The CIO world of Higher Education in 2015

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1. EXECUTIVE SUMMARY

The paper examines the changes, environmental, technological and managerial, that may be anticipated over the seven year period till 2015 for HE. It questions the skills needed by staff servicing the future IT/IS environment and the likelihood of significant reductions in IT staff.

The paper will call on evidence to justify the pace of technological advancement whilst at the same time recognising the impact this will have on the skill base of employees and end-users. The sociological impact of new technologies is likely to significantly impact on the nature of the education from cradle through to grave. Despite the pace of technologies the application environment, in particular software is moving much more slowly. What is the impact of the mismatch? As educators are we are adequately preparing new generation employees to meet these challenges.

Are we fit and ready for purpose as we go into the next decade; where we should anticipate challenges? Higher Education is probably the last bastion not to be attacked aggressively by privatisation. How long is this situation likely to continue? So despite all the warning bells you want to be a CIO in 2015? What skills should you be developing and how do you avoid or delay becoming a dinosaur in office?

2.   The ACADEMIC CONTEXT

UK universities will be forced to change over the next decade; the potential home student population in the UK will fall by 100,000 - 15% to 16%. If we are to get to the minimum of 40% graduates in the labour market set out in the Leitch [Leitch] review, then we are going to have to bring lots of people back into university education from the existing workforce.

The changing demographics and funding regime will mean students won't generally live away from home for three years; part time study rather than full time with substantial numbers being employer funded will create a very significant change. The sector will need to respond to the diversity of more mature students whose demands for study and mechanics of study will be very different. A credit based system may well result in the future student gaining credits from several institutions servicing particular needs associated with their employment.

The requirements is for a highly skilled workforce to service the competitive environment existing in the global economy. The long tail of under-achievement associated with the 12-18 education in the UK will have to be tackled in the workplace, not an easy task!

2.1. The Predictions

Hopefully, all IT/IS staff have at least skimmed the text 'The Singularity is Near' [Kurzweil]. The Singularity is a phrase borrowed from the astrophysics of black holes. The phrase has varied meanings; as used by Raymond Kurzweil it refers to the idea that accelerating technology will lead to superhuman machine intelligence that will exceed human intelligence, probably by the year 2030. The book uses an analysis of the history of technology and shows technological change to be exponential. The so called "returns" such as chip speed and cost-effectiveness, also increase exponentially. The book is brave and controversial but in this paper I am only looking to the next seven years where it is highly likely that the predictions in terms of pace of change will match the analysis and also Moore's Law to be discussed following. Whatever ones view, the changes in the seven year period will be far greater than we wish to imagine, due to our innate desire to view change as linear rather than exponential. Most readers will have lived through a significant part of the history of the computer and probably all of the history of the internet. Our experience of change will hopefully demonstrate that as humans we generally over-predict on a two year horizon and woefully under-predict on a ten year timeframe. It requires no mathematician to apply the rules below to technological devices such as phones, MP3 players, laptops etc to make some personal and startling predictions about impact of technology.

3.   THE EMERGING IT/IS ENVIRONMENT

The trends for the next seven years in terms of developments of IT technology are clear and readily predictable. An observation of Gordon Moore, widely known as "Moore's Law," in which in 1965 he predicted that the number of components the industry would be able to place on a computer chip would double every year. In 1975, he updated his prediction to once every two years. It has been a guiding principle for the trade to deliver ever-more-powerful chips while decreasing the cost of electronics. Only last year he gave an interview for the BBC [Technology] regarding this observation and glimpses towards the next decade. It is clear that Moore's observation is capable of being met for the next decade even as we move yet closer to the physical limits imposed by the atomic structures of materials. Interestingly, technology in the consumer arena is moving at a pace far greater than society's ability to embrace its potential within its shelf-life. Consumer devices are manufactured for planned obsolescence simply because of the inevitability arising from Moore's Law. However, this make return on investment particularly challenging and risky to organisations wishing to benefit from their wide ownership; many users regarding them as disposable 'toys'.

