was touched on briefly by another interviewee from Continuing Education, who feels that his skills-based course in statistics works better than the more 'interpretive' course in animal behaviour which he also teaches. Another teacher of an online course in statistical methods agreed with the advantages of providing a statistics course in a digital medium. She argued that students can find learning statistics in the classroom frustrating: either too easy or too hard. In an online environment, where they can approach the resources at their own speed and in which the answers to their questions (in the forum) are documented, they can feel more in control of their learning.

5.4 STUDENTS WITH DISABILITIES

Focus group; student survey questions 8, 26–31.

The focus group organised with the assistance of the Disability Office attracted participants with a range of conditions. We did not ask students explicitly about the nature of their disabilities; rather, we left it to students to share this information as they chose. The conditions of which we became aware included dyslexia, diabetes, depression, hearing difficulties and ADHD.

5.4.1 INSTITUTIONAL SUPPORT FOR DISABLED STUDENTS

Focus group participants and survey respondents alike expressed their appreciation of the support they received from the Disability Advisory Service (DAS) and some disability liaison officers in colleges. This included the provision of supportive software and voice recognition tools, training in technology use (by the DAS), and assistance (from the DAS) with updating students' pre-existing software and hardware.

Participants also commented favourably on the educational support they received, including one-to-one tutorials, extra time in exams, programmes to help with dyspraxia and dyslexia.

That said, two principal barriers to support are apparent from the focus group data. The first is cultural: 'a misunderstanding of disability and mistrust of technology' in the University. Participants generally felt that disability is not discussed enough, and some referred to a lack of understanding or

sympathy on the part of teaching staff who may be needed to engage with a student's assistive technology (for example, by wearing a microphone in tutorials).

The second, organisational, barrier is a lack of clarity within a collegiate system over responsibility providing suitable technologies: the University or the individual colleges: 'the trouble a lot of people have is that no one really knows who is supposed to provide it.' As a result, students may have to fall back on their ingenuity or on that of family and friends.

We are unable to comment on the provision of assistive technologies by faculties and departments as we did not collect any evidence on the subject.

5.4.2 DISABLED STUDENTS' USE OF TECHNOLOGY

Only a minority of focus group participants said that they use assistive technologies. In addition to lack of institutional support, the reasons given include weak IT skills, the built-in accessibility features in modern devices such as smartphones, the cumbersome nature of some specialist equipment, and a reluctance to be seen to be different. Also, certain types of disability do not entail the use of assistive technology.

In the experience of several focus group participants, much of the University's assistive technology is underused. Some systems were described as outdated. An undergraduate reliant on T-loop systems in lecture theatres commented that they are not always functional, as few people outside the DAS understand how to use and maintain them. The training need applies to academics as well as to technicians: an undergraduate who needs teaching staff to wear a microphone in her tutorials commented that 'it does feel like some of the tutors could do with a crash course' in its use.

A number of technology-related issues important to students as a whole have added relevance for disabled students, including printing, single sign-on, and the sub-optimal performance of websites on mobile devices. However, the demand voiced most frequently was for lecture capture (this was also the only context in which staff participants in the project referred to disabled students). Recorded lectures and seminars would benefit disabled students who have to miss classes or find it hard to keep up with the pace of delivery. It was also observed that lecture capture would remove the need for note takers, which are both a costly human resource and further mark out disabled students as 'different'.

6. DIGITAL TECHNOLOGIES IN TEACHING

Although this section concentrates on the direct reports of teaching staff, we interweave relevant data collected from students in order to complement or supplement academics' evidence. The principal sources of data are indicated below the heading of each section. A summary in tabular format of the staff survey data is provided in Annexe 5. A similar summary of the student survey data is provided in Annexe 2.

6.1 ACADEMICS' CURRENT PRACTICE

Our interest in how academics currently engage with digital technologies in their teaching addressed three topics: the kinds of technology they are using; their use of technology to support common teaching and learning activities; and the types of course resources and materials that they consider should be made available to students online. The quantitative data reported in Figures 6.1 to 6.3 are derived from the 45 survey respondents who have a teaching role.

6.1.1 'CONVENTIONAL' *VERSUS* 'EXPLORATORY' USE OF TECHNOLOGIES

Staff survey Q 5; staff interview data

Survey question 5 aimed to elicit the extent to which academics stick to the 'conventional' applications used in higher education, and the extent to which they could be said to adopt a more exploratory or creative approach. By 'conventional' applications we mean general-purpose 'office' and productivity tools, the VLE and subject-specific software and websites. We considered signs of a more exploratory approach to be using social media in one's teaching (such as YouTube, Flickr, Twitter and Pinterest), actively seeking out new tools and technologies and incorporating them into one's teaching, and creating websites or apps for one's students to use.

The headline data are shown in Figure 6.1.

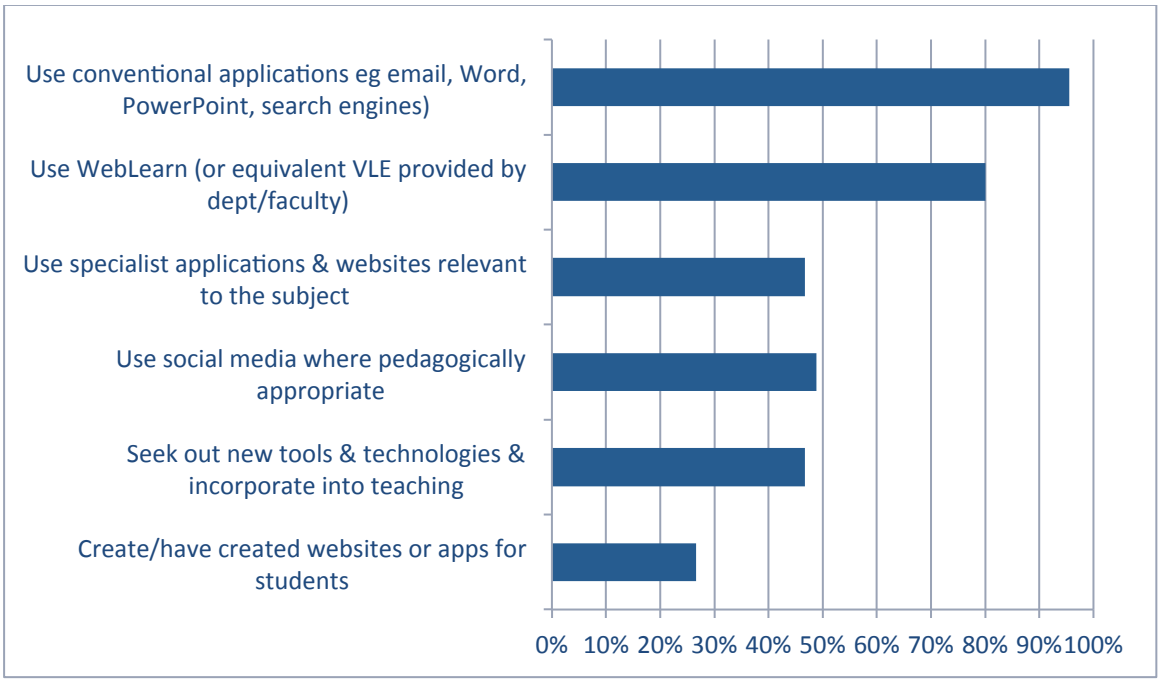

Figure 6.1 Different kinds of technologies used by academic staff in their teaching.

Delving more closely into the figures reveals that 33 (73%) respondents were engaging in one or more of the three forms of exploratory or creative activity, and that 16 of these teach in the Social Sciences Division. These 'adventurous' social scientists mainly use social media and/or seek out new

tools for their students, but five have also created websites or apps. One of them commented on her practice: 'There are a lot of blogs in my subject. I contribute to these blogs and also refer my students to blogs. They are particularly good for giving commentary on recent cases in an accessible format' (AS18, in response to survey Q 5).

A current non-user of social media in her teaching could…

> …recognise that tools like Twitter have value both for us to communicate with each other, and as a professional networking tool for my students to become familiar with. I think what most holds me back in exploring new technologies is lack of time, but also not knowing who else of my teaching peers are using these tools. Having other professionals to discuss them with and observe would give me more confidence, ie to try social media within the Oxford context (APC17, in response to survey Q 5).

Regarding WebLearn, the sole interviewee who had taken part in the DIGE 1 project observed that more colleagues in his department were now using the VLE. However, their activities were still largely confined to uploading slides and class notes, which he felt was due to lack of time to investigate the other ways in which WebLearn can be used.

6.1.2 SPECIFIC TEACHING ACTIVITIES

Staff survey Q 6–7; staff interview data

We wished to ascertain both the proportion of academics who currently support particular teaching activities (or have supported them in the past) and the extent to which they have considered going beyond their existing repertoire. Figure 6.2 (on the next page) summarises their responses to these four answer choices:

- I do this currently or have done it in the past.
- I have not done this, but I have thought about the possibility.
- I haven't previously thought about doing this.
- Other response or no response.

