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ICT AND GENERAL ADMINISTRATION IN EDUCATIONAL INSTITUTIONS

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INTRODUCTION

This policy brief provides an overview of Information and Communication Technologies (ICT) and general administration in educational institutions. The report will not focus too much on specific technologies that institutions are using as these will quickly become dated, but will instead provide an overview of the landscape of ICT systems associated with administration in educational institutions. The aim is to provide policy makers with an overview of technologies and how they are used to support the different aspects of educational institutions. The document concludes with some recommendations and implications for policy.

The education business covers three areas of activity: learning, teaching and research. The focus in terms of learning and teaching is on the design, delivery and accreditation of learning provisions. This includes everything from student application, through to final accreditation and graduation. In terms of research this includes initial bidding for research grants, running and management of projects and dissemination and archiving of research outputs. Institutions have a range of IT systems to support these activities. This review will describe the key features of the main types of IT systems. It will also discuss the relationship between institutionally supported IT systems and other services available externally, such as cloud computing, which are increasingly being used by students and academics. The Joint Information Systems Committee (JISC) has an online set of 'Infokits',[1] which provides a useful set of resources on a range of ICT systems.

[1] http://www.jiscinfonet.ac.uk/infokits

IT SYSTEMS TO SUPPORT EDUCATIONAL INSTITUTIONS

ICT are now vital to support the business of educational institutions, and support the full academic lifecycle, in terms of learning and teaching from initial students enquiries through to accreditation and graduation and in terms of research from initial bid writing through to project delivery and dissemination. It includes six main areas: pay roll and financial accounting, administration of student data, inventory management, personnel records maintenance, library systems and learning management systems

The core IT services provide support for the following areas. Firstly, the student journey, from an initial enquiry through to graduation. This includes managing of a student's initial enquiry about courses, application, module selection, monitoring and support for the delivery of a course, assignment handling, examinations and graduation. For on campus students systems are in place for room booking and timetabling. This is usually done through a central IT system, but there may also be local bespoke systems for some departments. Courses are delivered and support through an institutional Virtual Learning Environment (VLE)/Learning Management System (LMS). Most institutions have one centrally supported system, but in some instances there may be local or bespoke systems. The library provides access to learning resources (both paper-based and digital), these can include learning materials and set texts for course, research journals and multimedia resources.

The research activities are supported through systems for managing and monitoring research applications, research grants and contracts, research finance, publications recording and patents and intellectual property recording. Systems are in place for estates and facilities management. This includes: stock control, recording of project details, recording and monitoring of the requests for maintenance, recording and monitoring of the issue of car park passes, and IT equipment disposal.

Financial services include: asset management, accounts payable, accounts receivable, financial reporting, management accounting, management information, payroll, pensions, purchase ordering, goods receipt and invoice processing, tax treasury.

Human resources IT systems cover: recruitment, recording of staff employment activity and history and recording of staff training history.

Residential and commercial services include: application, allocation, control and financial management of student accommodation and, where appropriate, provision of conference services and the delivered catered service.

A JISC report[2] lists nine main types of ICT educational systems: finance, student records, timetabling, Human Resources (HR), payroll, estates, library management, Learning Management Systems (LMSs)/Virtual Learning Environments (VLEs) and Customer Relations Management (CRM). [3] It provides an outline of the key companies used in the Further and Higher Education sectors in the UK. The report concludes by considering the level of maturity across the nine areas. The report identifies that CRM is the area that shows the least maturity. The other area of fragmentation as a corporate system is the Estates area. The area of LMSs shows complete dominance of the market by Moodle and Blackboard. HR and Payroll have a clear relationship, in terms of a significant correlation between the supplier of the HR system and the supplier of the payroll system, the two often the same. Three or four suppliers dominate the Library market. There is a remarkable similarity in the market shares shown for Finance, Student Records and Timetabling systems. In each case, the higher education market has one player, which is significantly larger than any other and then has a relatively low

[2] http://www.jisc.ac.uk/media/documents/programmes/jos/sharedservicesreport2.pdf
[3] Also known as Learning Management Systems (LMSs)

number of small players. Agresso has over half the higher education market in Finance as has Tribal in Student Records. In Timetabling, the largest player in higher education has just over 40% of the market, whereas the largest player in further education has about a third of the market: it is noteworthy that the largest player, Scientia, in higher education has only a small part of the further education market. Timetabling also reflects the pattern in Finance and Student Records in that there are a smaller number of large players in higher education than in further education. A popular system for HR/Finance/Research is supplied by a German company SAP. Also SAP-GM is often used by research departments for grants management - both in terms of keeping track of what applications have been made and managing the finances of awards. It is also used for generating management information about award levels, income, etc. Inteum is a commonly used system for Enterprise and Business Development, which manages things like patents and licences arising from research.

