Comment to the Information Futures Commission – The Information Journey

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> *"In the Information Systems field (including Software Engineering and IT project management) the growing complexity of IT projects has been recognised in both industry and academia. The complexity in IT projects is escalating due to increased and more intense interdependencies between individuals, organizations, and technology. This growing complexity must be addressed during system development efforts. Yet, the IS field lacks a clear understanding and appreciation of the sources, nature, and types of complexity as well as a formulation of appropriate ways to analyse, conceptualize, measure, plan for, mitigate, control or decrease the increased complexity."*
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> "Special Issue on Complexity and IT Design and Evolution", Information Technology and People, 2005.

Building for the Future

The key to building IT infrastructure that retains value over time is building for interoperability. Interoperable infrastructure allows for use and continuing re-use across natural boundaries. Such boundaries exist between systems, across departments, in partnerships (business to business), contracts, collaboration, through infrastructure changes, between educational sectors, government and the public sector. Universities (and many other organisations) are complex organisations working across numerous boundaries which change in nature over time. Dealing with these boundaries is an ongoing business activity. Reducing the impact of this activity on new activities, partnerships and restructures can allow the University to focus on the problems at hand, move quickly and efficiently.

The service-oriented approach logically structures a business and its infrastructure into boundaries of activities and responsibilities. What is important to the business is how these "services" (both human and machine services; department, people, and computer services) can be used and leveraged. Not all of these structures and boundaries need exist within the organisation, allowing for sensible use of partnerships and service providers. The aim of identifying service boundaries is to enable a business to structure itself in such a way as to provide: enablers of further business activities, cost savings, and multipliers of value. Development of services is dynamic, but continually emerges from what is valuable to the business in the present. As such legacy and enterprise systems are typically core components of a service architecture, having high value and enabling the development and operation of higher level and human-based services. The use of standards (local, global, and community standards) is essential in this approach, enable people/computers to have conversations across boundaries with minimum effort and confusion. At a hardware and software level standards enables greater choice, choice of vendor provided infrastructure and choice of partnerships and communities.

The key to a successful service-oriented infrastructure is its governance. Governance must ensure that developments are in line with organisational strategy, leverage existing infrastructure, are developed to local standards, are operated accordingly and made available to the organisation. The opening up of these services and underlying data/information (through services) across the organisation leads to widespread re-use (multiplying value) and improved data quality (through community testing and inspection). If done correctly these services become building blocks or business pivot points, and not pain points and bottlenecks.

> ***Recommendation:*** *The University adopt a service orient approach to the development of business and technology services, with particular emphasis on service-oriented governance. This should be done iteratively, within a small number of new high-profile project and gradually increase over time to common practice.*

The use of "Platform Technologies" in research is an example of where service-oriented infrastructure is being developed in line with research needs. This stems from a growing recognition that specific capability-based or technology-based support can provide difficulties. Traditional support is often provided around silos of expertise or business activities, for example: web services, networks, windows support, desktop support, room bookings, and conference centre. There is often an attempt to stitch these together to providing more generic or community support groups. eg. Technical Support, CRMs, Research Support. It must be recognised that there are existing forces and efforts against this trend:

- shared services and shared governance, collaborative services
- collaborative learning
- Service Oriented Architecture and Enterprise Architecture
- content centric learning (eLearning)
- user centric learning (iLearning or uLearning)

Difficulties occur when needs do not fit into exactly one capability, technology or group, they either fall outside of what we currently do or support, or they fall across a number of our capabilities. Some current examples are the need to host small conferences (requires room booking, networks, human resources, a website, mailing list), or hosting of research data networks (networks, data centre, hosted systems, collaborative tools and video conferencing). “Platforms” emerge from and are directly related to core business needs, provide end to end support for complex stakeholder’s activities, and attempt to reduce the level of coordination and difficulty on by the end users (a one stop shop). However, these platforms may be underpinned by core/shared services, that is reusable infrastructure. The platforms themselves must collaborate to develop and govern the services infrastructure, hence the importance of building for interoperability.

Some “Platform Technology” examples can be found at the University of Melbourne within life sciences. At the Howard Florey Institute the “Medical Imaging” platform includes the needed expertise and resources in data management, software development, high performance computing, engineering and medical imaging research. The Bio21 Institute

recognises a number of different platform technologies including a NMR Facility and Bioinformatics Group. Recent investigations have revealed the emergent need for several other platform technologies include areas such as “Structural Biology”. These are not specialist groups but the full vertical stack of researchers, expertise, engineers, instrumentation, compute and other infrastructure needed to provide this platform to researchers.

