Walking a tightrope: IT strategies for supporting university research, teaching & administration

Jeff Haywood
Vice Principal Knowledge Management, CIO & Librarian, Main Library, University of Edinburgh, Edinburgh, EH8 9LJ, UK
jeff.haywood@ed.ac.uk

Abstract. The importance of ICT to all aspects of university business cannot be overemphasised. However the devolved nature of university management, and particularly of research, results in tensions between the central university ICT services (including elearning), striving to provide resilient and cost-effective services for all, and the academic communities that need agile and leading-edge ICTs to serve their time-constrained and collaborative needs. Examples of these tensions are provided. Completely resolving these tensions is not realistic, but some methods, based on good practice in strategic management and knowledge management can support better partnerships that enable all to feel that their objectives are taken into account and ensure better understanding by all stakeholders of the issues.

Keywords. ICT, IT, strategy, research, e-learning, teaching, university, knowledge management, community of practice

1. Background
1.1 The nature of universities

The world’s universities comprise one of the longest-lived ‘systems’ or networks of human organizations, with some members of the network tracing their ancestry back over a thousand years. Alongside this longevity is renewal and growth, with every country seeking to expand its higher education sector, creating new universities to join their ancient and no-so-ancient colleagues in the world university system [1]. Despite the significant variations in their missions, internal structures and management processes, there are substantial similarities between universities, most conspicuously the degree of autonomy that is given to their academic staff, and in some of them to support staff as well. The academic enterprise often resembles a (large) congregation of individual entrepreneurial units rather than a corporate organization, with the academic units being more closely aligned to the world-wide community of scholars in a specific subject than to the neighboring units inside the same university. The loose federal nature of the university is reflected in management structures, with degrees of devolved power over decision-making and budgets, and in the most devolved cases, with almost no central authority or services.

The devolved nature of the university is generally viewed as being essential to the creative academic endeavor, in which knowledge is in constant flux and hence research and teaching must have agility and flexibility to excel in this changing work landscape. Despite a common stereotype of academe as conservative, resistant to change and slow moving, the marked ability of academic staff in all fields, but especially the sciences and clinical subjects, to wheel and turn like hawks to spot and ‘bring down’ new funding challenges, indicates a different side of the university, one which is shaped by pressure of time and focus on objectives. The work of academics is a continuum of projects and of deadlines, teaching and research, which have to be met.

1.2 IT developments

The last 40 years have brought an ever-expanding range of ICT hardware and software to individuals, businesses and organizations of every kind. The mini-computer of the 1960’s is outclassed by the current mobile phone; wireless and wired networks are beyond the imagination of most people a generation ago, and our ability to work and play together whilst at a distance is close to the writings of science fiction authors of the post-war years.
These developments have not left the university untouched. Academic staff in all disciplines have adopted ICT, admittedly at different speeds and with varying enthusiasm, but as a whole academics use ICT daily and are aware of its implications for their research and teaching. The list of their tools and approaches is very long, ranging from simple email and websites at one end, encompassing online collaboration; standard office productivity software; data capture, handling and manipulation; to massive data storage and high-end compute power at the other end of the spectrum. Within each of these ICT ‘categories’ lie multiple hardware and software options, with choices about commercial and proprietary (closed), open standards or open source.

The creativity at the heart of the academic endeavor, and the strong relationships of academic staff to their remote colleagues in their ‘field’, as well as to their local colleagues and to their students and their university, mean that their preferences for particular ICT solutions may not always align well with the preference of their home university [2]. The funding model at the heart of most academic research, in which academics compete for external or internal funding, and when successful deliver on promised objectives in relatively short timescales, results in a focus on fit-for-their-purpose and a strong sense of spending ‘their own’ money. Their external collaborations, sometimes very extensive and with powerful international research organizations, require the inclusion of people who are not full members of the university, or even those who are not formally known to it at all, creating difficulties around authentication, permissions and data security.

The university as an organization inevitably tends to take a more corporate approach to ICT, seeking economies of scale for its investment, aiming for stability, resilience, good provision of services for those staff not so well-endowed with research funding, for its students (who are out of the research funding equation) and for its administrative staff (who have increased substantially in number over the years of HE expansion and the importation of modern business finance, HR, estates etc practices).