THE GROWING IMPORTANCE OF ICT

ICT enable new ways of producing, searching and sharing information and knowledge (Conole, 2013). As the amount of information is rapidly increasing, it has become even more important to manage complex entities and to recognize relevant and reliable information and knowledge. A UNESCO report from 2005[4] lists seven ways in which technologies can be used in education. Firstly, it can improve administrative efficiency and provide a pan-institutional IT infrastructure for managing the different aspects of learning, teaching and research. Secondly, ICT can be used to disseminate teaching and learning materials to teachers and students, usually through an institutionally supported VLE/LMS. In addition, many institutions now have Learning Object or Open Educational Resource repositories. Similarly, most institutions have an open access research repository and increasingly academics are required to deposit their research outputs in the research repository. These are also increasingly being used in terms of research accountability, both for internal promotion and in terms of returns for national research assessment exercises. For example, in the UK, there is an assessment exercise every four years and academics are expected to identify their four main research outputs. Thirdly, they can be used to improve the ICT skills of teachers and students and their digital literacies and competences. Most institutions have a range of online resources to help teachers and students to develop their digital literacy skills and for students to develop good practices in terms of study skills. Resources are also usually available to help teachers make effective use of technologies in the design of courses. Fourthly, they allow teachers and students access to sources of information from around the world. Increasingly, teachers and students are augmenting institutional IT systems and resources, with tools and resources freely available on the web. Increasing use is being made of cloud computing technologies for example. Some institutions have outsourced core tools like email and many are moving to things like Google Apps for example to provide tools for communication and sharing of resources. Many students now prefer to have IT tools that they can use post-course, and do not want to be tied into institutional email systems for example. Fifthly, academics want examples of good practice and mechanisms for sharing ideas on education and learning. IT systems can enable this in two ways: through repositories of learning materials and designs, and by providing mechanisms for academics to share and discuss learning and teaching. Sixthly, IT systems can provide spaces for academics and students to collaborate on joint projects. These can also be used to support collaboration for research projects. Finally, IT can be used to conduct lessons from remote locations and support distance learning. This can include both synchronous and asynchronous communication.

[4] http://www.itu.int/ITU-D/ict/partnership/material/ICT_Education_Paper_Nov_2006.pdf

A JISC report (JISC, 2011) states that digital technologies are changing the way researchers work and the way in which research is conducted. EDUCAUSE provide an authoritative overview of emergent technologies of relevance to educational institutions, with their '7 things you should know about…' series of reports.[5]

Krishnaveni and J.Meenakumari (2010) argue that computers can be used extensively for educational administration. They list the following as some of the areas where computers can be used for effective educational administration: general administration, pay roll and financial accounting, administration of student data, inventory management, personnel records maintenance and the library system. They suggest ICT can support three areas of activity: student administration, staff administration and general administration. Student administration involves various activities from the admission process to learning activities through to the processing of results and performance analysis. Important aspects include the automation of admission process through e-media (including dealing with initial student enquiries, applying for admissions through electronic media, registration, electronic enrolment, course allocating, and information about timetable and attendance monitoring. This also includes communication with peers and tutors. Staff administration includes recruitment and work assignment, recoding attendance, leave management and performance appraisal.