> ***Recommendation:*** *The University investigate the core “platforms” that enable our business and support end-users in their activities (as opposed to infrastructure or division based support).*

Builders of the Future

The IT practitioners of the future University will be "interoperability practitioners". The primary activity of these interoperability practitioners will be to build better infrastructure to facilitate ongoing and community use, identifying interoperability pain points and lessons learned, and understanding what makes a community viable (including partnerships and collaborations). In addition, a better understanding of the principles of interoperability amongst skilled IT staff will provide the following benefits: prevention of unprofitable shared-infrastructure, partnerships, collaborations and relationships; structuring relationships strategically; and better utilisation of the shared-infrastructure, partnerships, collaborations and relationships that we have.

There are both risks and benefits in working collaboratively on ICT infrastructure, for example with other institutions in the education sector. However, tried and tested interoperability only comes from working within communities. Such communities provide the power to drive international standards, vendor adoption and service provision towards business needs. Sharing community resources, infrastructure development projects and knowledge can lead to greater outcomes for less cost. A good example of this is the DEST funded RUBRIC project where a collaboration of 8 regional universities shared manpower and expertise to develop research repository infrastructure. Another successful example is the APSR report “Sustainable paths for Data-intensive Research Communities” where the University of Melbourne employed a dedicated project manager (Anna Shadbolt) who established a local collaboration of staff from the Library, Research Computing Service and the eResearch community, and collaborated nationally with APSR partners, in particular ANU. For the University to strategically take advantage of national infrastructure, as it develops, we need to actively participate in such community. Without University participation our educators and researchers will independently invest resources in exploring national infrastructure and developments with the inherent risks involved. In areas that align with our strategy, the University can take on the activity of collaboration, absorbing the risk for our educators and researchers and sharing the benefits, outcomes and expertise obtained. This requires a university strategy, plan and commitment for the following activities:

- identifying potential projects and initial liaison (looking)
- investing in and working within these projects in spite of the risks involved (investing)
- communicating and sharing the outcomes, failures and successes (talking)

- identifying operational infrastructure opportunities from the successes (doing)

Each of these activities requires dedicated manpower.

It is possible, both nationally and internationally, for the University to provide leadership in the development of interoperable ICT infrastructure in collaboration. Many such collaborations and infrastructure projects have only small numbers of dedicated people. By providing substantial fractions of EFT (0.5 and above) to these projects the University can make substantial contributions and ensure that our interests are taken into consideration. In time, infrastructure projects that are of critical value to the University community can be driven from the University. Such collaborative projects will leverage the pool of expertise and resources available in the wider community and attract greater government funding. Collaborations also lead to a wide range of options for the operational home of resulting infrastructure services. Housing of some services outside of the University can reduce the burden of ongoing infrastructure costs.

> ***Recommendation:*** *The University develop strategy, planning and commit to the activity of engaging the broader community in infrastructure development. The University should invest in and provide leadership in interoperable ICT and infrastructure collaboration by through dedicated manpower.*
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> ***Recommendation:*** *The University provide comprehensive training for new employees in particular those associated with infrastructure, platforms and services. Training would include: the principles of interoperability, service-oriented approach and collaboration; the University service-oriented governance environment; interoperability skills including basics of business process analysis and management, service-oriented architecture, community standards, documentation frameworks.*

Knowing Where We Are

Leveraging our existing information assets will be essential to support analysis and decisions for infrastructure and governance. While we have a wealth of information in the University it is often not at our fingertips and can be difficult to interpret. (Such information includes not only corporate and departmental records but usage information and system statistics.) Exercises such as the Information Futures Commission often result in efforts to access and understand our corporate information but go no further in ensuring that this can occur in an ongoing way. In some areas, such as research, it is difficult to obtain information about our organisation, our infrastructure, it's use and the data and information that exists and is produced. Future analysis and infrastructure planning will only be successful when underpinned by reliable, accessible and timely information about our infrastructure and users. Long term corporate memory will promote learning from and building upon previous activities, decisions and infrastructure development.