However, even this rather ‘conservative’ view of ICT is coming under internal pressure as awareness of Web 2.0 begins to impact on senior managers’ thinking. Many university leaders are now concerned about the message that any lack of use of more up-to-date ICT sends to prospective students and staff, and they debate the positioning of their university in a much more competitive and league table oriented HE world. ‘Google or Net Generation’ awareness [3] causes senior staff to question how to ensure relevance to today’s students, these students themselves are very aware of services and facilities offered at other (competitor) universities that their friends and family attend, and senior IT service staff are themselves part of international communities of professionals that discuss, and sometimes agonize, about how to manage these competing demands on budgets that are often shrinking, or at best maintaining constant purchasing-power.

2. Identifying and managing the tensions in university ICT

These different perspectives on the selection, procurement and operation of ICT manifest themselves in different ways in different areas of the university, and perhaps between universities depending upon their management model and academic composition. My view is that the major tensions apparent in university ICT lie mainly around these attributes:

- finance (‘mine-theirs’)
- standards (‘open-proprietary’)
- one-size-(doesn’t)-fit-all
- (in)flexibility
- locus of control (‘central-local’)

Whitworth et al [4] have offered a useful model (a spider web) to visualize the balancing and equilibria between different aspects of IT systems in terms of attributes such as ‘ease of use’, ‘security’, ‘privacy’, ‘flexibility’, and this approach enables us to see how favoring one attribute distorts the web towards it and by necessity reduces the proportion of one or more other attributes (Fig 1.) Note that the model assumes a pre-defined level of finance, which is therefore effectively a third dimensional axis that affects the extent of any attributes that can be afforded. Of course, in practice, for those of us involved in acquiring ICT solutions, the variations along this finance
axis are a significant component of the discussions.

Fig 1. Interrelationships between attributes of ICT systems
redrawn from Whitworth et al [4]

For the Head of University ICT (Chief Information Officer, Director of IT, Information Services Director etc) and Heads of Academic Units (Schools, Departments, Faculties etc) charged with making ICT work for their university within realistic budgets, these are challenging times!!

Everyone is likely to have their own examples of these tensions. I have chosen four areas from my own university, the University of Edinburgh, to exemplify the tensions in practice, and then I will comment on the ways in which we have been working to reduce and to accommodate them that (hopefully!) will enable all stakeholders to feel comfortable with the outcomes.

2.1 E-learning

Around 15 years ago, e-learning entered the mainstream academic domain as the ‘new kid on the block’, introducing novel tools and techniques to the already growing ICT toolset that had emerged through the 1970’s and 1980’s. In most universities, perhaps all, the development of e-learning was organic at the outset, with individual academics or Schools/Departments adopting what they perceived as the most suitable tools and approaches. To some extent this diversity then diminished due to the maturing of commercial (WebCT, Blackboard) and open source (Moodle) virtual learning environments (VLEs) that could be used as university-wide services and that academics new to e-learning were encouraged to use instead of ‘doing their own thing’. There was, and still remains, a tension around the economies offered by a single VLE, and the preference of some academics and courses for a VLE other than the central service, and so multiple VLEs in one university are still common, although usually one is the major service. The professions, especially Medicine, Veterinary Medicine and Law in the US and UK, are archetypes of this devolved activity in e-learning.

For a few years the e-learning domain was fairly stable, but recent developments have resulted in fresh tensions around the selection and deployment of e-portfolios, wikis, blogs, social networking and bookmarking sites, virtual worlds etc. The agility of innovating academics far outstrips the ability of central IT/e-learning services to add new services to their catalogue, even assuming the IT support staff were aware of their emergence and could formulate rules and guidance for their use quickly enough. Some of these tools break the mold of university IT services by being externally-hosted, being open to the wider community (or the world), and having little or no control over the quality or legality of the content placed on them. This need to move quickly in a changing electronic landscape is seen as essential, even by academics who believe that the ideal is for high quality common central e-learning services. Thus the tension in e-learning currently revolves mainly around agility and responsiveness to change, and the diversity and instability that this brings, versus reliable and stable services for all that give consistency and interoperability on which mission-critical activity depends.