An EDUCAUSE report lists the following IT services in institutions: i) support services, which includes a help desk and desktop computing, user support, training, computer store, ii) educational technology services, which include support for student technology (labs, training, support, etc.), support for academics in terms of instructional technology and in particular support on using the institutional LMS, classroom and learning space support, multimedia services and support for distance education provision. There are also a range of IT services around the administration of IT organization, IT planning and budgeting, IT policy, IT security, project management, business process analysis, systems analysis, enterprise Infrastructure and Services; Identity Management Information Systems for finance, Human Resources, students, alumni and fundraising, facilities, grants management, etc., business intelligence/data administration/data warehouse. It also covers communications infrastructure services, such as: network infrastructure and services, telephony, data centre operations, research computing and web support services. Institutions will have a general website about the university, with each department having a web presence containing information about their courses and research activities. Some aspects of the web provision are supported centrally and some locally by individual departments.

CORE TOOLS

A set of core tools are provided to support academics and students. These include office software for word processing, presentations and spreadsheets, as well as access to an email system for communication. In addition, many institutions have audio and/or video conferencing facilities, which can be used to support both learning and research activities.

Many institutions are now outsourcing their e-mail and increasingly institutions are moving to remotely managed hosting solutions for their LMSs. Google Apps is popular as an alternative to more traditional products such as Microsoft Office, providing a suite of tools that can be used to support day to day IT activities.

[5] http://www.educause.edu/research-and-publications/7-things-you-should-know-about/7-things-you-should-know-about-learning-technology-topics technology R&D19

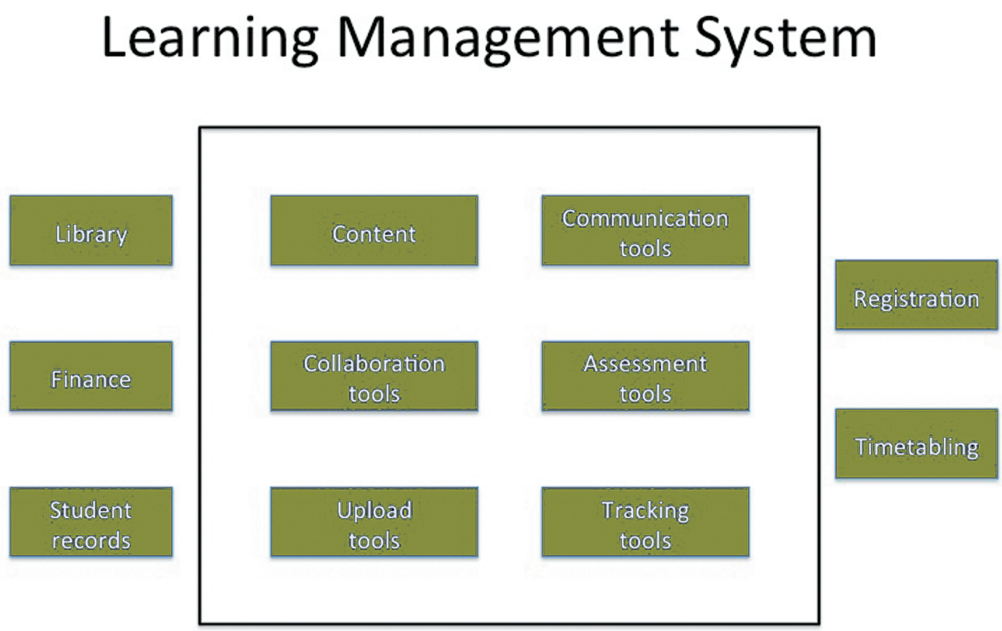

Figure 1: Components of an institutional LMS

LEARNING MANAGEMENT SYSTEMS

In terms of managing the delivery of courses institutions use Virtual Learning Environments (VLEs)/Learning Management Systems (LMSs). Figure 1 shows the typical components of an LMS and the relationship to other institutional IT systems.

Three of the most popular LMSs are Blackboard, Moodle and Sakai. LMSs provide a hub for learning materials and course delivery and often also cover the management of course registration, course scheduling, discussion forums, blog sites, student scores, and student transcripts. LMSs contain a number of tools for presenting learning materials, for communication and collaboration and for managing assignments. These include tools such as blogs, wikis and e-portfolios. For most institutions the LMS is the most significant enterprise application for learning and teaching.[6]