The activities most supported with digital technologies revolve around 1) making resources available to students online, 2) supporting lectures with presentation software and 3) written work (receiving submissions and giving feedback). However, in their interviews two academics pointed out possible drawbacks in using presentation software in lectures: namely, the temptation to cover too much material, and to cover it too fast for students to assimilate:

> Not having the technology forces you to slow down. It's very easy when you have 50 slides to go though that and it's a huge amount of content. If you have to write everything down on a blackboard it's impossible. The way you present something or explain something changes a lot. I think students tend to prefer the slower pace of explaining without the use of these digital tools (AP13).

Technological support for students' learning activities falls a long way behind. This is perhaps unsurprising in the case of online discussions, since their value on largely face-to-face courses is open to question. Even so, there is evidence in the interview data of their use on undergraduate courses in the collegiate University. For example, one tutor had tried both synchronous and a synchronous chat in WebLearn with undergraduates for revision as an alternative to email. The advantage of this for her would be that she need only answer a question once. However, she reported that the students felt too embarrassed to put questions on the chat, possibly (she suggested) because it is not currently possible to make chat anonymous in WebLearn.

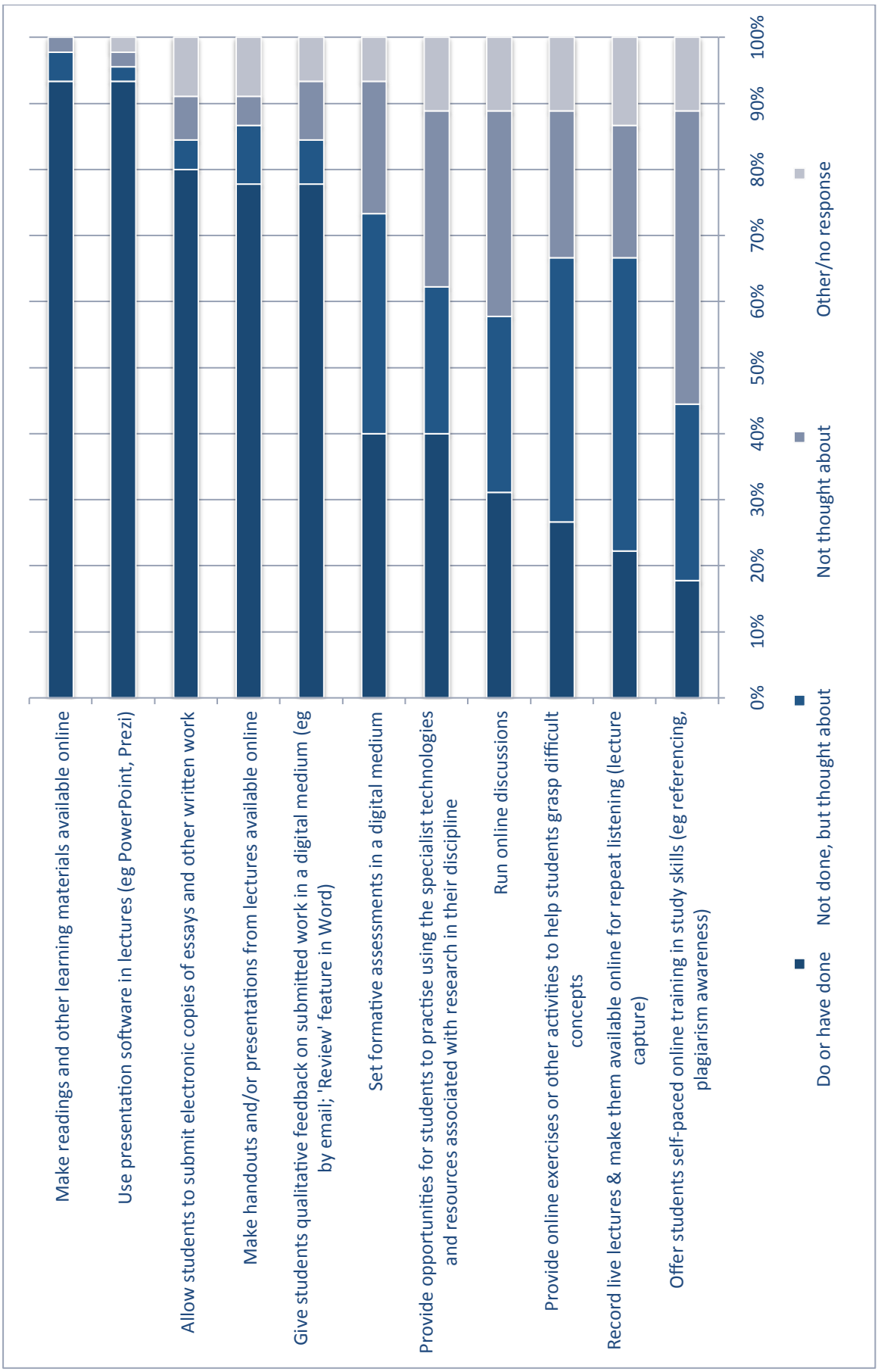

Figure 6.2 Academics' use of digital technologies to support specific teaching activities.

The relatively low proportion of academics who provide formative assessments through online multiple-choice questions, quizzes and other digital techniques may be in part a function of the subject they teach, as we know that the Medical Sciences Division has used online assessment extensively for a number of years. An interviewee from MPLS described his success over several years with voluntary self-tests for reinforcing concepts for visualising objects in 3-D. Because the questions become progressively more challenging, he is able to identify the point at which students become stuck and, hence, adapt his subsequent explanations in class. Even though the tests are not compulsory, completion rates have been 100% for the past three years.

Lecture capture is a decidedly minority activity at the moment, but this is perhaps explained by the fact that the University has only been trialling a central service for two years. The differing perspectives of academics and students on this topic are explored in more depth in section 6.2.6.

We did not explore the reasons why respondents who had thought about using technology with a particular activity but had not actually used it. Supplementary comments to the question suggested that factors might include the unsuitability of the subject, personal disposition, preferred teaching approach and the University regulations (which preclude the use of technology for some activities). To these we can add lack of time, lack of institutional support and the difficulty of finding other academics who have tried these methods with success – perceived barriers to which academics referred elsewhere in the survey and interviews.

6.1.3 SPECIFIC ONLINE RESOURCES

Staff survey Q 11; staff interview data

Focusing on one of the majority uses of digital technologies – putting course-related resources online – respondents were asked to identify which elements of a course they felt should be made available as part of normal practice. The list was derived from an informal initiative to ascertain the minimum standards for VLEs (Reed, 2014). We deliberately refrained from asking our respondents whether the materials should be provided in the VLE (WebLearn) specifically, as our primary interest was in the materials themselves. We were aware that some departments have their own websites or other course management systems and did not wish their attention to be diverted to the hosting platform.

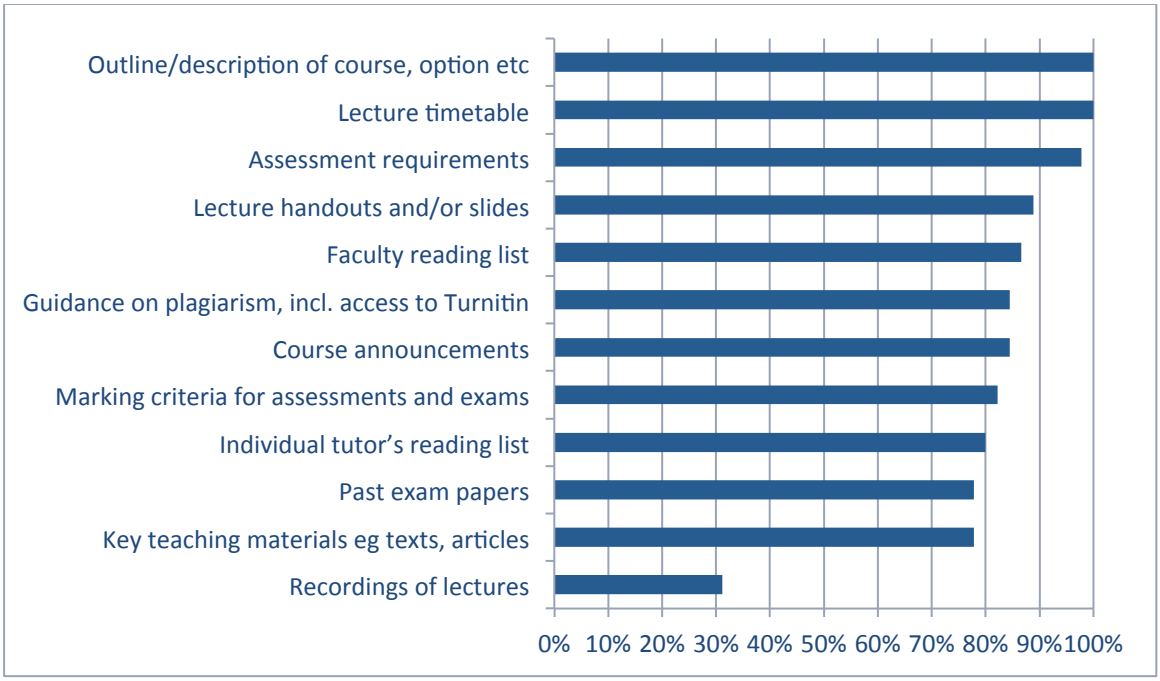

Figure 6.3 Online course elements considered to be part of 'normal practice'.

