SPATIALLY ENABLING GOVERNMENT: A SNAPSHOT FROM VICTORIA

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ABSTRACT

A spatially enabled government manages its information and processes using spatial concepts and technologies. The vision gained traction in the mid 2000s and has been the focus of international forums including GSDI and PCGIAP. This paper aims to review the status of the vision by presenting the results of qualitative and quantitative studies undertaken into the spatial capacity of the Victorian Government. The studies sampled a number of core government functions and focused on the related spatial policies, legislation, institutional arrangements, human resources, information systems and spatial technologies.

It is found that Victoria has a strong background in SDI and spatial policies and had some early success in implementation. It was an early leader in spatial information provision; however, these early systems are now dating and reassessment is needed to ensure most appropriate further development. Equally, updates to existing cadastral/registry systems have improved process efficiency and accessibility; however, it is highly doubtful whether these digitized systems would be suitable for underpinning other government activities. Victoria’s institutional arrangements are also encumbered with historical legacies: a large-scale re-organization would be costly and unlikely to significantly improve spatial enablement.

The paper concludes that it is still unclear whether existing systems are capable of underpinning the spatial enablement of the entire government. Whilst, web mapping services are prevalent in Victoria’s land management systems; strong leadership, collaborative approaches and more investment is required to see these spread into other government functions.

INTRODUCTION

The potential of spatial technologies when combined with other information technologies is now clear. They can radically reform governmental and societal functions. Spatial technologies can unite seemingly disparate information sets and display them as pictures, a simple mechanism for people to understand. By the mid 2000s the concept of a ‘spatially enabled society’ was defined by Williamson et al (2006) and others (Rajabifard, 2007). A spatially enabled government manages its information and processes using spatial concepts and technologies.

The concept is generating significant discussion at national and international levels: peak coordination bodies such as The Permanent Committee on GIS Infrastructure for Asia-Pacific (PCGIAP) have devoted specific working groups to the concept. Additionally, industry and government conferences such as ‘Spatial@Gov’ in Canberra 2009 and ‘Spatially Enabling Government: Manage, extend, plan and deliver on spatial capability’ (IQPC, 2007) have concentrated on discussing the implementation of the concept in a practical sense.

This paper aims to review the status of the vision by presenting the results of qualitative and quantitative studies undertaken into the spatial capacity of the Victorian Government. The research method is briefly described before the results are discussed using the following categories: spatial policies, legislation, institutional arrangements, the role of the cadastral, information systems, and human recourse capacity. The paper concludes by outlining Victoria’s opportunities and threats in relation to the spatially enabled.
government concept.

METHOD

To conduct the study a mixed methodology was used. This involved undertaking both qualitative and quantitative case studies and combining the results at their completion. Each component was given equal weighting. The quantitative study involved an analysis of all spatial legislation in Victoria. The statute books were analyzed with a view to identifying every piece of legislation that had a spatial footprint. This was considered the fastest and most comprehensive way to identify the majority of spatially related legislation in the state. ‘Spatial legislation’ was defined broadly. While all legislation is spatial as each applies within a jurisdiction’s border, a more specific definition was used: If a rule existed between people and a place and was supported by the jurisdiction’s people (through legislation) the legislation was considered to be spatial legislation. Authoritative websites were used to access the statute books (Victorian Government, 2006; Australasian Legal Information Institute, 2006). As legislation is continually being created and updated, a specific ‘snapshot’ date was chosen: 11 January 2006.

A two-stage process was undertaken for each jurisdiction. First an inspection of each statute was conducted in alphabetical order, section by section, in order to determine whether a spatial element existed within the statute’s text. This method had to be used as keyword searching through web based search engines was found to be unreliable: different statues use vastly different terminology and language when referring to similar phenomena. The second stage focused on the statutes where a spatial element was found to exist. For each statute, the nature of the spatial element was recorded in a Microsoft Access database (Table 1). The data would provide for a comprehensive overview of all the government activities that could potentially be spatially enabled. To check the validity of the outcomes the same information was also be gathered from New South Wales. However, this stage did nothing to indicate whether the interests were being managed spatially. These kinds of assessments required qualitative analysis.

The ‘qualitative’ component was deeper but more targeted than the quantitative study. The aim was to understand the practical implementation of the statutes. This study helped to determine what level of spatial enablement had been achieved to date. Additionally, the opportunity for future spatial enablement could also be assessed. Resource constraints meant only a sample of statutes were analyzed in the qualitative study. Data collected included issues relating to registration techniques, mapping techniques, application of ICT and public access to information (Table 1). This phase required more than legislative analysis: government websites and other documentation were consulted. Scenarios were also used, for example, live interactions with a particular system.