So what are the trends that can be readily predicted as we consider the impact that will arise in the University environment? The consumer is somewhat besotted by the mobile technologies such as phones, MP3/4players and these fairly ubiquitous across most age sectors and social groups. The proliferation of broadband access to the home, office and now widely available by wireless across city and populated regions is further fuelling the market for devices combining a wide portfolio of on-line consumer services. New generation technologies and battery developments drive greater

portability and convenience. Increasingly we are seeing new services specifically targeting consumerisation of IT/IS; the ability to download streaming media (film or music) on the move and mechanisms for messaging and rich communication paradigms as well a location services using GPS. The web and web 2.0 will continue to be the dominant environment for access to resources and services integration. The relatively feeble human interfaces to portable devices do not prevent their popularity and of course we can predict significant improvements in seven years where processor capability will mitigate compactness. However, what cannot be predicted is the possibility of disruptive technologies/paradigms, e.g. the World Wide Web which arrived un-predicted and transformed the landscape in next to no time.

3.1. The Paradox

It is an interesting conundrum that whilst silicon technologies have been moving apace the software associated with them is moving laggardly. Consider specific examples: high performance computers double in capacity as per Moore's law whilst the application software they execute for significant research areas has seen little in the last two decades. In fact the languages and operating systems themselves show pedestrian development and rarely maximise potential of the multi-processor architectures, memory architectures, or other computer sub-structure developments. Many significant business systems utilise code written a decade or more ago in languages not now widely taught. Database architectures similarly have made little progress in optimising opportunities afforded by new architectures so benefiting from Moore's Law alone.

Having raised the paradox we must ask questions about it for the future. Just suppose we do not find effective ways to harness the technologies we create. Putting it simply, what if the development of software to harness increasing computer capability fails! Society is adopting systems embracing complex software for many applications where human lives depend, Airplane flight control systems for example. Society's faith would be readily dented by catastrophic failures.

Clearly the cost and effort associated with major software systems is very large indeed; the intellectual capital being immense. We have allowed Moore's Law to do for us what would be unthinkable if technology was to be chased by repeated software rewrites. Only in the consumer mass-market areas, generally for small applications, is software progressing rapidly; even in this area backward compatibility demanded by consumers become a hindrance to step-change. We have adopted many new programming paradigms including visual software tools, reusable code, etc, yet still the pace of software development is not keeping pace.

The open-software approach has significantly encouraged developments but its pace is well short of the environment it serves. Traditional enterprise software lifecycle cannot keep pace with the speed and changing needs of 21st century business. The culture of collaboration in the open-source software development community may open doors of opportunity!

There may be significant problems ahead as students shun traditional areas of computer science in the western economy countries; at the same time China, India etc are seeing major opportunities as software development and maintenance is outsourced to them on a cost advantage basis. Where will this leave us as, the baby-boomer society, now seeing 'grey-haired' staff retire?

As IT professionals we should encourage our institutions to strengthen investment in IT/IS education and more widely embed it into other disciplines. The needs of our industry over the next decade will be large as a disproportionate percentage of skilled staff retire leaving huge legacies of codes, tools and systems. We need to equip IT students with both legacy skills and a route to lead us to a better state. Managing complexity in large systems and mechanism to enable integration and migration will be increasingly critical to our society.

3.2. The Changing demands in Higher Education

What does all this technology mean to University services and support models for students? The demise of the desktop student computer has been predicted for quite a while but generally campuses continue to see strong demand for access to institution provided resources. Laptop ownership by students is evidenced by many recent surveys to be close to 100%; however, there is understandably a reluctance to carry a 'heavy' and valuable device with power constraints during the student day. Wireless networking is not totally pervasive on all campuses but hotspots are

generally widespread and there is ample evidence that this remains a high priority for campus investment. However, as we invest mobile operators are delivering pervasive 3G/4G wireless networks not bounded by our walls.