As Figure 6.3 shows, with the exception of lecture recordings, over three-quarters of respondents considered that all of the resource types should be available online.

6.2 DIGITAL TECHNOLOGIES IN A RESEARCH-INFORMED PEDAGOGY

To report the practical ways in which academics use digital technologies to support their teaching this section of the report takes its cue from the League of European Universities' advice paper on online learning in research universities (Mapstone, Buitendijk & Wiberg, 2014). We use a framework from the research literature in order to explore some of the ways in which give examples of how academics at Oxford 'aim to teach based on research and to use excellent methods of pedagogy at the same time' (ibid.: p. 3) are using digital technologies to support that endeavour. This framework identifies four approaches as characteristic of research-informed teaching:

- research-led
- research-oriented
- research-based
- research-tutored

(Spronken-Smith, Mirosa & Darrou, 2014, based on Healey & Jenkins, 2009, and Healey, 2005)

Sections 6.2.2–6.2.5 give examples of each approach from the DIGE 2 interview data, section 6.2.6 examines the multiplicity of perspectives on two aspects of the use of digital technologies in lectures: students' personal devices and lecture capture. First, section 6.2.1 reports contributions from interviewees on ideals and realities in the relationship between research and teaching.

6.2.1 THE RELATIONSHIP BETWEEN RESEARCH AND TEACHING

Student & staff interview data

Two academics from the Social Sciences division took the view that (in principle at least) that a research-intensive university should be at the leading edge of both pedagogy and technology, and should be aware of students' changing competence and expectations: 'We ought to be able to stay ahead of and make use of the technologies that are around us … also to make use of the resources that are available' (AS19). The reality, in contrast, is a constant tension between the amount of time devoted to teaching and the amount of time devoted to research, especially where career progression depends on the quality and quantity of one's research. As an interviewee from the life sciences commented, it requires much effort to combine both.

The lure of a research career at Oxford may therefore leave little room for exploring ways in which on might improve one's teaching:

> In order to do more advanced teaching stuff, either you have to have a curiosity about pedagogical methods or you have to really care about your students. That can be hard if what's brought you to Oxford is the exciting research that you can do (APC17).

The same interviewee went on to comment that some senior colleagues still hold a knowledge-transmission conception of teaching: 'having to get what's in their brain into the brains of their students and the best way to do that is just to talk to them, or at them.'

The extent of a cross-over effect from using digital technology in one's research to using it in teaching is not easy to gauge. A humanities tutor explained that:

> For my research I'm very dependent on digital technology … When I teach I must confess I do not use technology. We have a text, we read from the text, we talk. If there is a point that I'm making I write it on the board, or if there are images that I want to share I have a book with me and I pass it around. … although [technologies] certainly help, I don't see it as an essential part of my teaching. Sometimes I feel it's a hindrance (AH01).

A contradictory view was expressed by an undergraduate interviewee (UM07), who seemed to suggested a link between the amount that digital technologies are used in research and the amount they are used in teaching: 'Anatomy tutors tend to be really old school: dusty textbooks and hand-

drawn limbs … if the internet didn't exist it wouldn't matter'. In contrast, one of her other tutors is involved in research into modelling microorganisms and provides a number of opportunities for her students to use technology, including protein databases.

6.2.2 RESEARCH-LED

Staff interview data

According to Spronken-Smith and colleagues (2014), in the research-led approach to teaching the curriculum is structured around content drawn directly from research, and this is implicit in the data from the student survey which shows that even undergraduates are accessing citation databases to obtain journal articles. From the teacher's perspective this may involve keeping up with developments in other areas, but it can also benefit one's own work: 'the teaching that I do requires that I keep up with research questions in a field where I'm not necessarily working, and that gives me a different perspective on what I am doing' (AP11).

Often, the research being shared with undergraduates is one's own: 'For me a research intensive university means that all of my teaching is informed by my own research experience' (AP11). A Law tutor described how she and a colleague upload their draft research papers onto WebLearn for their PGT students to comment on, with mutually beneficial outcomes.

6.2.3 RESEARCH-ORIENTED

Staff interview data

A research-oriented curriculum emphasises teaching the processes of knowledge construction in the subject: for example, how to think like a historian, chemist etc. The tutorial is the locus of this aspect of teaching; an interviewee from Medical Sciences Division spoke of 'the idea of a tutorial as an intellectual apprenticeship, that what you're doing is not learning material; what you're doing is watching a biochemist doing biochemistry' (AM05).

In terms of digital technologies, this can mean introducing students to the research tools, and the Biochemistry Department gives students experience of tools for investigating protein structures, crystallography and so forth. AM05 explained that contemporary tools, with their more user-friendly interfaces and availability of help files, enable students to concentrate on the conceptual material. However, a drawback of this is that students concentrate on the surface features of the tool: 'They don't build up a questioning approach. Everything is so easy to use that they don't need to develop techniques to work out how to use things which are not obvious.'

Examples of the use of research tools from other divisions include a humanities tutor who uses the same multi-text search tool with her students as she does in her research and a social scientist who teaches critical thinking through giving students linked data. She believes that game-style environments hold learners' attention for a limited time only, arguing in favour of getting them involved in the underlying models and in-depth work with the data.

6.2.4 RESEARCH-BASED

Student & staff interview data

Research-based learning involves students in inquiry-based learning or other activities involving research, for which they might additional need to learn research skills and methods (Zamorski, 2002). Dissertations are, of course, a research-based learning activity, but tutors also construct research-based activities for their students of shorter duration. There is evidence that students appreciate these:

> The focus on databases to look at [Middle English] manuscripts kind of flushes out an area of development because there has not been a lot of research so far in terms of

> manuscripts. The fact that we can do that and make original research as undergraduates is quite exciting. It's a way of engaging us (UH02).

An example from the staff interviews was provided by a tutor in earth sciences, who described an activity which he had prepared at short notice following a volcanic eruption in Indonesia. The goal was to map out the area affected by ash from the volcano and thereby make a rough calculation of the amount of ash emitted. This was to be done by harvesting photographs posted on the internet. Students' mobile devices were co-opted into the activity, which involved students searching Twitter, Instagram and other social media for images of areas covered by ash. The tutor felt the activity had the potential to develop into a proper research project.

6.2.5 RESEARCH-TUTORED

Staff survey Q 8; student & staff interview data

The fourth approach in Spronken-Smith and colleagues' classification of research-informed teaching focuses on students' learning through writing and discussing papers or essays. This is exemplified in the Oxford tutorial model and in seminars at PGT level.

Questions about the place of digital technologies in tutorials generated a considerable volume of qualitative data from both students and staff, much of it critical. The nub of the issue is the close dialogue between tutor and student(s) around the essay, a dialogue which is characterised by 'intellectual engagement with the problem' (AM05) and which may be vulnerable to disruption if digital technologies are introduced:

> The purpose of a tutorial is one to one engagement. … For me, to have technology in something that is so highly personal and communicative, as I feel teaching is, I think it depersonalises it and it makes it awkward sometimes (AH01).

> …in tutorials you have two people, you can pass a book between them. Tutorials are quite nice because education is constantly becoming more and more abstract, like you can take online courses. To get one to one attention like that is really valuable. Almost if we were to use digital technologies there I would feel a bit fobbed off (UH02).

Even so, a number of staff interviewees recognised that the computer can enrich the dialogue in a tutorial; for example, showing a resource or programs on one's own computer, perhaps using a large screen so that the students can easily see it. One humanities tutor went as far as likening a Google search to picking a book from the shelf:

> I also will use Google during tutorials … This is another way of doing research in the tutorial, which is actually not dissimilar from how tutorials have been conducted for generations. Which is that the tutor stands up, wonders over to his bookshelf, picks up the relevant book and opens it up to a page and gives the students the reference (AH03).

Differences of opinion sharpen in the matter of students bringing their own devices (ie smartphones, tablets and laptops) into tutorials, a practice commonly referred to as BYOD ('Bring Your Own Device'). In response to a survey question about their attitudes to BYOD in tutorials and seminars, 71% of respondents said they are willing for students to use their mobile devices, 24% said that they build activities into the class involving students' own devices, and 18% took the extreme position of not allowing students to use their devices. These three basic positions are fleshed out in the interview data, which reveal varied positions.