JISC provide a list of the main functionality associated with an LMS.[7] These include: controlled access, via a password to the courses that the student is taking. Also student tracking in terms of what materials they are accessing and how long they are spending on them. Learning analytics has emerged as a new research field in recent years (Siemens, 2010). Tools and dashboards are being developed to harvest the data available from LMSs in terms of what the students are doing. These tools can be used by academics to monitor student progress and identify students who are having difficulties and also by students themselves in terms of monitoring their progress. The LMS records system has basic information about students, such as: registration details, course details, course prerequisites, qualification aims, study time and tracking information. LMSs are also used as repositories for learning resources and materials. These might be produced by the course designer, may be commercial materials or alternatively may be freely available Open Educational Resources (OER) or commercial materials. Materials can be presented in a variety of formats from simple text to interactive multimedia. There are also a number of tools to support the students in their learning, these include: assessment tools (both e-submission systems for assignments as well as e-assessment tools), and tools for communication and collaboration A range of tools are provided to

[6] http://net.educause.edu/ir/library/pdf/ELI7072.pdf
[7] http://www.jisc.ac.uk/whatwedo/programmes/buildmlehefe/lifelonglearning/mlebriefingpack/3.aspx

support interactions between students and between students and their tutors. There are three basic methods of communication tools common in LMSs: email, discussion forums and chat rooms. Tools may also be included to enable students to publish materials either via an uploading facility, through a blog or a wiki. Within the LMS it is possible to link to other web-based resources, such as other sites of relevance in the institutions, for example library resources and links, as well as external links. Most LMSs integrate with core administrative/management systems that are IMS standards-compliant. Data can be seamlessly shared between the VLE and the MIS system.

A JISC CETIS report provides a good overview of Learning Management Systems.[8] The report describes the current status of LMSs and their relationship to cloud computing. It also describes a number of different models of Distributed Learning Environments.

TECHNOLOGY ENHANCED LEARNING

The LMS is usually the core tool for supporting the delivery of learning. However, increasingly academics are also incorporating other cloud-based services, such as the dropbox tool for sharing files. The following link provides a list of free tools and resources for teachers.[9] UCISA[10] defines Technology Enhanced Learning (TEL) as:

> *Any online facility or system that directly supports learning and teaching. This may include a formal VLE, an institutional intranet that has a learning and teaching component, a system that has been developed in house or a particular suite of specific individual tools.*

The UCISA survey on Technology Enhanced Learning (TEL) lists a number of key aspects of TEL. Firstly, if used effectively; TEL can enhance the quality of learning and teaching and for most institutions remains the primary driver for promoting the use of technologies. Secondly, the availability of TEL support staff is a leading factor in encouraging the development of TEL, academics need support in terms of knowing how technologies can be used to support learning and need guidance on creating effective learning interventions that are pedagogically informed and make good use of the affordances of technologies. Thirdly, a lack of time and money are listed as the top two barriers for using technologies. Fourthly, in general, teaching, learning and assessment remains the leading internal strategy influencing institutional TEL, although some institutions do have explicit policies on TEL and e-learning. Fifthly, the survey found that Blackboard Learn is still the most used enterprise or institutional VLE, but use of Moodle across the sector has increased. Sixthly, plagiarism detection, e-submission and e-assessment tools remain the most common centrally supported software in use across the sector. Seventhy, e-portfolio, wiki and blog tools are also well established and being used in a variety of ways to support communication and collaboration. In contrast, social networking and non-LMS-based blog tools (such as wordpress) remain the most common non-centrally supported software controlled by staff and students. Finally, use of mobile technologies and mobile versions of the LMS is increasingly important as more and more academics and students have mobile and smart devices. The leading services optimised for mobile devices by institutions are access to library services, email and course announcements. Timetabling information, access to course materials and personal calendars are also popular mobile enabled services.

The report provides a detailed breakdown of the current status of Technology Enhanced Learning, including details of the key tools currently being deployed, the extent to which institutions are beginning to outsource services and a critical list of the barriers to uptake.

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[8] http://publications.cetis.ac.uk/wp-content/uploads/2011/02/Distributed_Learning.pdf
[9] http://www.freetech4teachers.com/2012/09/an-updated-63-page-guide-to-google.html
[10] http://www.ucisa.ac.uk/~/media/groups/ssg/surveys/TEL_survey_2012_final_ex_apps

HUMAN RESOURCE SYSTEMS

A human resource information system is a system used to acquire, store, analyze and distribute information (Haapasilta, 2010). Human Resource systems cover the management of the entire working life cycle of an employee from the planning of the recruiting phase all the way to the end of employment. IT systems are now common for payroll, basic employee records and recruitment (Hahn & Subramani, 2000; Miner & Crane, 1995).