The arrival of new devices in the sub-notebook arena will significantly impact user attitudes to campus provision and we may be on the cusp of significant change. (Asus announced two Eee PC models at COMPUTEX Taipei 2007; Asus sold in excess of 300,000 units in 2007 and plans to sell several million in 2008)

The support model for student services to supporting PCs is in transition. Why is this? It is really simple, the capital cost is no longer significant in comparison to real cost of ownership arising from software licences, premise costs, power and even environment cooling, and human support. Despite major advances in support models for desktop PCs it remains expensive because of the complexities arising from our specific environment where we demand security and openness as conflicting demands. Users demand the ability to personalise their computing and user environments as they can on their own devices. To this end many institutions are moving to a client server model where applications and services are accessed centrally with the desktop being little more than a web display device. Device ownership is becoming irrelevant as security mechanisms mature enabling users to authenticate from anywhere.

It is inevitable that students will increasingly work more remotely from their institutions as services are pervasively accessible on-line. The significant benefit of the institution is likely to become in respect of face-to-face interactions with staff and between students. We do of course have to consider the impact of virtual communication environments which is rapidly gaining credibility with users for social contexts.

3.3. The Campus impact

Over the last few decades higher education has seen significant growth with a UK government expectation there will be 50% of the population benefiting from higher level education. My personal perception is that institutions have lost the closer student relationship we experienced. The new demands: massification, research concentration value for money and home-based living being are just some of the many. We have de-personalised many aspects of our former strengths, our approach has been to focus on quality services and efficiency through effective business systems and processes maximising potential from self-service and call-centre approaches.

Increasingly UK institutions are focussing on the academic core-business (teaching and research) and all manner of services are being outsourced or out-managed. Halls of residence, catering and social facilities are increasingly in the private sector; the needs of students for wireless/networking are driven by market forces where customers will take their money to best-value service provider and service bundling is increasingly dominant in the marketing model.

The impact of e-learning has been far less than predicted; most campuses adopting blended-learning. The e-learning platform value proposition is with regard to: managing the learning process, integration into business processes, access to documents/media, submission of assignments, on-line assessments, etc. Perhaps we should not be surprised by the casual progress with these paradigms; a Gartner hype cycle would say we are (slowly) moving from the trough of disillusionment towards the plateau of productivity. In the UK, an ageing academic staff, arising from earlier rapid expansions of HE, make it inevitable that academics choose not to prioritise e-learning. Reward mechanisms are not in place to re-prioritise investment of intellectual capital. Furthermore, there is ample evidence that educators resist developments and change which deflect form their own learning experience. Also the HE academic community is reluctant to share teaching resources arising from the 'not invented here syndrome'.

The poor efficiency of space utilisation at UK University campuses is well recorded. Teaching space is significantly under-utilised, academic offices seen as a fortress by those occupying them are increasingly empty as staff work from home whilst claiming dedicated space is needed for one-to-one discussions or small group work. Can the system afford these luxuries in what is becoming an increasingly competitive environment?

3.4. IT Service Provider Issues

The IT Director (formerly the Computer Director) was in their 'hay-day' during the mainframe era. A very expensive technology was procured every few years and was worshipped by all who used or supported it. The user-base was small and probably known personally to the computer centre staff.

The migration to the mini and then the PC transformed the services and model for their delivery. Most Universities for a decade or two led in the development of services which are now considered the domain of an ISP. The perception of users is such that we are compared to the major services in our domain. There are expectations of full 365 by 24hr unbroken service across the full portfolio of services we provide. Furthermore, in a world where many services are free at the point of use (Hotmail, Gmail, eBay, Google, etc) it is difficult for users to accept the cost model we need to provide the services they use.

The staff and recurrent software costs in relation to the capital investment are increasingly an issue. Complexities arise from competing demands in an environment where costing and return on investment are not widely prevalent. Users, staff and students are not supportive as IT is an iceberg where most of the costs are hidden from user perception and in an environment where at home costs are modest through operating in the mass consumer market making use of generic and widespread utility approaches.