Some tutors accept that students like to take notes on their devices, others do not; some are happy for students to look up references and resources on their devices, others are not. A survey respondent feared that if students are going online to look up something that they do not understand, then the tutor will remain unaware of their difficulty.

Another interviewee felt that looking up resources on an *ad hoc* basis might spill over into checking one's email; there is a fine line between value and distraction:

> Maybe to find something out, to find empirical information, things that they look up in the tutorial, which I encourage because research is finding information you don't know. But of course it's a very swift … step between relevant knowledge and data to irrelevant knowledge and data. … If their tutorial partner is reading through his essay for instance, which can be a valuable teaching exercise if used responsibly, there is nothing to stop the other student from going through their email rather than writing notes on their partner's essay (AH03).

One way to tackle the distraction problem is to co-opt students' devices into one's teaching: 'If you accept the reality that they will use their devices, then harness it' (AS22). Another suggested solution was for staff and students to negotiate a 'learning contract' defining the acceptable and unacceptable uses of BYOD.

Only one of the interviewees said that they prohibit BYOD outright. Another interviewee said that he would like to ban it, but is prevented by the college culture: 'There is a culture at [X College] that students bring their laptops to lectures. Other tutors allow it so if I don't I will be seen as an anomaly' (AH03).

A *laissez-faire* attitude was also discernable in the data, some interviewees voicing the opinion 'It's the students' job to make sure they learn' (AP10). It was also felt that banning BYOD might be detrimental to class morale.

At least one interviewee was unhappy about students recording tutorials on their devices, describing the effect on herself as 'inhibiting' and 'eerie'. She also felt that these students engage less in dialogue with her, appearing to pay more attention to getting a successful recording.

Several of the students interviewed considered it either inappropriate or unnecessary to bring a laptop into an intimate setting where meaningful academic discussion is at the centre of the learning; for example: 'It would feel rude/inappropriate looking at a screen … it seems more personable to be without' (UH05).

Other students alluded to the threat to the all-important tutorial dialogue from students who hide behind their laptop or busy themselves with looking things up or paging through their notes. In contrast, one interviewee asserted her right to exercise her preference for BYOD: 'I have got more confident about saying [to tutors] that actually I really don't like taking notes on paper [so] I'm going to bring my laptop anyway' (USH15).

6.2.6 LECTURES

Student survey Q 22; staff survey Qs 6, 7, 8, 11; student & staff interview data

Student interviewees appeared to consider BYOD in lectures more acceptable than in tutorials, for typing notes on their laptops or audio-recording the lecture on their smartphones. Academics' views are more ambivalent. Some are relatively comfortable with BYOD, suggesting that the onus is on them to make lectures more appealing: 'I can't know if they are just Facebooking or Googling something I'm saying, but it also encourages me to do interesting sessions that people want to participate in' (AS23). Even so, they acknowledge that in larger groups, where there is less interaction, the risk of distraction is increased.

Some staff are aware of students recording lectures. In the case of disabled students they consider this acceptable; in other cases they do not. One interviewee pointed out that, quite apart from issues of copyright, a lecture is in effect a 'performance' by the lecturer who should therefore have a choice in the matter. He also suggested that students who record lectures do not pay attention to the lecturer as they know they will have the recording to listen to afterwards.

Students' views on the formal recording of 'live' lectures[15] – lecture capture – were solicited in question 22 of their survey. All of the UG respondents and 93% of the PGT respondents to this question felt they would gain from access to recorded lectures online, particularly to clarify or reinforce difficult concepts, or to review a topic when preparing for an assignment or exam. Additional benefits of lecture capture mentioned by student interviewees are the ability to fill in gaps and inaccuracies in the notes one has taken during the lecture, and the option of learning in different ways according to personal preference.

Students' supplementary comments to the survey question also reveal some misgivings about lecture capture, including reduced attendance (discussed further below) and sub-optimal learning; for example:

> Students need to develop the skill of listening, retaining spoken information, assimilating it into a prior body of knowledge all without recourse to a recording or using a computer.
>
> Lectures are best treated as an initial stimulus to start thinking about topic … the real learning starts when you go to the books and articles. By the time someone wants to review a topic, they should be well beyond the point of a lecture series being useful any longer.

As noted in sections 6.1.2 and 6.1.3, recording one's lectures for students to revisit later is currently a minority activity among teaching staff; some of the reasons were given in supplementary comments to survey questions and in interviews. An adverse impact on attendance at the actual lecture appears to be the greatest concern; for example: 'My students have repeatedly admitted to me that for those lectures where the notes/handouts are available online or the lectures are recorded, they don't bother to turn up for any of the lectures' (survey respondent).

Four staff interviewees commented that students who miss the actual delivery of the lecture and rely on the recording forgo the opportunity to ask questions of the lecturer. The lecturer is thus unable to detect when students do not understand and to change his or her approach accordingly. Another interviewee from the Medical Sciences Division voiced his concern that weaker students will miss out if they rely on recordings for their learning. He suggested that the stronger students will pay attention, make notes, learn during the lecture, reflect, and go back to the recording in order to check the finer details; in contrast, the weaker students will feel they do not need to worry whether they understand something or not during the lecture itself because they can listen again later.

A few interviewees among both students and staff pointed out that, even without lecture capture, there are a number of reasons why students do not attend lectures at the moment. A humanities undergraduate observed that students will pick and choose the lectures that are likely to interest them, while a science undergraduate commented that, since the recommended textbooks have been written by the tutors themselves, students believe they can get what they know from reading the textbooks without attending the lecture. A final contributory factor, identified by a staff interviewee, is the lack of synchronisation in the timetabling of tutorials and lectures. If the tutorial is scheduled some weeks before the corresponding lecture, students may see no value in attending the lecture; if the timings are reversed, students may not have retained the lecture material. This mismatch may provide 'a legitimate demand' (AS18) for lecture capture, particularly if students are able to download a recording of last year's lecture should their tutorial be timetabled before this year's delivery.

[15] Unsolicited opinions were received from some staff and students on the provision of pre-recorded lectures on face-to-face courses (for example, as a means of 'flipping' the classroom). We have not reported these, as the University is currently concentrating on recording live lectures.

6.3 MAPPING ACADEMICS' CURRENT PRACTICES TO STUDENTS' PERSPECTIVES ON DIGITAL TECHNOLOGIES

Student survey Q 22, 24, 25; staff survey Qs 9, 10; student interview data

Extrapolating from the data reported in sections 6.1.2 and 6.1.3, it is possible to make some tentative inferences about the extent to which academics currently support students' conceptions of the benefits of digital technologies and experiences of the effective use of technology by teaching staff.

Question 25 of the student survey solicited examples of what students considered to be the 'effective' use of digital technologies by academic staff. The responses fell into three broad categories:

- supporting students' grasp of complex concepts (also known as threshold concepts);
- facilitating and improving students' independent learning away from the classroom; for example, making course content available in WebLearn or Dropbox. This provision was enriched where tutors had a blog or Twitter account through which they could alert students to new resources and developments in research;
- setting and marking assignments, in particular the use of WebLearn in conjunction with Turnitin to set and review assignments, and using the 'track changes' feature in Word to mark assessments.

It appears that teaching staff are going a considerable way towards meeting students' preferences in making resources available online, and in accepting and giving feedback on written assignments. However, they may need encouragement in finding digital tools to help their students to understand complex concepts.

Reviewing the data reported in section 6.2.6, it is probably safe to infer that lecture capture is the aspect of teaching and learning in which the gap between students' preferences and academics' readiness to meet them is the widest.

The overall partial match of provision to expectation opens up the question whether academic staff feel under pressure to engage with digital technologies in their teaching, and whether (in line with popular assumptions) they perceive students to be a source of this pressure. In response to staff survey question 9, only 14 (31%) of 45 respondents acknowledged a sense of pressure, with 11 identifying students as a source of pressure in a follow-up question. One interviewee subsequently suggested that, although students may apply pressure to have their lecture notes and handouts online, they are not pressing for staff to use new teaching technologies.

In this context it is important to note that, although students may wish teaching staff to engage with digital technologies to a certain level, they do not necessarily expect or want technology to be used extensively; for example:

> The leap, in my view, that tends to be made is from assuming, rightly, that younger people use technology in their social lives, to thinking that they therefore also expect this to be the case in their work or studies, which isn't necessarily the case (US12).
>
> I enjoy the variety of how different tutors approach their subject in different ways and sort of illustrating that there isn't one way to approach it but [that] there are different ways. It opens a lot of doors to not have that everything should be accessed from a book or everything should be accessed online through social media or watching things (UH01).
>
> I think there shouldn't be a requirement to use digital technologies in teaching. I think that the professor should be sufficiently trained in all possible means that could enhance student experience, but they shouldn't in any way be forced to do that because in the

> end they are the ones choosing how to present the material and if they feel that their teaching is best delivered just orally, than it should be that way (RS21).