The payroll system automates the pay process by gathering data on employee time and attendance, calculating various deductions and taxes, and generating periodic pay cheques and employee tax reports. Data is generally fed from the human resources and time keeping modules to calculate automatic deposit and manual cheque writing capabilities. The time and attendance system gathers standardized time and work related efforts. The benefits of an administration system are that it allows an institution to administer and track employee participation in benefits programs. The HR management component records basic demographic and address data, selection, training and development, capabilities and skills management, compensation planning records and other related activities. Online recruiting tools have become one of the primary methods used by HR departments to garner potential candidates for available positions within an organisation.

OPEN EDUCATIONAL REPOSITORIES

Most institutions now have an OER repository, which provides free access to learning materials. Systems used include: repurposing the institutional VLE (for example the Openlearn[11] repository developed by the Open University UKis hosted on Moodle), using a blogging tool (such as wordpress for example), or simply as a series of static web pages. In addition, most institutions have a research repository where academics can deposit their research outputs. Two popular systems are the ePrints system[12] developed by the University of Southampton and DSpace.[13] Further more many institutions now have institutional research data management systems, which allow the users to store information on their publications, professional activities and working relationships. A JISC CETIS report[14] describes the challenges and opportunities of OER. It positions OER in the context of the wider notion of openness and in particular lists the following as important initiatives and programmes: the Open Source Initiative,[15] the Open Content Initiative,[16] the Open Access Initiative,[17] and Creative Commons.[18]

TIMETABLING AND RESOURCE ALLOCATION

A JISC policy briefing paper describes the current use of technologies to support timetabling and resource allocation.[19] The report lists three main areas of activity: requirements identification (identifying all requirements for teaching and learning activities), scheduling (identifying date and time of activities) and location allocation (allocation of rooms and other resources to activities).

11 http://openlearn.open.ac.uk
12 http://www.eprints.org/
13 http://www.dspace.org/
14 http://publications.cetis.ac.uk/wp-content/uploads/2012/01/OER_Briefing_Paper_CETIS.pdf
15 http://www.opensource.org/
16 http://www.opencontent.org/
17 http://www.pubmedcentral.nih.gov/about/openaccess.html
18 http://creativecommons.org/
19 http://www.jisc.ac.uk/media/documents/publications/bptimetablingv1.pdf

STUDENT RECORD SYSTEMS

Student Record Systems (SRS) manage student data and are a central part of the core administration function for every institution. SRS support the maintenance of personal and study information relating to:

- Handling inquiries from prospective students
- Handling the admissions process
- Enrolling new students and storing teaching option choices
- Automatically creating class & teacher schedules
- Handling records of examinations, assessments, marks, grades and academic progression
- Maintaining records of absences and attendance
- Recording communications with students
- Maintaining discipline records
- Providing statistical reports
- Maintenance boarding house details
- Communicating student details to parents through a parent portal
- Special Education / Individual Education Plan (IEP) services
- Human resources services
- Accounting and budgeting services
- Student health records

Increasingly, the SRS will be integrated with other institutional IT systems (such as finance and the LMS).[20]

LIBRARY SYSTEMS

Library systems cover all aspects of the management of library materials both physical and digital. This includes the following areas:

- acquisitions (ordering, receiving, and invoicing materials)
- cataloguing (classifying and indexing materials)
- circulation (lending materials to patrons and receiving them back)
- serials (tracking magazine and newspaper holdings)
- the public interface for users.