3.5. What are the implications

The current model of IT/IS support is not sustainable. The pressure on resources in UK universities and probably in most other countries is inevitably going to expand; inevitably government cash will be needed to support issues arising from increased population age. Institutions will be looking to prioritise investment directly towards core business activities and IT services will inevitably be seen as not essentially core! In the UK, a number of universities have already made the step towards partnering for desktop services (usually for students and alumni), outsourcing email, calendar, etc. Generally partnerships are with the major services, Microsoft and Google, and a win-win situation is achieved. Users perceive university service as an imposition and second-rate and dislike to the constraints from regulations. The personalisation agenda of individual users, strengthened by diversity of student base, will demand freedom of service provider and integration pathways.

The agenda for collaboration between UK institutions has always been strong. Collaboration led to the JANET network being established and thence a wide portfolio of services is now available across a number of themes through the model established by UK funding councils delivered through the JISC [JISC].

The UK government is driving hard on its won agenda for shared services in all public sector organisations. There is an inevitability that Higher Education will be driven to adopt measures to deliver anticipated cost savings claimed to be achievable through shared service approaches. The Flex [Flex] model is a shared service for ICT designed for all public sector organisations. It provides a desktop shared service through a framework contract and is made up of a core of services; There are options to buy additional and bespoke services through the framework; a claimed benefit is that the Flex framework avoid lengthy and costly procurement processes and claims to assure high quality and consistency of service from the supplier. Flex is being adopted in the public sector and the claims made may soon be visibly tested.

3.6. Shared Services

The UK Government determination for the shared service agenda [Shared services] is clearly demonstrated by initiatives in the National Health Service and the UK Research Councils to name just two. The agenda has looked at major transformational projects such as the NHS patient record system and at the 'low-hanging fruit'. Central to the agenda has been the expectation of making significant savings in at least Finance and HR services, core to all organisations. The concept of shared services in the public sector is compellingly simple and hence difficult to refute even if one should wish. The five features usually required to facilitate the sharing of corporate services in UK Government are:

Separate organisation and/or management: Operational aspects of a business or function are separated into a new centre (the 'shared service centre') whilst strategy and control functions are retained by the business

Better and standard processes: Business processes undergo rigorous analysis and streamlining leading to improved and standardised operations. This is usually led by the shared service centre and changes the way corporate services are delivered throughout the business

Scale operations: Shared services requires the creation of sufficiently large scale operations to generate economies of scale

Effective use of systems: Shared services deploys a range of cost-effective technology usually including major systems, workflow, imaging, telephony, self-service etc

Service Management: A service management approach is required to ensure a high focus on customer service by the shared service centre (including for example, detailed performance reports, service level agreements, account management, etc).

The Government has identified nine domain sectors, one of which is Education. The UK funding councils for higher education will be expected to deliver proposals with regard to achieving against the shared service agenda. Despite institutions being legally autonomous, through financial imperatives they will driven as desired. To date a major stumbling block has been VAT, payable on all services, which assuming all other matters equal would have the impact of raising the cost by 17.5%. However, the government agenda commits to remove all stumbling blocks and VAT is one now listed issue to be resolved imminently.

3.7. What Implications for User-Support Staff

The implications arising from a rapidly changing environment has been increasingly obvious over recent years. Students enter university far more savvy regarding technology; they are used to seeking support from their peer group and/or from simple 'Google' searches. The systems and applications in consumer environments deploy a high degree of artificial intelligence to resolve issues. University employees have embraced IT and have varying degrees of skills and confidence. Few seek deep support and it is only in relation to the larger business applications and tools that serious training is demanded. IT training for students been embraced in the key skills agenda, usually embedded within discipline specific teaching. On-line documentation, tips, FAQs, and support material proliferate on the web or are readily purchasable.

In this context, many 'help'-desks have been embraced into wider-ranging support desks (one-stop shops) with referral systems to handle more challenging needs. Conceptually, these desks are more like call centres attempting to resolve an issue in a single pass. CRM software is utilised to provide effective business process and to record and undertake analytical analysis to inform process and procedure. Extended-hour support is a major cost challenge; sharing or outsourcing may well be a step forward that will have to be widely accepted.

