

Can All University Administration Systems be shared via the Cloud?

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Moving University Administrative Systems to the Cloud has the potential to make “game changing” reductions in capital costs, improvements in flexibility, and increases in functionality. Such a wholesale move, however, may not be feasible. Cloud based services have to be standardised, offered to a broad user base, under contracts with limited longevity, and directly to end-users. Some administrative systems, by contrast, need to be customisable, are offered to a small number of users, depend critically on longevity of contracts, and require qualified IS to maintain security and integrate with other systems. This paper explores where cloud solutions are feasible and where they are not. It provides a model of potential use of the cloud in Australian universities, and discusses future developments which could affect this model.

Introduction

This paper explores whether University Administrative Systems could be moved fully to the Cloud. This would involve using standardised offerings, delivered under a pay-per-use model (Staten and Schreck 2011). Potentially this could mean a reduction in initial capital costs, and possibly ongoing operating costs, and an improvement in the flexibility and range of functional support. Such considerations could well be part of the “game changing” necessary to ensure that universities thrive in the face of increasing dependence on IT, decreasing funding, and fiercer and more globalised competition (Wheeler 2011).

The Cloud is used to provide different types of service, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) (Schubert 2010, Kaisler et al 2012). Cloud-based services have particular characteristics. They are standardised; they are offered by service providers with a broad user based; they are available on a pay-per-use basis; and they are offered directly to end-users, without the involvement of IS specialists (Staten and Schreck 2011).

Not all of these characteristics may be suitable for all administrative systems. Attempts to standardise core administrative systems within Australia, for example, were never fully implemented (CASMAC 1991, Baumber and Mullarvey 2000, Vitale 2000). Service providers may serve small groups: Australia has three main service providers for a student administration system unique to this country, which means that each provider has between 9 and 12 customers. Pay-per-use contracts, without longevity, could pose serious problems for those systems that are the basis for the database of record. Direct offerings to end-users call into question how integration, security, and data integrity will be addressed.

This is not a problem for all University systems, however. Some academic support systems, such as the learning management system, Blackboard (2012), and the library system, Millennium (2012) offer functionality much of which is generic to an international community. Service providers have a broad user base – Blackboard is used in 181 countries and Millennium in 40. While both systems contain some University data – such as student lists – these are provided via an interface or integration with the database of record, which is based in the student administrative system. Some administrative systems can also be serviced from the Cloud – Rightnow (2012), for example, is used in many Australian universities as part of student relationship management.

This paper provides a model for the use of Cloud based services in universities. It starts by discussing and summarising the characteristics of the Cloud. It then gives an illustrative overview of some of the main university systems. These are then grouped to form the model, which gives potential cloud solutions for each type. This is followed by a section on future considerations, and a conclusion.

Characteristics of the Cloud

Broadly, the cloud is an internet-based mechanism for delivering a range of services. It has been defined as “an elastic execution environment of resources involving multiple stakeholders and providing a metered service at multiple granularities for a specified level of quality” (Schubert 2010 p 8).

The cloud is used to provide different types of service, including:

- Infrastructure as a service (IaaS): manageable and scalable resources, including data and storage services
- Platform as a service (PaaS): a platform for the development and hosting of applications and services
- Software as a Service (SaaS) : applications or services using a cloud infrastructure or platform. (Schubert 2010 pp 9-11).

Kaisler et al (2012, p1554) give a more detailed breakdown including storage, database, information, process, application, platform, integration, security, management/governance, and testing.

The cloud can be deployed in several ways. The *public cloud* allows enterprises to both offer and use the services of other enterprises. The *private cloud* is typically owned or leased by the company offering the services. *Hybrid cloud*, although not in common use, could allow some of the opportunities offered by the public cloud, while retaining control of some aspects, for example data, by using a private cloud. *Community clouds* are being discussed as a means of allowing organisations to pool resources for a cloud to serve their community (Schubert 2010 pp 10-11).

Cloud-based services are normally accessible via the internet, using standard web browsers. They have several additional characteristics, as described in Table 1 below, modified from Staten and Schreck (2011).