The JISC briefing paper provides a user overview of library management systems.[21] The report states that the UK HE LMS market is mature and four main vendors (ExLibris, Innovative, SirsiDynix and Talis) have almost 90% of the market. It also lists five areas for future development: i) Open Source Software, ii) Open data and platforms, iii) Clickstreams and context data, iv) vertical search and v) Universal Resource Management. The helibtech site provides more detailed information; covering vendors and a range of upcoming issues and technologies.[22] Further details of vendors is available online.[23] The development of Mobile applications for libraries is a growing area. A recent ARL report[24] provides a good overview of the current state of the field. See also a report on mobile technologies for libraries.[25]

Managing identities is essential infrastructure for libraries to assign loan privileges, etc. as well as critical for many other areas, e.g. registration, payroll. EDUCAUSE defines this as: *Identity management refers to the policies, processes, and technologies that establish user identities and enforce rules about access to digital resources*.[26]

[20] http://www.dmoz.org/Computers/Software/Educational/Administration_and_School_Management/ provides a link to common SRS.
[21] http://www.jisc.ac.uk/publications/briefingpapers/2008/librarymanagementbp.aspx
[22] http://helibtech.com/
[23] http://www.arl.org/sparc/repositories/
[24] http://www.arl.org/bm~doc/arl-br-261-mobile.pdf
[25] http://crln.acrl.org/content/72/4/222.full.pdf
[26] http://net.educause.edu/ir/library/pdf/EST0903.pdf

Many information systems in educational institutions (such as e-mail, learning management systems, library databases, and grid computing applications) require users to authenticate themselves. An authorization process then determines which systems an authenticated user is permitted to access. With an enterprise identity management system, rather than having separate credentials for each system, a user can employ a single digital identity to access all resources to which the user is entitled. A JISC report argues that 'simple, secure access to digital resources allows institutions to manage their business systems efficiently and make more resources available to a wider range of internal and external users. However, few institutions have identity management systems optimised to achieve these benefits'.[27]

At a higher level, there is increasing interest in persistent unique identifiers for authors and institutions so that, for instance, all your publications can be tied together when searching Web of Science.[28] For a broad overview the following report is useful,[29] whilst a report from UKOLN,[30] provides useful information on vendors.

INSTITUTIONAL REPOSITORIES

A digital repository is a mechanism for managing and storing digital content. Repositories can be subject or institutional in their focus. Putting content in an institutional repository enables staff and institutions to manage and preserve it, and therefore derive maximum value from it. A repository can support research, learning and administrative processes. Repositories typically use open standards to ensure that the content they contain is accessible in that it can be searched and retrieved for later use. The use of these agreed international standards allows mechanisms to be set up which import, export, identify, store and retrieve the digital content within the repository.[31] A JISC briefing paper[32] lists a number of benefits of Open Access Repositories. Firstly, the content they house is more visible than the paper or commercially available digital version of the same content. Repositories can store a variety of different forms of content – sometimes new forms, as is the case with primary data. The ability to cross-search multiple formats in one search is helpful to the researcher and can encourage new forms of research based on published evidence and data. Secondly, materials such as PhD theses can get many more consultations in a repository than the paper equivalent. A paper thesis will often exist in a single copy, usually on closed access in a book stack. By comparison, an electronic copy in an Open Access repository may receive dozens of downloads each month. This is good for the author because it gives them, as a young scholar, greater visibility in their subject area. Thirdly, at a subject level, repositories have the potential to pull together content from a variety of different sources and so to become an important reference source which underpins future research in the subject. Fourthly, at an institutional level, university strategy documents are beginning to cite the institutional repository alongside the institutional publications database as core pieces of their research infrastructure. Fifthly, the emergence of new world and university rankings for repositories can only raise awareness at an institutional level of the importance of making research content generally available. Finally, in a world of social computing and social networking sites, repositories have the potential to be more sustainable and long term, given that they are managed by institutions or scholarly bodies with a mission to undertake and

[27] http://www.jisc.ac.uk/supportingyourinstitution/institutionalmanagement/identitymanagementsystems.aspx
[28] See for example http://technicalfoundations.ukoln.ac.uk/node/92
[29] http://technicalfoundations.ukoln.ac.uk/subject/research-information-management
[30] http://www.ukoln.ac.uk/isc/reports/cerif-landscape-study-2012/CERIF-UK-landscape-report-v1.1.pdf
[31] http://www.rsp.ac.uk/start/before-you-start/what-is-a-repository/
[32] http://www.jisc.ac.uk/publications/briefingpapers/2008/researchrepositoriesbpv1.aspx

disseminate research. It is repository managers, authors and institutions that need to support this vision in order to make it a reality.