Data from a number of student interviews suggest that students feel it is more important that 1) technology genuinely adds value (ie is not merely used for its own sake) and 2) staff can use technology proficiently: for example, to create simple PowerPoint slides, show a YouTube video, adjust loudspeaker volume or maximise the screen. Some students acknowledge that, if staff seem less competent in basic IT skills than them, this may be because students use technology more: 'students are not necessarily more tech-savvy than teaching staff; they are just a bit quicker as they are so used to using it all the time. For example, students will more likely know command shortcuts' (US14).

7. PERSPECTIVES ON AN INSTITUTIONAL STRATEGY

The DIGE 2 research was conducted at the same time that the University was developing its Digital Education Strategy. Although we have reported too late to feed our findings into the strategy, we believe that they may nonetheless prove informative.

7.1 THE RELATIONSHIP BETWEEN TECHNOLOGY AND PEDAGOGY

Staff survey Q 14; student & staff interview data

The starting-point for our exploration of a digital education strategy at Oxford was survey question 14, which invited respondents to comment on the observation:

> A major risk for universities is that they become strategically led by what digital technology can do, rather than requiring digital technology to enhance their educational and research missions within a defined academic strategy (Mapstone, Buitendijk & Wiberg, 2014: p. 4).

Staff survey respondents and interviewees almost universally acknowledged the potential for digital technologies to enhance both their pedagogy and the learning outcomes of the topics and skills they are teaching; for example:

> I recognise that learning how to use digital technologies, and preparing online learning materials can be time-consuming, but I believe that the investment of time and effort will lead to better learning outcomes for students, and make them better equipped to use digital technologies in their own professional lives (APC17, in response to survey Q 14).

There is a clear implication from the data that an institutional strategy must place technology must at the service of pedagogic goals and not *vice versa*. The following quotations from survey respondents are representative of the views of a number of academics:

> I think it's easy for the technology to lead, rather than the teaching and learning strategy leading the technology.

> Those who do not embrace education through technology will soon be left behind, but we should not lose sight of education itself and should use technology to utilise our existing strengths.

That said, the relationship is a dynamic one, with technology opening up possibilities for pedagogy to seize upon: 'defining an academic strategy should be influenced by the potential of digital technologies' (survey respondent).

7.2 CHARACTERISTICS OF A 'DIGITALLY CAPABLE' INSTITUTION

Staff interview data

The interviews with academics followed up survey question 14 by inviting them to share their thoughts on what might constitute a 'digitally capable institution',[16] which is arguably one way to characterise the outcome of a digital education strategy. The variety of interviewees' responses from interviews can be summarised in the following points:

[16] The term was taken from the programme for the Jisc Digifest 2015, which defined a digitally capable institution as one that a) 'makes effective use of digital technology to provide a compelling student experience' and b) 'realises a good return on investment in digital technology' (no reference available). Use of the term on our part does not imply our endorsement of this definition.

- a mixed economy of digital and 'physical' resources to support learning and research;
- an institution whose members have the skills both to use the hardware and software provided and to manage them in their daily lives ('to be a professional in a digital world': AS23). Proficiency should include basic productivity tools and communication tools (including email), and also an awareness of IT security issues;
- 'an institution which is in a position to use digital technology whenever it is deemed to be pedagogically appropriate' (AM05), which employs specialist staff to discover and disseminate pedagogic innovation and which provides a forum in which academics can explore the uses of technology;
- an institution which is capable of adapting and evolving in its use of digital technologies and is not dependent on particular systems.

Achieving the second and third of these objectives dominated interviewees' suggestions for how a digital education strategy might be implemented, reported in the next section.

7.3 IMPLEMENTING A DIGITAL EDUCATION STRATEGY

Staff survey Q 14; staff interview data

One interviewee felt that a digital education strategy would indicate that the University considers technology-enhanced learning to be important, but, in keeping with Oxford's model of devolved decision-making, another suggested that the central University should act as an enabler, not a regulator. In his view, the centre should restrict itself to describing different approaches to using digital technologies in teaching and learning and indicating what constitutes 'best practice', but should leave individual academic units to adopt their own approaches, provided that the required outcomes are achieved. A number of other interviewees took a similar view that any strategic drive should be at the department or faculty level. However, the colleges, with their strong culture and separate teaching communities, were perceived to pose a possible challenge to implementation.

Throughout the survey and interview data academics mentioned the barriers that prevent them from exploring how digital technologies might help to improve their teaching, barriers which have been well documented both in our previous research with Oxford academics and in the wider research literature. Some interviewees some contributed specific proposals for how these barriers might be overcome at Oxford.

Several people advocated significant investment to enable academics to research potentially useful technologies, receive the necessary technical training, and develop and implement new approaches in their teaching:

> If universities wish to put digital technology to best and appropriate use, they need to factor technology research time into academic schedules (and not just expect academics to do the work in their own time, as is the case for most such 'additional' activities) (survey response)

A leitmotif of the interview data was the inspiration that can be drawn from other academics in the University: '…the range of technologies that are available and being used across the University and to what degree they are successful or not (based on student and tutor feedback)' (AMC06); 'I just want to connect with other people who are curious about learning and how to promote learning online with technological tools' (APC17). The difficulty for many is finding out about such people and their innovations; suggestions included small-group workshops, 'where people with expertise come in and share some expertise but you can also try it hands on' (AP11).

In terms of learning technology support, the interview data indicate a valuable, and valued, role for specialist staff in leading the discovery of innovative technologies for teaching and learning. They also point to the benefits of a partnership approach between specialists and academics in order to

identify and disseminate optimal usage of these technologies within Oxford's pedagogic model. A suggestion was also made for deploying learning technology support locally (ie within departments).

A somewhat less tractable issue in implementing a digital education strategy is Oxford's institutional model of devolved decision-making. It can be manifested in what one interviewee described as 'hostility' in academics' reactions to initiatives from the centre, and fierce independence with regard to one's teaching; for example,: 'For my own part I am an enthusiastic user of some digital technologies and a refusenik about others. I should account to nobody in respect of my reasons!' (survey respondent).

One interviewee feared that resistance to the centre might result in a in a digital education strategy being very general; other academics felt that a strategy could be compatible with academic independence. A survey respondent suggested that 'An appropriate technology-enhanced educational strategy would be one in which support is offered for academics to make their own decisions about how much technology they incorporate,' while interviewee APC17 considered persuasion to be the order of the day. Partnering people up, or in some way demonstrating to academics what a different style of session involves and what the students might think of it, might provide enough momentum for them to try it for themselves. Such initiatives, she added, could furnish opportunities for cross-pollination within and between departments or divisions.

8. THE STUDENT DIGITAL EXPERIENCE IN THE WIDER HE SECTOR

This section places the findings of the DIGE 2 project in the context of developments in the higher education sector as a whole. It briefly reviews some key reports in order to identify resonances with, or recommendations for, our work. It additionally draws attention to current and recent projects undertaken by Jisc, the outputs of which might inform the implementation of the recommendations that we make in section 11.

8.1 SECTOR REPORTS

UCISA's annual TEL Survey report for 2014 (Walker et al., 2015) enables us to benchmark Oxford's provision against general practice in technology-enhanced learning (TEL) in UK universities. The principal areas of congruence are:

- the optimisation of services for mobile devices;
- 'interaction with content' as the most common use of the Web to support teaching and learning;
- social networks and document sharing sites as the most common non-institutionally supported software; and
- lack of time and knowledge on the part of academics as the key hurdles to the uptake of digital technologies in teaching.

Data in the report show that Oxford currently is behind many other institutions in introducing lecture capture; however, this situation should be rectified with the expected transition of the RePlay project into a service.

The UCISA survey captures current use and has a strong technological and service focus; for current innovations in teaching/learning practice techniques and for emergent technologies, it is necessary to turn to other reports.

In addition to technology-oriented practices such as BYOD, the Open University's *Innovating Pedagogy* report (Sharples et al., 2014) highlights the acquisition of threshold concepts and digital literacy (referred to as 'learning to learn') – areas where the DIGE 2 data indicate that greater support for Oxford students is desirable. *Innovating Pedagogy* also highlights a number of teaching techniques, including event-based learning, digital storytelling and bricolage ('creative tinkering with resources'), the utility of which could be explored in conjunction with academics as part of a professional development exercise for TEL.[17]

The *NMC Horizon Report: 2015 Higher Education Edition* (Johnson et al., 2015) foregrounds digital literacy as one of the key challenges facing the sector. It additionally identifies a number of short-to-medium term trends, including the flipped classroom, a growth in blended learning, redesigning learning spaces, measuring learning and OER (open educational resources).