> ***Recommendation:*** *The University invest in existing information assets by ensuring our information sources are made widely available and that this occurs in an ongoing way. This should include efforts to improve the reliability of the data, to document the meaning and appropriate use of the data, and to ensure long term archiving.*

Recommendation: *The University develop and maintain a central information registry of corporate records, departmental records, open and close information sources, usage and system statistics. The registry should point to the existing information sources, document the contents, access conditions and process.*

Additional investment is required in global data assets. While our information environment is growing global information is growing at an even faster rate and is increasingly encroaching on our activities. As an example, it is evident from discussion that a large number of staff and students use Google to discover scholarly resources and use Skype and Google Chat/Groups to communicate results to colleagues. A more targeted example is the emergence of Research Networks such as ASSDA (humanities and social sciences), BioGrid (health informatics), Australian Phenomics Network (bioinformatics), BlueNet (biology and geospacial), PARADISEC (linguistics), Accessing the Cultural Conversation (education and arts), LHC Computing Grid (science). Research networks have at their core federated information/data networks and the necessary services to share and process this information. They stem from the researcher driven need to collaborate across organisational boundaries and to work with the best in their field, locally, nationally or internationally. Funding agencies and the Australian government also support this as effective use of research spending: large scale and collaborative projects where expertise, resources, and data are shared across institutions. Universities, including the University of Melbourne, are developing platforms and services that support and facilitate such networks. To become a leader in supporting research networks would be major factor in attracting and developing forward thinking researchers.

Recommendation: *The University becomes a leader in supporting and facilitating Research Networks. The University should also facilitate the creation of Research Networks headed by Melbourne research groups through providing inexpensive support, infrastructure and toolkits for new projects. The development of this infrastructure should be a high priority.*

Knowing Where We Are Going

The Information Futures Commission as an exercise has highlighted the need for community involvement in building our future. It has also highlighted the breadth of expertise and thought leadership that exists within our community. The rapidly changing landscape of ICT, research and to some extent education poses a high degree of risk for any community undertaking large scale business analysis, planning and implementation, in anything but an ongoing and iterative way. Continuous community involvement and analysis of “where we are” and “where we are going” is required for emergent infrastructure that truly supports the Universities activities at any given point in time. While principles and strategies such as interoperable infrastructure, the service-oriented approach, and service-oriented governance can help build the future infrastructure the success of these is in opening up communications with stakeholders and the broader community.

Standards communities such the World Wide Web Consortium (W3C) and IMS Global Learning Consortium have developed over years of collaboration models and processes for wide spread community engagement and development of standards. These provide excellent models which could be used as the foundation of a University infrastructure

communication strategy. These communities have overarching advisory and strategy groups, technical advisory groups, and dedicated staff for coordination and facilitation of activities. Interest groups form from the community to investigate new technologies, possibilities and problems. Working groups have more substantial targets and may form as a result of interest groups. Coordination groups manage dependencies and facilitate communication with other groups, even external communities. The University of Wisconsin-Madison has recommended a process for the development of IT-related policy that follows a model with some similarities. The CIO facilitates the process with Stakeholder groups, Policy and Planning (strategy), Advisors, ITC technical advisors and the wider community.

> ***Recommendation:*** *The University adopts a model of continuous community engagement and development of future information infrastructure. This model requires operational staff, advisory groups and the ability for the University community to form new infrastructure interest groups towards forming working groups which will lead to implementation projects. Service-orient governance takes on the role of policy and planning to ensure working group goals are in line with organisational strategy, leverage existing infrastructure, and are developed to local standards.*

Influences:

"Research Report: Interoperability Standards Across the Australian Education & Training Sector", AICTEC, August 2007. (website cited May 2008)

http://www.aictec.edu.au/aictec/go/home/priorities/pid/11

"Australian Government Information Interoperability Framework", AGIMO, April 2006, ISBN: 1 921182 10 5.

The e-Framework for Education and Research, DEEWR Australia, JISC United Kingdom, Ministry of Education New Zealand, SURF Netherlands. (website cited May 2008)

http://www.e-framework.org/

Chris Blackall, private communication on the value of the e-Framework for the interoperability practitioner community.

“eResearch for the Arts and Humanities: a Pathway to Institutional Sustainability?”, Chris Mackie, Andrew W. Mellon Foundation, presentation at IDEA 2007. (website cited May 2008)

http://www.linkaffiliates.net.au/idea2007/events/open.html

“RUBRIC: Regional Universities Building Research Infrastructure Collaboratively”, (website cited May 2008)

http://rubric.edu.au/

“The Development of an Institutional IT Policy Process”, The University of Wisconsin-Madison, ID: MWR08098 EduCause, March 2008.

http://connect.educause.edu/display/46486