OPEN ACCESS PAYMENT MANAGEMENT SYSTEMS

A new, but fast moving area of importance is open access payment management systems. One of the implications of open access publishing is that we are moving from a wholesale model for supporting journal costs (publishers collect a single subscription payment from a relatively small number of institutions worldwide) to a retail model where authors `pay' upfront for open access publication on an article-by-article basis. This could mean hundreds of invoices per publisher per institution. The Research Support Office at the University of Leicester is trialling a product from ingentaconnect,[33] which brokers between the university, the research funder and the publisher. Research4life[34] is an interesting programme. It is a publisher programme to provide free/highly-subsidised access to scientific papers in the developing world.

FINANCE SYSTEMS

In terms of Finance Systems there are a number of core functional areas that are required, such as: providing basic ledgers for purchasing, sales, fixed assets, and a general ledger to bring all transactions together for reporting purposes. Payroll systems are also important and need to be linked to the HR functionality of systems. There are some areas where systems are more bespoke to higher education, for example systems to account for capital funding from funding bodies and for accounting for research grants and contracts. Many institutions use SAP and Agresso, who have a number of clients in the UK and internationally. One of the key challenges is how the financial system interacts with the student records system.

CONCLUSION

This report has provided an overview of the ICT systems being used in educational institutions to support learning, teaching and research activities. It has described the main functionality across key aspects of activity and given some examples of the types of tools that are commonly used. The following ten recommendations and policy implications arise:

1. ICT are now vital in terms of supporting the delivery of learning, teaching and research in all educational institutions.
2. Students are increasingly expecting to have information and materials about their course available online.
3. Students are increasingly bringing their own devices (laptops, mobiles and smart devices) to the campus. Institutions need to ensure that the learning spaces on campus are technology enabled, for example in terms of simple things like plug sockets and good/robust wireless access.
4. Students increasingly want to be able to work on and off campus and to be able to seamlessly access materials to support their learning.
5. Institutions need to have in place institutional strategies on all aspects of ICT provision and clear policies on service level agreements on IT systems.
6. Cloud computing is increasingly being used by both academics and students, institutions need to have in place clear policies on the relationship between institutionally supported ICT systems and use of cloud computing.

[33] http://www.ingentaconnect.com/content/alpsp/lp/2012/00000025/00000003/art00004
[34] http://www.research4life.org/about.html

7. Both academics and students need to develop a new set of digital literacies to harness the potential of technologies to support learning, teaching and research. Therefore institutions need to provide central support in terms of educational technology.
8. Senior managers need to have an awareness of what technologies can offer in terms of learning, teaching and research and be aware of emergent trends in technology developments.
9. Boundaries are blurring in terms of teaching and learning, academic and student roles, institutionally supported IT systems and free tools and resources, on and off campus provision for learning.
10. Many institutions have legacy systems that are not well integrated. Further work needs to be undertaken to provide a more seamless linking between the different IT systems described in this report.

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OTHER RESOURCES

- http://www.educause.edu/ero/article/enabling-data-driven-university
  http://www.ijesd.org/papers/55-D461.pdf
- http://books.google.co.uk/books?hl=en&lr=&id=dgE6IESHSXwC&oi=fn&pg=PA3&dq=ict+university+administration&ots=kRcG-T590C&sig=dr6IxBAHYu3oUzrnJx80Fp1qwEE#v=onepage&q=ict%20university%20administration&f=false
- http://www.tandfonline.com/doi/abs/10.1076/ilee.11.2.91.14132
- http://www.jiscinfonet.ac.uk/infokits
- http://www.jisc.ac.uk/media/documents/programmes/resourcediscovery/lms-study.pdf

This policy briefing provides an overview of the Information and Communication Technologies that are used to support educational administration. It covers the full range of technologies used to support learning, teaching and research. This includes technologies used to support learners from their initial inquiries about courses through to graduation, technologies to support teachers in the design and delivery of teaching and technologies to support the research lifecycle from bidding through to project management and finally research dissemination. In particular it highlights the importance of Learning Management Systems (LMSs) to support learning and teaching. It concludes with a set of recommendations for institutions.

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