2.2 Supported / managed PC desktops

With a computer on every university staff member’s desk, and sometimes a laptop and home PC too, the cost of maintaining and licensing software on thousands of PCs has led many large organizations to adopt a ‘common desktop’ solution that applies standardization and consistency, and enables automation of routine maintenance. (Here desktop means the operating system, its configuration, the software loaded, security policy and its network connectivity.) In its extreme case this is a ‘single desktop for all’ where no end-user can modify the PC, but in more flexible forms
it may allow users to have admin rights, to load software, set preferences etc within defined limits. Although commonly the PC is a Windows PC, the same principles apply to Macs and Linux PCs. Some universities, including my own, have successfully adopted flexible supported desktops.

So where is the tension? For administrative and secretarial staff there is little or none, as the software suite can be agreed, there is less individualism in the culture and few strong, frequent personal collaborations with colleagues outside the home university network. For this group the benefits of a PC they do not need to maintain themselves are high, and compatibility with other colleagues in the university is greatly enhanced. As long as the toolset encompasses their needs and is being adapted to changing work patterns and demands, the managed/supported desktop works well.

For academic staff and researchers the tension lies in their need for flexibility and customization as they trial and adopt IT tools that must, by definition, lie beyond what a central IT service can realistically offer. (There may also be a support-platform problem if all OS in use in the university are not included, but I will leave this challenge to one side.) The value to them if they adopt a managed/supported desktop is time saved in maintenance and automatic loading of software updates/versions, plus fast recovery in the event of a system failure, but the price may be loss of ability to configure and modify, loss of admin rights and hence ability to add software of choice, and possibly inability to run some software that the desktop cannot support. (There is also, although varied in extent between universities, disciplines and individuals, a resistance towards the managed/supported desktop on grounds of autonomy and independence as principles.) For busy academics with research and teaching priorities these constraints may be more than they can adapt to.

2.3 Research data storage

Almost all university research now involves some use of ICT, and hence produces and draws on digital data. In some cases these are very large datasets (e.g. in particle physics, molecular genetics and neuroimaging) and others the datasets are small (e.g. saved email attachments, research publications). For all users the trend is upwards – more datasets, more disk space, and importantly, more criticality of the data to the individual or team's research efforts. Some of the major national and international funding agencies are now requiring open public access to data and publications produced with their financial support (e.g. National Science Foundation, Wellcome Trust), adding to the need for universities to engage with the data storage agenda, and at the top end of the storage spectrum, to engage with e-science too (e.g. Grid, Cyberinfrastructure).

Traditionally, university researchers, at least in the sciences and medicine, have funded their own research infrastructure through research grants, and sometimes large funding allocations have been used to acquire large facilities for ‘big science’ work. The model is less developed in social sciences and humanities, where the solo scholar (or one academic with a postgrad or two) is often the largely-unfunded research ‘team’, and the university is expected to provide the infrastructure. In the past the infrastructure was an equipped office plus the library, but now it also includes the full range of ICT services that modern research in these domains requires.

The urgent question for the university is how to ensure that adequate data storage can be assured for its academic research staff which takes into account a scale from Gigabytes to Petabytes, and that is at a cost that can be afforded using whatever funding model is appropriate. This is where the tension appears.

One the one hand, the simplest solution for the researcher may be to use whatever funds are available to buy her/his own storage and maintain it locally, either personally or by means of research staff. This can be well done or badly done, but is uncontrolled and un-audited. Those researchers who are well-funded will have good services and those without funding will have none. Digital curation will be minimal. Ideally such staff probably prefer not to have to provide these services to themselves but in the absence of what they perceive of as suitable central services they do so, and then guard against forces that attempt to compel them to do otherwise [5].
On the other hand, the university may feel the need to have an eye to legal compliance and security, and also risk reduction against loss or non-access of key research materials that it in some sense ‘owns’ and wishes to future-proof. It may feel an obligation to support its researchers more equitably but has limited funding to meet their spiraling needs. A resolution of the tension is needed, and that might be based around an agreement between ‘both sides’ to pool resources, with the researchers putting their money into the pool (e.g. by paying for storage and services, or by contributing cash for new shared equipment from research funders) and the university allocating some of its own funds (which after all come largely through the efforts of the academics) to a core data service that can take care of the needs of most small to medium users, but does not attempt to cope with very large users. Thus a high quality data storage service can be run that is close to a commodity item for the great majority of users, but which requires both ‘sides’ to agree on its nature (e.g. quality of service, operating procedures, replacement cycles) and funding as both are partners in the venture.