3.8. Implications to Technical Staff

The change agenda for staff in IT/IS departments continues to be immense; they have been more used to change than most parts of our institutions. However, the change which is coming is of a very different nature; this change although led by technology will not be about themselves embracing the new technologies but rather accommodating an environment in which their technical skills will be undermined by an external services market dominating provision. Some staff will accommodate by moving job to the more commercial environment associated with service provision whether external or through institutional partnerships. Initially at least, there will be a need to retain certain skills as new and old environments require to be seamlessly integrated in transition; our institutions could have systems at risk if change is not carefully managed.

However, our best staff may well be looking to the future and seeking to secure their own role in that future, possibly with the service contractors competing for our business.

4.   RE-STRUCTURING

There have been many models of restructuring IT/IS services in the UK. Convergence, centralised and de-centralised models have all been widely tried. At this time in the UK, significant restructuring is proceeding. In part this is an opportunity arising through 'grey' retirements, also imperatives around service(s) delivery improvement abound. The convergence agenda of bringing services together (library, computing and business systems) has stalled and possibly is in reverse. In most Universities the actual staff organisations undertaking services delivery are discrete. Commonly the aggregation of services is only joined through a common senior management structure. Nimbleness, increasingly the priority for services, is defeated in wide-breadth service models but conversely efficiencies may be lost if ignored.

The role of the CIO, Knowledge Director, Director IT/IS or similar title increasingly demands an individual operating at the highest level of the institution; arguing for a strategic approach to business process throughout the institution. To be strategic they should be agnostic to in-house provision or outsourcing seeking instead only to maximise service delivery.

UK Institutions are set up to compete and measures including research assessment and teaching performance are key indicators in competition. However, core business IT systems should not themselves significantly impact an institution's competitiveness. It should be seen as beneficial if costs are reduced whilst service is improved and standardised.

It is difficult to anticipate the timetable towards shared service innovation into UK campuses; the ability for our collegiate model to derail and delay should not be under-estimated. However, it would be reasonable to assume very significant progress will have occurred in the papers seven year planning horizon. It is likely that there will various models of innovation attempted and in our sector pathfinders can be found using pump-priming funding for pilots. It is likely that there will be a group(s) of early adopters who enter shared institutional partnerships with or without major partners such as Oracle, SAP, etc. There will be institutions that wholly outsource and retain only minimal local support and integration capabilities. The significant TUPE [TUPE] issues of transferring staffing to be brought into any shared service model will inevitably slow progress but is not insurmountable.

Restructuring of services seems inevitable; it is likely on a larger scale than we have seen previously. The well documented reduction in staff morale originating from change or threat of change is looming. The scale of change is going to be extensive and good staff may well elect to take control of their personal fortunes.

As centralisation is an inevitable demand will once again arise for localised (discipline or departmental) support. There may be roles for staff to work more closely to provide professional IT support into research activities but generally the wider devolved model should be resisted as it can easily derail opportunities offered in a shared service model. It is in this context that strong services governance must be accommodated.

5.   IT GOVERNANCE and the CIO ROLE

IT/IS governance in institutions is to become increasingly crucial; costs and performance management of IT/IS services should be embraced institutionally through governance which reflects the institutions overall governance. Data and knowledge management will be essential territory for the governance model (which must be fully conversant of legislation issues); included in its remit will be oversight of policies regarding access to data and user rights. The CIO must work to strengthen governance as a priority.

The management of service(s) contracts will become a substantive role in the CIO agenda. Determining and disseminating value for money aspects will be essential; day-to-day accountabilities associated with contracts negotiated through frameworks may prove to be more complex than anticipated. The increasingly professional approach to institutional management will establish business priorities which in turn determine demands on IT/IS services. In an increasingly 'outsourced' world the role of the CIO will be to manage a contractual relationship with formal and informal service providers. A role in knowledge management will pervade the agenda as institutions increasingly learn to share generic teaching materials for the benefit of the learner community; whilst, preciously guarding the IPR associated with knowledge from research and commercial relationships. Outsourcing will more clearly focus an institution with regard to the cost of IT services

Metrics and full transparency is the key to ensuring confidence for the governance of services and projects. The IT governance should establish:

- consistency of IT and business strategies
- clarified process and procedures
- services performance monitoring
- contract monitoring
- delivery mechanisms for ROI
- decision making accountability and transparency
- knowledge management accountabilities