A few of the DIGE 2 staff interviewees commented approvingly on the notion of the flipped classroom (O'Flaherty & Phillips, 2015): ie providing lectures online and using the contact time thereby freed up to concentrate on activities to consolidate students' learning. These tended to be teachers on PGT programmes, which typically have larger classes, than on undergraduate courses where the tutorial has long served the same function as the face-to-face component of the flipped classroom.

[17] An instance of event-based learning in the University was the synchronous discussion held in the WebLearn chat tool by staff and students in the Politics Department on the night of the 2010 General Election.

Blended courses – ie where students study for some of the time in Oxford and for the remainder at a distance – are still confined primarily to postgraduate programmes with a professional development angle. In DIGE 2 we have detected traces of interest in bringing online elements into undergraduate courses (primarily, online discussions to support revision), but there is scope for modest development without compromising the integrity of those courses. The possibilities suggested by Mapstone, Buitendijk and Wiberg (2014) as appropriate for research-intensive universities include small online courses involving off-campus as well as on-campus students, using MOOCs from other universities to replace parts of their own courses, and joint courses with other research-intensive universities.

With the exception of a survey question asking students where they prefer to study, the DIGE 2 research team did not explore the topic of learning spaces, as this has been the subject of a project carried out by colleagues in the IT Learning Programme. Our recommendations in this respect will thus be somewhat limited in scope and will concentrate on technological aspects rather than on configurations of rooms.

Learning analytics may not be viable on a large scale at Oxford, reliant as they are on collecting data from large numbers of students through the traces they leave in online services and environments such as the VLE. However, they may be of value in discrete areas of learning, such as tracking students' usage of recorded lectures to identify patterns in their various behaviours.

We know from the 'Openness in Teaching and Learning at Oxford' project (Masterman & Chan, 2015) that few academics actively recommend OER to their students at present, but the recommendations of that report make suggestions for ways in which OER could be co-opted into a research-informed teaching framework and promoted through academic development programmes.

The *Horizon* report of 2014 also includes a lengthy list of emergent technologies from which it singles out for attention wearable technology, the 'internet of things' and adaptive learning technologies (intelligent tutoring systems). The utility of these, and of many other technologies in the list, depends heavily on the discipline and the kinds of learning activity that they are intended to support. At present, it is largely up to individual, curious academics to discover new tools and explore their possible value to teaching and learning, and these discoveries tend to be shared with a small number of colleagues at most. Deploying learning technologists throughout the divisions (rather than only in the centre and the Medical Sciences Division) to collaborate with academic staff would facilitate – even accelerate – such discoveries and enable them to be disseminated across the University.

8.2 JISC 'CO-DESIGN' PROJECTS

Another indicator of current issues in relation to technology-enhanced learning in UK HE as a whole are a number of projects being conducted by Jisc.[18] Two of these projects, 'The Digital Student'[19] and 'Building Digital Capability',[20] have strong resonances with two of the themes emerging from the DIGE 2 data: students' digital literacy and challenges of academic' engagement with digital technologies.

A third project, the 'Change Agents' Network',[21] is exploring the role of student-staff partnerships in bringing about technology-related change in universities, with students taking equal responsibility in 'shaping and leading their own educational experiences' (Kay, Dunne & Hutchinson, 2010: p.1). The

[18] Jisc (https://www.jisc.ac.uk) is a national not-for-profit organization which champions the importance and potential of digital technologies for education and research within the UK higher education, further education and skills sectors.

[19] https://www.jisc.ac.uk/rd/projects/digital-student

[20] https://www.jisc.ac.uk/rd/projects/building-digital-capability and http://digitalcapability.jiscinvolve.org/wp/2015/03/29/framing-digital-capabilities-for-staff/

[21] https://www.jisc.ac.uk/rd/projects/change-agents-network and https://www.jisc.ac.uk/guides/students-as-agents-of-change

University already has a record of working with students as partners in change in a non-technological context: embedding a new skills training programme in the Master's degree in Global Health Science.[22] A partnership role for UG as well as PGT students could be envisaged in technical development projects (through adopting participatory methodologies) as well as initiatives for curriculum enhancement and innovation with technology. Existing schemes such as the Innovation Challenge Fund and the OxTALENT awards could act as springboards in this respect by encouraging submissions from student-staff partnerships.

[22] https://www.heacademy.ac.uk/resource/practical-skills-training-programme

9. KEEPING UP TO DATE WITH THE STUDENT DIGITAL EXPERIENCE

The observations in this section address research question 4.2: mechanisms for maintaining the currency of our knowledge and understanding of the student digital experience at Oxford, and for communicating that knowledge and understanding to key stakeholders.

9.1 DEVELOPMENTS IN THE HE SECTOR AS A WHOLE

Information on how the higher education sector is moving in terms of students' current and forthcoming needs can be obtained from respected existing publications such as the ones reviewed in section 8.1, and through attending conferences and other events organised by the learning technology community (eg ALT-C and meetings of the Jisc Learning & Teaching Experts' Group). However, as seen in section 8, the information thereby acquired needs to be appropriately synthesised and reinterpreted in relation to the institutional culture and the model of research-informed teaching at Oxford in order to make recommendations for systems and services that could be provided by the University.

9.2 DEVELOPMENTS IN OXFORD

The observations in this section are derived from reflecting on our research methods and data, and from our participation in a workshop organised by Jisc, 'Digital Student Data Collection and Analysis', on 29th April 2015 and two Skype consultations associated with it.

A strong case can be made to keep up to date with the student digital experience in order to identify ongoing issues and changes both in technology and students' use of it, so that we can determine whether an institutional response or intervention is required. Furthermore, although many of the findings from DIGE 2 confirm everyday observations, collecting evidence in a more structured way can capture a multiplicity of perspectives and thereby enrich the input into decisions regarding the provision of digital systems and services to support the digital experience of Oxford students.

It is possible to collect quantitative data about the technologies used by students on an ongoing basis; for example via:

- the Freshers' Fair survey, to ascertain the technologies that students on all course types bring to Oxford with them;
- additional questions in the NSS and Student Barometer, although options are limited in terms of the number and types of question we can ask;
- any internal surveys or other data collection methods undertaken by colleges and academic units, who should be encouraged to share their findings with the centre, if not the whole University. We have already met with the Bodleian Libraries' Assessment Unit, which revealed overlaps in our respective work and opened up possibilities for cross-pollination of our findings.

Additionally, a new Digital Student Data Service toolkit is currently under development by Jisc, building on user requirements to which DIGE 2 team members contributed through the activities mentioned above. The aim of this service is to enable institutions to collect and analyse data about student expectations, experiences, attitudes and satisfaction with digital technologies through a standardised set of questions. Visualisation tools will make it possible to communicate data within the institution, and it should also be possible to compare data with those from related, anonymised, institutions. We retain an active interest in the progress of this work and will provide feedback and recommendations to the University accordingly.

Smaller-scale qualitative studies are effective in gathering contextual data (areas 2 and 3 above). Both our experience and the findings of the Jisc 'Student Data' workshop team suggest that students are more amenable to taking part in such studies than to completing surveys. Oxford's SAG (Student Advisory Group) provided approximately 17 of the digital diarists, and so relations with it should be strengthened, with a view to conducting similar 'digital diary' exercises every two years. The cost of arranging, collecting, transcribing and analysing one case study from a digital diary is approximately 1.5 researcher days, plus remuneration for the participant (in DIGE 2, a £30 Amazon voucher). An 'in-between' exercise to collect rough-and-ready answers to simple questions could be carried out by commissioning a team from The Student Consultancy; this has been done satisfactorily for eliciting user requirements on two occasions: for enhancements to WebLearn and for a student portal.

10. COMMENTARY

Before embarking on a commentary of the DIGE 2 findings, some preliminary observations are desirable. First, the response rate in the student survey was disappointing, but probably results in part from 'survey fatigue': students' views had been sought relatively recently by IT Services in two technology-related projects, and our research was conducted at the same time of year as the annual Barometer and National Student Survey. Second, since participants were recruited primarily online, there was a risk that the data might be skewed towards the viewpoint of digital 'enthusiasts'. In reality, a multiplicity of experiences and viewpoints emerged from the data, critical as well as positive. Furthermore, in drawing upon themes and issues from the peer-reviewed literature and sector studies to inform the design of our research, we are confident that the findings of DIGE 2 in relation to students' and academics' needs and preferences correspond closely to the findings of research reported in these outside sources (with allowances for the distinctiveness of the Oxford context).