Table 1: Service Characteristics of the Cloud derived from Staten and Schreck (2011)

Characteristics	Details
Standardised capability	Standard offering defined by services provider, with little or no customisation outside the offering.
Always available, and scales automatically to adjust to demand	Resilient and highly available Service provider offers massive capacity, such that any given customer can get as much capacity as they need at a given moment – and give it back when not needed.
Pay-per-use or advertising based	Free or pay-per-use, usually without long-term contracts, setup charges, or exit fees. The service is paid for in one of three ways <ol style="list-style-type: none"> 1. Advertising, usually for consumers 2. Subscription, billed by availability per unit of time, such as a month or less 3. Transaction, billed for actual usage, such as minutes of computer time, gigabytes of network bandwidth, or gigabytes of storage.
Offers full customer self-service	Customers can provision, manage and terminate services themselves, without involving the service provider

An Illustrative Overview of University Software

This section gives an illustrative overview of some of the main University systems, focussing specifically on the extent to which they can be served by the cloud-based characteristics, established above, of standardised capability, broad user base for service provider, short-term contracts, and negotiation directly with end-user. Table 2, overleaf, summarises the discussion.

Table 2 University Software

System name	Student Administration
System description	Student lifecycle management, curriculum management, government reporting, student fees. Database of record for students and curriculum.
Standardised capability	Variation not only on a country basis, but also between universities. Not used outside university sector. Data handling according to country specific laws.
Broad user base	Suppliers typically have between 9 and 12 users
Short-term contract	As a database of record, it is critical that access to those records is retained. Long term contracts required due to complexity and uniqueness of processes.
End-user negotiation	Complex and critical security and integration needs require IS specialisation
System name	Research administration
System description	Managing research grants, and other records. Database of record for research.
Standardised capability	Not used outside university sector.
Broad user base	Can be very small number of users.
Short-term contract	Database of record, smaller and simpler than student administration. Long term contracts required due to uniqueness of processes.
End-user negotiation	Complex and critical security and integration requires IS specialisation
System name	Finance
System description	Financial aspects, including all ledgers and accounts. May also include details of student fees. Database of record for financial performance.
Standardised capability	Reflects Australian law. Used across many sectors. Some aspects, eg fees may be unique to Universities. Unique government reporting requirements
Broad user base	Suppliers typically have a broad range of users
Short-term contract	Database of record, although not all data must be retained long term. Long term contract due to complexity of integration.
End-user negotiation	Complex and critical security and integration requires IS specialisation
System name	Human Resources
System description	Management of the workforce, including time and leave management, payroll, training and development. Database of record for staff
Standardised capability	Reflects Australian law. Used across many sectors. Some aspects, eg contracts unique to Universities. Unique government reporting requirements
Broad user base	Suppliers typically have a broad range of users
Short-term contract	A database of record for all staff data. Integration with student administration and finance in some areas. High levels of integration for reporting needs.
End-user negotiation	Complex and critical security and integration needs require IS specialisation
System name	Student Relationship Management
System description	Coordinating and responding to student enquiries
Standardised capability	Uses standard customer relationship management capability
Broad user base	Suppliers have large, global client base
Short-term contract	Ideally, a reasonably long term contract would ensure consistent support
End-user negotiation	Needs appropriate, secure interface with core systems, requiring IS input
System name	Learning Management
System description	Provides course content, message boards, student marks, discussion boards
Standardised capability	Functionality standard across higher education sector
Broad user base	Suppliers typically have a broad range of users.
Short-term contract	Feasible, although the requirement to interface with core administration systems for staff and student lists would make long term contracts preferable.
End-user negotiation	Needs appropriate, secure interface with core systems, requiring IS input
System name	Library
System description	Self-service, library catalogue, acquisitions and serials management
Standardised capability	Functionality standards across a broad range of sectors
Broad user base	Used in 40 countries
Short-term contract	Feasible, although with some problems.
End-user negotiation	Needs appropriate, secure interface with core systems, requiring IS input

Two university systems have in common the fact that they are specific not only to the university sector, but also to Australia. These are the student administration system, and the research administration system. The student administration system supports the management of the student lifecycle, from enrolment to graduation, sometimes also including admissions and alumni management. The research administration system supports research proposals and grants, the reporting of outcomes, and compliance with relevant legislation. Both are responsible for the database of record within their area, and both are used for government reporting.