<table>
<thead>
<tr>
<th>Study type</th>
<th>Data collected</th>
<th>Description/ Values</th>
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<tr>
<td>Quantitative</td>
<td>Spatial extent of the legislation</td>
<td>Parcel Based (Specific Parcel, Multiple Parcels, All Parcels), Non-Parcel Based (Point, Network, Polygon, Dynamic), Unavailable</td>
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<tr>
<td>Qualitative</td>
<td>Allocation Method</td>
<td>Systematic, Sporadic, Unavailable</td>
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<td></td>
<td>Registration Method</td>
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<td></td>
<td>Update Method</td>
<td>On request, None, Unavailable</td>
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<td></td>
<td>Removal Method</td>
<td>Time Based, Request Based, None, Unavailable</td>
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<td></td>
<td>Level of ICT</td>
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<td></td>
<td>Information Access Price</td>
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<td>Public Alteration of Information</td>
<td>Yes (Online form, offline form), No, NA, Unavailable</td>
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<tr>
<td></td>
<td>Identifier</td>
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<td></td>
<td>Mapping Status</td>
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At the completion of both studies the results were synthesized and organized under the following categories: spatial policies, legislation, institutional arrangements, the role of the cadastre, information systems and spatial technologies, and human resource capacity. These categories are considered important
RESULTS AND DISCUSSION

Victoria’s Spatial Policies

In terms of spatial policy, Victoria was an innovator throughout the 1990s and early 2000s. Victoria’s first formal spatial policy was the ‘Strategy for Geographical Data Management in Victoria 1991-2000’, however, the Tomlinson report published in 1993 is more widely cited as beginning the push towards a state SDI. The report created a vision for the wide-spread and shared use of spatial information and GIS within state government and society. The Tomlinson report led to the creation of Land Victoria, the Geospatial Information Reference Group (GIRG) and Victoria’s Geospatial Information Strategic Plan 1997-2000 (VGIS). While VGIS and GIRG aimed to provide whole-of-government strategies, they lacked a high-level government mandate and therefore failed to fully engage with areas such as emergency management, socio-economic planning and the private sector.

Since VGIS 1997-2000, there have been three updates: VGIS 2000-2003, VSIS 2004-2007 and now VSIS 2010. The documents lay guidelines and strategies for framework information, key business information, custody, metadata, access infrastructure, pricing, accuracy and awareness. VSIS 2004-2007 replaced GIRG with the Victorian Spatial Council (VSC) and the Victorian Government Spatial Council (VGSC) and a secretary. These bodies are linked with high-level government and aim to mandate the coordination of spatial information use and management within government and across Victoria. Whilst these councils are undertaking progress towards a ‘single view’ platform, a large number of spatial information and related initiatives are still managed in silo-based departments. Victoria, through the Spatial Information Infrastructure (SII), Department of Sustainability and Environment, also participates in the national spatial and SDI policies. They have representation at ANZLIC, ICSM and within PSMA. They are actively involved in national metadata projects and were involved in the 2007 Spatially Enabling Government conference in Canberra.

At a more practical level, Victoria’s SDI is based around a fundamental set of digital maps, collectively known as Vicmap. The Vicmap suite consists of several layers: Vicmap Control and Position (control network), Vicmap Property (parcel and property layers), Vicmap Address, Vicmap Administrative (administrative boundaries), Vicmap Transport (roads, rail), Vicmap Elevation and Bathymetry, Vicmap Hydrography (water features), Vicmap Imagery (satellite and aerial). SII are the custodians of Vicmap. All are routinely maintained with the more dynamic datasets (Property and Transport) being updated by the private sector. The Vicmap datasets represent the foundations of SDI in Victoria. Vicmap is extremely well documented and administered, however, Vicmap is only a base; there are many thousands of other spatial datasets. These are owned and managed elsewhere, often using different standards and techniques for representation and storage. SII initiatives has brought some of these datasets together; however, this tends to happen on an ad hoc basis.

In summary, Victoria has a strong history in spatial policy development. Government, private sector and academia have worked collaboratively for almost two decades in this regard. While the strategies are well understood by the spatial sector, a perceived weakness has been the inability for these strategies to pervade wider government and society. Part of this lack of awareness can be attributed to SII’s historical links to surveying: the links have provided technical capacity, however, they have potentially obscured the position of ‘spatial’ in government structures.