2.4 IT productivity and communication tools

For business corporations, the choice of which office productivity tools (i.e. word processor, spreadsheet etc) and which email, e-diary and contacts directory to use largely resolves itself to the Microsoft suites. This is partly due to interoperability with partners and clients, scaling to enterprise strength, a strong support base with the good possibility of recruitment of IT staff will skills in MS implementations. Not all corporations follow this path but they are the clear minority. Many have a single OS platform, usually Windows, which simplifies the decision, and the OS and the software are mutually reinforcing. For universities the choices are less clear, partly because of OS variations (some scientists having community- and research-influenced preference for UNIX/LINUX; media subjects selecting Apple) and also because there is a deeply-held view amongst some academic staff that proprietary software is undesirable per se in comparison to open source.

For the central IT service the need to acquire, maintain and support users through implementation of a robust, preferably common, suite of tools is a primary driver and in some cases has led to a separation between academic units and central services in terms of both choice of tools and support mechanisms.

2.5 Strategies for resolving the tensions

Success in resolving tensions is dependent firstly upon willingness of the stakeholders in the university to work together for the long-term benefit of all. Depending upon personalities and the degree of pre-existing rapport, this can take a short or a long time to reach. Top level politics define the setting in which the proposals which I am putting forward here are worked through, and each of the strategies I outline next in a) to e) is dependent upon action in the option above and/or below.

a) Strategic partnerships. This is work to be done at the top level political domain of the university, however that is defined in each university. Those who hold the major budgets and set strategies and plans in places, those who are concerned with major university-wide remits for research and teaching, the IT directorate, key staff influential in shaping research and teaching agendas, trade unions and staff associations, HR units, student associations etc need to be either actively signed-up, or aware and comfortable with, the idea of partnership in strategic ICT matters. This may be easy to achieve, but where a highly-devolved status quo has held for a long time, and where autonomy is jealously guarded, time and effort will be needed to reach an understanding of the value to all of finding ways to work together more effectively. The language of partnership is important. It sometimes sounds trivial (‘it is just words’), but words set expectations about actions and deeply influence the attitudes of ourselves and our colleagues.

b) Agreed ICT strategies and implementation plans. These are the manifestations of the strategic partnerships, and embody the agreed objectives of the partnerships at a high level (as written strategies), with their more practical elaborations (the
implementation plans) which by preference contain some agreed milestones and performance indicators. Important features of these documents is that a) they should be ‘living’ and referred to in annual plans, sub-plans and work schedules, and b) they should have priority assignments for major objectives whenever possible. Even if the funding does permit progress to plan, the strategies and their implementation plans simplify the process of re-negotiation. They also provide a touchstone against which new opportunities can be tested to see whether or not they fit inside the strategic framework, and minimize decision-making ‘on the fly’. Importantly, they set expectations by both partners, and can be used to manage ‘unreasonable’ demands for service by either partner.

**c) Agility/stability and service standards.** To be successful, university ICT must be a partnership, and each partner brings different strengths to the table. Broadly, the academic partners (including their ICT support staff) bring awareness of ‘business’ needs, ability to judge whether services are fit for purpose, and a wide horizon-scanning that goes deep into the leading edge developments in individual academic fields. The sum of their knowledge informs the university where the world is going / may go over the coming years, and what to monitor. Broadly, the central ICT services bring understanding of good practice in enterprise strength IT, how to protect digital assets, how to integrate services and how to get good value for money for the university as a whole over time. They are knowledgeable about professional standards and skills in their domain. Both of these perspectives are essential to the well-being of the university and need to be exposed and discussed openly to firstly, recognize the inherent tensions between them, and secondly, to reach compromise on them.