Standardisation of student administration systems tends to occur on a country-by-country basis, and even within countries, there are differences. In Australia, two of the student administration systems, Callista (2012) and Technology One (2012) are unique to this country, and the third, Oracle/Peoplesoft Campus Solutions (2012) has been modified to suit the Australian environment. Australia is not alone in this: the LADOK system is unique to Sweden (LADOK 2012), Finland has commissioned the Oodi system (Nurmi et al 2011), and Denmark the STADS system (UniIT 2012). In the UK, 60% of Universities use SITS: Tribal which was uniquely developed for that country (2012), with several others using UK specific versions of Banner and Oracle/Peoplesoft. The user groups for the three student administration systems used in Australia are all highly active, reflecting the need to support differences in administration needs within that group.

The user base for each supplier is consequently small. In Australia, Callista and Technology One are used at nine sites, and Technology One is implementing at a further three. Oracle/Peoplesoft Campus solutions is used at ten sites. Other systems in use include APTUS Tafe (1 site), Banner (2 sites), SITS/Tribal (1 site implementing).

The requirement for long term support is critical. Much of a University's database of record is held within the student administration system. Most of those records have to be kept for a long time –some, such as records of students and their qualifications, in perpetuity. Curriculum records also have to be kept for the long term. These systems are highly complex, with tight integration with other university systems, such as finance, and a number of interfaces with systems including timetabling, HR, library, and learning and management systems.

Student administration systems, then, could only move to a very specific type of cloud: one available only to the Australian University community and used by a limited number of vendors with long term contracts. Research administration systems share many of the characteristics of student administration systems, although they are considerably smaller and less complex, and therefore would have the same requirements of a cloud based solution. Data would have to be held in compliance with Australian laws, which may affect where, geographically, it was held.

The Finance and Human Resource systems are also responsible for the database of record in their area, require tight integration with other systems, and are used as the basis for Government reporting. They also have requirements which are unique to Australia. However, unlike student and research administration, they can be used in other sectors, and hence suppliers have a considerably broader user base. Such systems could move to a private cloud, provided that there were long term contracts with vendors, since they are complex systems with tight integration requirements. Data would have to be held in compliance with Australian laws.

There are some administrative systems that are more peripheral, in that, while they interface data from the core administrative systems, do not add to key records. Such systems include student relationship management systems, which can be used to coordinate and respond to student enquiries in many areas. These systems can be implemented using standardised functionality. They have a broad user base in a number of sectors, and internationally. Long – term contracts are not essential; a different customer relationship system, would involve some inconvenience for students, and the creation of new interfaces with other systems. It would not, however, affect the ability of the university to run its core processes, ensure that it retained all university records, and complied with legislation.

The feasibility of moving student relationship management systems to the Cloud has already been tested: several universities in Australia use one of Oracle's cloud based solutions, RightNow (2012), as the basis for this functionality.

Academic support systems include Blackboard (2012) for learning management and Millennium (2012) for library support. In both cases, standard products are used. They have broad user bases – Blackboard operates in 181 countries and Millennium in 40. A short term contract would not be ideal, since there are interfaces with core systems, particularly regarding staff lists. However, the systems do not form part of the database of record, nor do they require detailed integration.

The student relationship system, learning management system, and library system are all accessed directly by students and staff as part of their personal digital ecosystem. As such there are expectations regarding their conformance and interaction with other cloud based systems which may not be part of the university systems (Finger et al 2010). This means that they need to respond to changing demand: a possible motivator for moving to the Cloud to make use of the flexibility and range of offerings this allows.

A model of cloud use

Based on the previous discussions, Table 3 summarises the way in which cloud solutions may vary, depending on the type of system. Where a system is core, holds part of the database of record, and is unique not only to Australia but also to the University sector, there is a naturally small user base. A community cloud may be the only way in which a cloud solution could be offered in such circumstances. Furthermore, solutions would have to be under relatively long term contracts. Any data held as part of those solutions would have to comply with Australian law, which probably means that it would have to be physically held within Australia.