10.1 DIGITAL TECHNOLOGIES IN STUDENTS' LEARNING

The salient digital feature of students' learning in 2015 is undoubtedly the mobile device. Smartphones in particular, but also tablet technology, now play a central role in most of their lives, across all subjects and all levels of study. In addition to the technological implications for wireless coverage, there are two clear needs. First, learning spaces (especially shared facilities such as the Examination Schools), resources, tools and services must be optimised for a mobile student population. Second, academic staff should be supported to engage with the devices in their teaching. This does not need to entail blanket initiatives such as the provision of tablets to whole cohorts; acquiring sets of tablets for targeted use in specific learning activities, as the Medical Sciences Division has done, can be a cost-effective alternative.[23] Another approach is to co-opt students' technologies into productive learning activities[24] or to recommend simple apps to aid study (eg 'flash cards' and quizzes) to students. To counteract the problems of inattention in both small-group teaching and lectures, a set of guidelines could be devised centrally to give academic staff confidence in establishing ways to manage BYOD, including negotiating a *modus operandi* with students.

Nevertheless, it must be recognised that a minority of students are unable to, or choose not to, manage their lives and studies through mobile devices. Care must be taken to minimise this residual, but non-negligible, digital divide.

Positive feedback from students on the speed and flexibility with which they can access the University's broad range of online resources, particularly through SOLO and WebLearn, is to be welcomed. Even so, we can investigate ways to improve services further through technical developments; for example, by optimising the integration between WebLearn and third-party services.

The qualitative data challenge the assumption that, as a generation which has grown up with computers and social media, students expect digital technologies to be used in university teaching or have eschewed paper and pencil completely. Moreover, it is evident from students as well as staff that, although incoming students may be *au fait* with social technologies, they may be less well prepared for studying with digital technologies in higher education because of weak IT skills in key applications and shortcomings in putting technology to the service of their learning. There may still be a need to tackle the misconception of the 'digital native' among some staff; more importantly, a

[23] A case study of the Pop-Up Learning Space Experiment (PULSE) can be found at http://blogs.it.ox.ac.uk/ltg-casestudies/?p=1561

[24] Our collection of case studies shows how this has already been done effectively; for example, using voting or quiz apps on students' devices in lectures to elicit their misconceptions. See http://blogs.it.ox.ac.uk/ltg-casestudies/tag/mobiletech/

major investment in students' digital literacy is needed, with attention to the problem of distraction which is prominent in the DIGE 2 qualitative data.[25]

The 'employability' agenda is hard to disregard, particularly in light of the House of Lords Select Committee's *Make or Break* report (2015). It may not be appropriate for academics in all subjects to bring into their teaching digital tools and skills that are relevant to the workplace, but there are openings for students to develop those skills in other ways: for example, internships and consultancies. The first round of student projects sponsored through the Innovation Challenge Fund has proved promising in this respect; additional opportunities could be provided through projects which adopt a participatory, or 'change agents', approach.

A final general comment to be made is that the student digital experience is that part of the overall student experience (academic and social) which is acted out in the digital medium; it is indissoluble from the whole. This means that issues and exceptions identified in students' digital behaviour may be amplifications of pre-existing behaviours (for example, low attendance at lectures). Some of these have an underlying cause elsewhere; for example, in the conceptualisation of learning which they develop at school or an incomplete understanding of their own learning needs. Although digital technologies can be used to help tackle these underlying causes, this is not universally the case; 'human' solutions may be the only effective ones, particularly where attitudes to study need to be reshaped.

In relation to the four student sub-populations which we investigated, we can make a number of observations.

Online bridging courses for **students in transition from school to university** have their value in subjects where the requisite skills and concepts can be communicated in a digital medium without the need for synchronous facilitation by a (human) teacher. However, their usefulness may lie more in helping students acclimatise to studying at university (and start to tackle digital literacy issues) than in boosting their performance in the subject of study. This is for two reasons: it is impossible to guarantee that students will take the course offered to them, and too many other variables come into play in seeking to evaluate effectiveness in terms of Prelims exam results.[26] Online bridging courses such as the one offered by MPLS are, in effect, small private online courses (SPOCs), but the utility of SPOCs (and even MOOCs) offered by third-party providers to support transition would depend on the applicability of their content to the Oxford context.

The digital needs and preferences of **taught postgraduate students** overlap with those of undergraduate students in the taught element of their courses and with those of research postgraduates as they embark on their dissertations. Even so, it should not be assumed that PGTs can cope simply because they have (mostly) already studied at university; their experience is coloured by the intensity and brevity of their courses; by differences in language, culture and previous educational system; and frequently by a gap between current and previous study (see also Masterman & Shuyska, 2012). Digital support for transition to PGT study on face-to-face programmes may be limited by students' ability to devote time in the period immediately preceding their arrival in Oxford.

Our investigation of **blended programmes** was limited. We know (including from the DIGE 1 and Thema studies) of at least three other programmes in the Department of Education and Department for Continuing Education. There is evidence of a strong understanding of the distinctive nature of online learning among the academics who design and teach these courses. This body of professional

[25] Distraction from one's studies by email and social media alerts is, of course not new; it was recorded in the Thema project in 2008 and in DIGE 1. The focus on students' learning practices in DIGE 2 has resulted in a greater proportion of references to distraction in comparison with DIGE 1, and this now invites a more substantial response on the part of the University.

[26] Macaro & Masterman (2006) reach a similar conclusion, albeit in relation to face-to-face transition courses.

knowledge could be usefully shared with academics in the collegiate University who may wish to incorporate wholly online elements into their undergraduate teaching.

Despite the built-in accessibility features of contemporary devices (especially smartphones), **disabled students** continue to be in need of both practical support and understanding. A joined-up approach involving the Disability Advisory Service, departments and colleges needs to be directed not only providing towards functioning technology, but towards also awareness-raising activities among academic staff.

10.2 DIGITAL TECHNOLOGIES IN TEACHING

Regardless of their discipline, experience or age, all but a tiny handful of academics use digital technologies in their research, communication and teaching. They do so in diverse and distinct ways across different departments at the University. That said, a balance (identified in the DIGE 1 report) still remains to be achieved between, on the one hand students' reasonable expectations and preferences in relation to their digital learning experience and, on the other hand, academics' freedom to decide for themselves how they wish to engage with digital technologies in research-informed teaching. In this respect, and in the light of data reported in section 6 of this report, it might be informative to explore the possibility of some consensually agreed minimum (baseline) level of engagement on the part of academics.

Although academics may believe that it is not desirable, or not possible, to have institution-wide policies on the use of technology in their teaching, they do have many suggestions on how to support and enable teaching staff to use them at the local (divisional, faculty or departmental) level.

While pedagogy should be put before technology, it is also possible for individual technologies to open up pedagogic possibilities that academics might not otherwise have thought of themselves. Some academics are constantly on the look-out for new tools and teaching ideas, but many do not know where to look (even if they are interested). Furthermore, some academics find certain aspects of the digital problematic and fear the negative consequences for their students' learning of, for example, lecture capture or reading lists with embedded links. However, we have evidence, both from data collected by this project and from the case studies of innovative practice[27] derived from the OxTALENT competition and projects such as RePlay, that these technologies can be successfully deployed if they are given an effective pedagogic framing. Making appropriate use of learning analytics (metrics) – for example the frequency and timing of replays of recorded lectures – could help to identify patterns of behaviour and, hence, to optimise the role and value of these technologies.[28]

We therefore need to continue to capture the many innovative and beneficial ways in which digital technology is being used across the University, and to disseminate them to the academics who would benefit from them the most, at the time when they could most benefit and in the manner most likely to result in uptake.

In summary, there is a need for focused professional education for academics in technology-enhanced teaching and learning over and above training in essential IT skills such as the use of presentation software and projectors in lectures. This should be a cohesive endeavour involving the Academic IT Group, Oxford Learning Institute, Libraries and departments.

[27] The collection can be found at http://blogs.it.ox.ac.uk/ltg-casestudies/

[28] Jisc provides a code of practice on the use of learning analytics: see https://www.jisc.ac.uk/guides/code-of-practice-for-learning-analytics

10.3 DIGE 2 IN RELATION TO DIGE 1

The DIGE 1 report identified three principal requirements regarding the University's digital systems and services over the period 2012–17:

- personalised and well-designed interfaces, giving student and staff direct, integrated access to the information they need;
- the predominance of wirelessly connected mobile devices and tablets; and
- the rise of audio-visual material both in teaching and learning, and in leisure pursuits.

Of the three requirements, mobile technology has emerged as the furthest advanced, although it may be premature to speak of the 'predominance' of tablets. It is already being addressed at the technological level through the GOWN project and the proposal for a mobile version of WebLearn. To take mobile learning to the next level, investment is needed in the areas outlined in section 10.1.

The requirement for 'personalised and well-designed interfaces…' applied across the board to the University's systems and websites, but was focused in the recommendation for a student portal (recommendation 3/ES3, where it was referred to as a 'multi-access gateway'). Strong evidence of user demand for a portal was gathered in summer and autumn 2014 in two small-scale interview studies, one conducted by the principal author of this report and the other by a group from The Student Consultancy.[29] The author's report provided input into an unsuccessful project brief in November 2014, and the report from The Student Consultancy was received the day after the project brief was declined. We are confident that these user requirements remain valid and that a new project request should be invited.