5.1. You want to be a CIO

What challenges to expect towards achieving the CIO role during the next seven years? Clearly it will remain a requirement that the individual has wide appreciation of the opportunities and mechanisms by which IT can make a substantive delivery to the core business of the institution. The role will decreasingly demand deep technical understanding and would significantly profit from the wider skills associated with an MBA. A post-graduate qualification is very desirable, but more important is ability to demonstrate personal achievement throughout career progression and a clear trajectory towards senior office. The CIO role will be increasingly challenged for by people working outside the education sector but to date appointments have favoured 'insiders'; this may be changing! However, individuals demonstrating industry/commerce experience at significant points in their career will benefit and thus we should encourage our own staff to seek external opportunities as part of a planned career progression.

A significant challenge for the university CIO is to track developments and tactics being deployed in other sectors and to carefully observe tactics in the arena of private education service providers. The CIO in a shared services environment will need to internally demonstrate return on investment and value for money; these skills should be built. Loyalty to service providers will be limited to contract term and in a procurement environment it must be expected that the market will be used to test at each opportunity. A good appreciation of risk management and planning will be essential.

Communication within/without the institution is probably the most critical skill; as advocate for the service provided it is essential that evolution of services is keeping pace with needs. The significant risk of becoming a CIO dinosaur is through neglect of change which we know in technological terms will be exponential.

Essential for the CIO is the ability to maintain effectiveness as both a strategic and tactical leader of IT; it is essential that a substantive effort is made towards personal and professional development and it would be reasonable to commit towards 10% of effort in this regard. A good cross sectional personal development should be achieved by venturing regularly beyond the higher education domain. The new CIO must strive towards a wider role than the 'trusted technology provider'; to this end significant investment should be made towards developing a full understanding of the business of higher education across all it's facets.

The stresses associated with a CIO role should not be underestimated; the skill requirements are leadership like a CEO, budgeting, costing and analysis as for a CFO, with executional skills like a COO, people management and emotional management skills of an HR professional and finally an acute awareness of the legal circumstances surrounding all operating areas. It is often claimed to be the second most challenging role in an organisation!

It was said that CIO was the acronym for career is over; however, it is a good career with significant challenges. Perhaps the golden age of the sectors early leaders can never be repeated but that would be true for most posts in a university environment.

5.2. Advice for the CIO

The governance and structure at many universities is such that a high percentage of CIOs (perhaps even 90-90%) report to an executive one level below the CEO (Vice Chancellor/President/Principal). Legacy from academic cultures is difficult to fight, and for many universities constitutional changes are not readily achievable even where better management would result. However, ready access to

the management top table should be less of an issue than that of being on it! Thus, debate on wider institutional issues is constrained by absence from those discussions and this can be a significant problem for the wider skilling proposed earlier. It is thus essential that the CIO:

- Prioritise formal and informal a routine meetings with executive members and the tier below.
- Visibly fight for a top-table place by developing wider appreciation of the institution's core businesses: education and research.

6. CONCLUSIONS

By 2015 even the veterans of IT will be amazed; we should be now preparing strategy for seven Moore's law evolutions – 2020; to be in a fit state in 2015 you will need a vision forward to 2020. The challenges by 2015 will be both technological and society generated. The paper has not attempted to address key questions such as is the design and paradigm of our educational model, campus approach, and teaching mechanism going to be fit for purpose in just one decade. Our institutions may be the dinosaurs and perhaps we should ask can institutions evolve fast enough and are the real barriers IT related?

The paying 'student' customer, returning to education throughout their career is going to be very focussed on quality and value for money. Employers will want employees re or up-skilled effectively and not be concerned about the provider's issues; education itself may be viewed as a utility on tap from numerous providers; 'Campuses without walls' may finally properly arise on our agenda!

It is inevitable that IT/IS providers and our institutions will be challenged by demands for economy through scale, competition from shared or private service providers, and a race to keep the staff skills appropriate and effective.

Perhaps the institutions themselves will be significantly challenged as providers in a global market of service providers.

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