Some core systems hold part of the database of record and are unique to Australia, but are used in a broad number of sectors. For these, a private cloud is feasible. However, long term contracts would still be essential and data would have to be held according to Australian law.

There are some peripheral administrative systems, such as student relationship management, and some academic support systems, such as learning management and library management, which can use standard offerings, and are available to a broad user base. They interface with the database of record, but do not update it significantly. For such systems, a private cloud is feasible, and while long term contracts are desirable they are not essential. There may also be some links to offerings in the public cloud.

Table 3 Potential cloud solutions

Type of system	Requirements	Possible cloud solutions
Core Administrative systems holding database of record: and <i>university specific</i> student administration, research administration	Compliance with Records, Privacy, Confidentiality legislation, Government reporting requirements. Tight integration between systems	A community cloud, specific to Australia, with a limited number of vendors. Long term contracts essential. Data must be held according to Australian laws.
Core Administrative systems holding database of record: used in a <i>broad number of sectors</i> finance, human resources		Private cloud, provided by vendor with broad support base. Long term contracts essential. Data must be held according to Australian laws.
Peripheral administrative systems using database of record: student relationship management	Compliance with privacy legislation. Interfacing with core systems. Interfacing with other cloud-based systems, sometimes at end-users discretion.	Private cloud, provided by vendor with broad support base. Long term contracts desirable but not essential. Some links with offerings from public cloud.
Academic support systems using database of record: learning management system, library system		

Future developments

The model developed above was for potential cloud solutions. Whether these solutions are taken up depends on a number of situational factors. These include the motivation of individual universities to embrace the necessary changes, the way in which core systems develop, and external changes, as discussed below.

Individual University Motives for change

The majority of universities implemented their main administrative suite around the turn of the century, often as part of their Y2K response. These implementations almost always brought significant cost and change. Any further change to cloud based systems might therefore meet with “change fatigue”. Universities may quite simply prefer to maintain the status quo where possible, at least for their core systems. It should be noted, however, that four universities are currently implementing new student systems: Sydney (SITS/Tribal 2012), and La Trobe, QUT and Swinburne (Technology One 2012a)

Development of core systems

There is the potential for redefining “core” systems. When student administration systems, particularly, were developed, this was informed by user groups. These user groups worked largely on the principle of including all as much as possible of their requirements within the system. . While this often included the processes which use or generate the database of record concerning students, sometimes other, fairly peripheral functionality was also included. Now that cloud-based systems are available to take over that peripheral functionality, it would be to reduce the core component of the student administration system, either deliberately, or by erosion, to a smaller, more tightly defined core.

Redefining systems depends not only on the universities, but also on the vendors, particularly when the user group is small. Any changed means of development of core systems will have to maintain a viable business model for vendors. This could limit the extent to which the core systems are redefined.

External change

There are three issues to consider here. The first is the development of the digital ecosystems in which we all live (Finger et al 2010). This will inform the standards of interfaces, and the ubiquity with which systems are available. It may be that vendors of core systems will embrace these, or it may be that cloud-based solutions will be used in conjunction with them.

The second is the development of the tertiary education sector. Depending on a number of factors, Australia could either find its educational product was becoming more “global”, hence reducing the requirement for Australia-specific software, or more “niche”, hence increasing the need to retain uniqueness.

The third is the attitude of the Government, which currently makes policy and reporting demands which are specific to Australia, and only marginally consider systems implications. This could change. The government could request reporting which was in line with the standards in other countries, and could be persuaded that the system costs of their change requirements should be considered.

Conclusion

System support for the cloud has the potential to reduce costs while increasing flexibility and functionality. There are some areas, however, where cloud solutions would be problematic, particularly for core administrative software. By considering the exact needs of particular functionality, its suitability for a move to the cloud can be considered. However, even where such a move is feasible in theory, it may not happen in practice. Several other circumstances can affect such a move, including the extent to which individual universities are willing to change, the possibility of changing the software, and a number of external factors.

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