**d) Sharing experiences.** People who work in effective teams towards a common objective gain mutual understanding of each other, of ways of working that have more implicit than explicit knowledge encoded in them, and a better ability to ‘see the problem from the other side of the fence’. Creating teams to design and operate services and facilities that draw on the various communities that are stakeholders in them is an essential ingredient in reaching partnership working. Of course, this is not a cost-free process. Discussion and negotiation takes time and effort, often only reaches a (vociferous) minority in some communities, and can lead to real frustration as compromises are worked out. Excellent people skills are needed to keep such teamwork on course, and selection of the right people to do this often results in those who are most talented at it being very burdened with their leadership. In addition to team working, which cannot by its nature include all ICT staff in its scope, is the role of professional forums, in which IT, or e-learning, staff from across the university meet as fellow professionals to share views and concerns, and to resolve tensions or differences of viewpoint, and to promote their common well-being. If well managed and well supported these professional forums can provide an indispensable locus for drawing on the un-codified knowledge-base of the university.

c) **Developing together.** To achieve common standards of services, and to ensure that misunderstanding is minimized, it is helpful for everyone, and especially operational ICT staff, to work within common and agreed frameworks. These are not ‘rocket science’ but are complex to draw up from first principles and benefit greatly by exposure to as wide an audience as possible to debug and refine them. For these reasons, it is sensible in the first instance to seek examples of such frameworks in the wider professional communities, and of course these have added benefit by being more portable for ICT staff in their careers. Examples of such frameworks are those for project management (e.g. Prince2 [6]);
IT service management (e.g. ITIL [7]); ICT staff skills and competences (e.g. the British Computer Society SFIA [8]); interoperability standards (e.g. IMS [9]); and Service Oriented Architecture [10]. By offering staff development and training to all appropriate staff working in a given area, regardless of whether they are in central services or academic units, a common understanding is achieved, and a bonus that all these staff see themselves as equally-valued within the organization. It enhances opportunities for mobility of employment within the university, and is a bonus in external recruitment.

These approaches to achieving better ways to design, acquire, implement and operate ICT systems within universities draw their inspiration from a large body of work in the field of knowledge management, especially our understanding of the importance of communities of practice in sharing non-codified knowledge and perspectives on work [11]. These ways of working have always been at the core of some university activities, particularly research but to some degree learning and teaching, but have not so readily been ported into the relationships between different academic communities and particularly between academic and support communities. The recent trend to recruit senior ICT staff from commercial organizations in order to gain their expertise in enterprise strength systems and management processes, has sometimes contributed to a difference in language and expectations.

3. Conclusions

As ICT becomes steadily more integral to all aspects of university business(es), including core academic activities across all subject areas, the quality of ICT services offered to staff and students becomes mission-critical. Much non-specialist ICT has become a ‘commodity’, with little or no strategic value in possessing it but damage resulting from poor implementation or lack of provision [12]. Thus robust webserver, email, and e-diary services that can interoperate across the university and with external partners and clients, and that can enhance productivity are vital, and factors to lead to impaired productivity or miscommunication must be strenuously minimized. Similar arguments can be made for much of the VLE-based e-learning, and research computing hardware and software. Only in the creative edge is advantage gained by selecting and deploying faster or better. The permeation of ICT into all areas of the university, and a need to promote its independent uptake and creative use by all staff, results in an inevitable loss of control by central ICT services. Local ICT experts of varying kinds, especially those linked to research activities, reinforce the centripetal forces that reduce central ICT service influence, and in the extreme can result in independent ICT units, strategies and management in academic (and perhaps administrative) units. One consequence of this diversity is inevitably increased costs, but perhaps more importantly is the potential loss of knowledge sharing and good practice, spread of innovation, and reduced productivity in interactions within and beyond the organization. Developing mechanisms to retain and gain advantage from the agility and innovation in academic units, and at the same time facilitate migration of these new additions to ICT services into the mainstream when appropriate and underpin all with a stable core of resilient services is the challenge for us all in the coming years.

4. Acknowledgements

I wish to acknowledge the invaluable contributions to my understanding, in this area of my work, of numerous past and present colleagues at the University of Edinburgh, and in universities across Europe, the US and Australia. In particular I would like to thank Simon Marsden, Deputy Director of Information Services, University of Edinburgh, and Helen Hayes, my immediate predecessor as Vice Principal, CIO & Librarian.

5. References

[2] Becher, T, Trowler, PR. Academic Tribes And Territories: Intellectual Enquiry and