The third key requirement – the rise of audio-visual material – was not specifically probed in DIGE 2. We collected some evidence that students like to receive material in different formats (media), whether from personal preference or because of disability, but there are insufficient data to draw conclusions about trends.

A further area of the student digital experience which we have not followed up from DIGE 1 is the online provision of termly feedback through OxCORT. A very small number of students referred to OxCORT in their interviews, and it is not entirely clear whether they were dissatisfied with the medium in which feedback is provision (eg OxCORT, email or paper) or with the provision *per se*: ie whether feedback is given in a timely manner (regardless of medium). The role of OxCORT thus needs to be considered within the broader picture of feedback practice.

[29] The Student Consultancy Report is available at https://weblearn.ox.ac.uk/x/W8QL1D (single sign-on may be required).

11. CONCLUSION AND RECOMMENDATIONS

The DIGE 2 project investigated the ways in which students in the collegiate University use digital technologies to support their learning; the role of digital technologies in supporting the learning of students in four specific sub-populations; and the ways in which the digital experience has changed, or has remained similar, since the original DIGE study in 2012. Given that the digital capabilities of teaching staff have an additional impact on students' experience, we also explored how effective practice in technology-enhanced teaching and learning might be fostered. Finally, we considered ways in which strategic data on the evolving digital experience might be collected on an ongoing basis.

The research team gathered data from approximately 300 students and over 50 members of academic staff through online surveys, interviews and 'digital diaries'. The design and analysis of the research were informed by reviews of the peer-reviewed research literature and reports of studies by recognised bodies in the field of technology-enhanced learning.

In reporting our findings and making our recommendations, we have been mindful (as we were in the original study) of the requirement to balance the preferences and expectations articulated by twenty-first century students with Oxford's inalienable core values.

RECOMMENDATIONS TO THE EDUCATION IT BOARD

The recommendations below are grouped thematically. Note that the recommendations relating to mobile technologies belong also to broader themes such as professional development and technology-enhanced learning spaces; they are therefore subsumed under those other themes rather than listed separately.

In addition to our recommendations to the Education IT Board for funding capital projects, we have identified activities which are germane to the research questions, but whose implementation lies outside the Board's remit. For these, appropriate stakeholders are suggested.

Cross-references are provided to the section(s) of the report from which each recommendation is derived.

Students' digital literacy

Sections 4.3.2, 4.4.1–4.4.7, 5.1, 10.2

1. Invest in a major programme to strengthen and expand existing support for the development of students' digital literacy, with the goal of transitioning this into sustainable, sustained provision. This programme should cover IT skills training, digital literacy and subject-specific skills training.

   Specific activities should include:

   - Develop cross-cutting online 'bridging' courses to provide incoming students with training in specific academic skills, such as statistics and programming, as well as general study skills.
   - Commission a pilot project, in conjunction with a small number of departments, to explore the feasibility of a support package to benchmark the digital literacy skills of incoming students and direct them to the appropriate training, including selected online courses from Lynda.com made available through course WebLearn sites.
   - Develop an online course to support all students in managing their learning, particularly in dealing with distractions from the internet. This course should be co-designed with students who have adopted successful study strategies.

Digital capabilities of academic staff

Sections 4.3.1, 6.1.2, 7.3, 10.1, 10.3

2. Invest in a major programme of focused professional education for academics in technology-enhanced teaching and learning, with the goal of transitioning this into sustainable, sustained provision. A collaborative approach should be adopted involving the Academic IT group, Oxford Learning Institute, Libraries and departments. Possible tasks and activities include:
   - Create a cross-departmental programme team, including staff from the Academic IT Group and the Oxford Learning Institute.
   - Create and promote an online resource for academic staff to access and share guidance on technology-enhanced learning, research findings, case studies of innovative practice and teaching resources. Topics addressed should include incorporating mobile technologies into tutorials, seminars and lectures, and integrating lecture capture into students' learning.
   - Provide a consolidated list of sources of funding (ie divisional and departmental schemes in addition to the Innovation Challenge Fund) to which academics can apply in order to have the time and resources to develop their teaching with technology.
   - Sponsor an annual 'teaching and learning' conference for Oxford academics, including a specific strand for technology-enhanced learning. The conference could also include the ceremonies for the University Teaching Awards and OxTALENT.[30]
   - Fund the initial run of an annual programme of seminars and workshops for academics interested in using digital technologies to enhance teaching and learning. This programme should be co-designed and co-led by the Academic IT Group and Oxford Learning Institute.[31] [32]

Funding and/or endorsement of existing initiatives

Sections 4.1 (Mobile WebLearn), 4.2.1–4.2.2 (WISE), 6.2.6 (RePlay)

DIGE 2 has provided strong evidence to endorse a number of existing and proposed projects and services:

3. Develop mobile interfaces for WebLearn and other heavily used institutional websites, providing apps for common tasks.
4. Following on from the WISE project, implement a service for units to develop or revitalise their WebLearn presence by providing a support package for 'DIY' and/or paid-for support from learning technologists.
5. Extend the RePlay lecture capture pilot into a full opt-in service, coupled with teacher education in the effective embedding of lecture capture into their pedagogy.

Recommendations for the Digital Education Strategy

Sections 7.3, 8.1, 8.2, 10.1
Key stakeholder: Digital Education Strategy Group

6. Establish, in conjunction with relevant units, a group to review the Digital Education Strategy in light of the findings of the DIGE 2 project and to draw up an implementation plan for the strategy.

[30] This was also a recommendation (no. 32) by the DIGE 1 project.

[31] The format of such a programme could be based on the existing 'Engage' programme for online presence and public engagement, designed and led by the Academic IT Group and the Bodleian Libraries.

[32] This was also a recommendation (no. 32) by the DIGE 1 project.

7. Implement support, as a service and/or toolkit, for divisions and departments to interpret and implement the Digital Education Strategy locally, including benchmarking the digital capabilities of their staff and carrying out regular reviews.[33]
8. Deploy learning technologists within the Humanities, MPLS and Social Sciences divisions (with 'dotted' reporting lines to the Academic IT Group in IT Services) who can curate digital resources and support academics in finding and using the appropriate digital tools.
9. Co-opt students as active partners into the implementation of the strategy where feasible and appropriate.

Technical projects for enhancing access to online resources and general information

Sections 4.3.1, 10.1, 10.3

Commission new project requests for the following:

10. Improved integration between WebLearn and third-party services to which it is gives access through the Learning Tools Interoperability (LTI) standard: eg Lynda.com.
11. A student portal: ie a personalised authenticated service, configurable by the user and offering access to appropriate University (central and local) services (see also DIGE 1 recommendation 3/ES3, which refers to this service as a 'multi-access gateway').

Learning spaces

Sections 4.1, 6.2.5–6.2.6, 10.1, 10.3
Key stakeholders: Digital Education Strategy Group; IT Services

12. Commission a set of guidelines for optimising all learning spaces (especially shared facilities such as the Examination Schools) for the use of digital technologies, both static equipment (eg data projectors) and mobile devices.

Metrics and analytics

Sections 8.1, 10.2
Key stakeholder: IT Services

13. Investigate the potential for the targeted use of analytics in order to identify, and better understand, patterns of behaviour in students' use of particular tools and services (eg recorded lectures), so that appropriate advice can be given to students and/or teaching staff.

Development methodologies for tools, systems and services

Sections 4.4.8, 8.2, 10.1
Key stakeholder: IT Services

14. Factor the involvement of learning technologists into the design and development of all new tools, systems and services that impinge on teaching and learning, in order to ensure that these are informed by knowledge and understanding of the needs and preferences of students and academic staff.

[33] Benchmarking toolkits are available from Jisc, including a tool developed in collaboration with the NUS (http://repository.jisc.ac.uk/6140/1/Jisc_NUS_student_experience_benchmarking_tool.pdf) and outputs from the Digital Student project (https://www.jisc.ac.uk/guides/enhancing-the-digital-student-experience).

15. Adopt, wherever possible, participatory methodologies that include a role for students as active and equal partners in the development (or revision) of tools, systems and services that affect their digital experience

Disabled students

Sections 5.4, 6.2.6
Key stakeholders: Disability Advisory Service; OLI; IT Services; IT and disability support officers in colleges

16. Formulate a co-ordinated approach, with a clear demarcation of responsibilities, between central services and the colleges for helping disabled students to identify and use appropriate assistive technologies.

17. Provide awareness-raising and training for academics in teaching and supporting disabled students, both in tutorials (eg through being prepared to interact with assistive technologies) and in lectures (eg capitalising on the potential of the lecture capture service to provide audio recordings and transcripts).

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Below are the references to works cited in the body of this report. A comprehensive list of works consulted during the design and reporting phases of the project is available in Annexe 7.

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