Victoria’s Spatial Legislation

Well over half of Victoria’s statutes have a spatial footprint (620 out of 1045). Similar results were also found in New South Wales (1054 Acts, 497 spatially related); a study undertaken by Lyons et al (2002) in Queensland; and Western Australia’s WALC (2004) report. This indicates that all States are facing the same issue with respect to overwhelming numbers of spatially related laws. Additionally, Victoria was found to be creating statutes at an increasing rate (Figure 1). However, it is worth noting that only active legislation was considered and the data is distorted prior to 1958 due to a legislative consolidation in that year.
Of the 620 spatial statutes, 120 were selected for further quantitative and qualitative analysis. Selection was based upon two factors. Firstly, the statute needed to create multiple legal spatial objects requiring administration. Secondly, the legal spatial objects created by the statute needed to apply to a number of different locations. Remarkably, over 500 of the statutes lacked this characteristic. That is, they were either highly specific (applied for a short period in one spot) or were highly generic (applied always and at every location in the jurisdiction). The remaining 120 were used in the study. In the 120 statutes studied, over 930 sections created legal spatial objects.

The spatial footprint of the 120-statutes/930-sections was then analyzed (Figure 2). The graph presents non-parcel interests as a single typology. The majority of interests were ‘parcel based’ and, more specifically, ‘patchwork’. The small number of ‘specific’ interests was expected: the 120 statutes were selected for not having this characteristic. In summary, the majority of spatial statutes are still parcel based. This means there is plenty of potential to exploit the existing cadastral layer to fast-track spatial enablement of other government activities. Conversely, there are a growing number of statutes that have no relationship to the cadastre (i.e non-parcel based). This trend is likely to continue as the ability to define position is simplified: GIS, GPS and Wireless Sensor Networks all provide such opportunities. The management of these legal points, lines and polygons can only be integrated with parcel based interests if a survey-accurate cadastral database is developed for Victoria.

Of the 120 statutes studied, 60 were selected for further qualitative and deeper quantitative analysis. Again, this was due to resource constraints. An initial inspection of the 120 statutes revealed that many did not have an underlying management framework equivalent to a registry or cadastre. Furthermore, there did not appear to be the need for such a complex system. For example, the right of a cadastral surveyor to enter any public or private land is a type of interest; however, it applies to all land and is relatively low in impact and simple to administer. Many example interests of this type were identified. Therefore, the 60 statutes deemed to have the largest amount of administrative overhead were selected for
further analysis. The analysis concentrated on institutional, cadastral/registration, spatial technologies and human resource capacity elements. These results are now discussed.

**Victoria’s Spatial Institutions**

Figure 3 demonstrates the proliferation of departments and agencies administering spatial legislation: Land Victoria and SII are now small sub-branches of DSE whose overall agenda is to manage the environment in a sustainable manner. Agencies dealing with parks, rivers, fire and catchments are all incorporated into DSE: each potentially administering a number of legal spatial objects. Additionally, other departments such as the Department of Primary Industry (DPI) contain many branches dealing with land related spatial activities. Importantly, in many cases only the parent department was recorded, suggesting that the study data underscores the number of agencies involved. While DSE had a significant role it did not have a ‘lead’ role: no department or agency is responsible for integrating the different information sets and processes within the disparate departments. While some agencies have formal collaborative links for sharing information, these are ad-hoc and often take months or years to finalize.

![Graph showing government departments and their number of spatial statutes](www.vic.gov.au)

It should be noted that each statute/section creating a land interest also requires an enforcement or regulatory agency. This is potentially different to the agency creating the statute/section and increases the number of agencies involved in spatial administration. Additionally, many statutes/sections also involved private sector institutions. This was particularly evident in statutes influenced by the privatization policies of the 1990s. Many industry management statutes promote self-regulation and codes of conduct. Examples include the utility sector and mineral exploitation sector.

In summary, there are opportunities to improve Victoria’s institutional arrangements to better achieve the principle of a spatial enabled government. Professor Michael Batty perhaps best summarized this opportunity after his 2004 visit. He suggested that many land management systems had emerged over time and that for each system different models of data and institutional integration had been used. However, there was no coordination of these models. These inefficiencies were further compounded by the institutional and physical separateness of many of the groups developing such systems. Those responsible for coordination did not have the capacity or mandate to effect such coordination (Batty, 2004). This situation still remains and is expected. The disparate institutional regimes were designed to complete specific administrative tasks, not to contribute to whole-of-government spatial integration. Only recently has the technological capacity emerged to allow disparate institutions to collaborate and share data, however, overcoming many decades of ‘silo’ behaviour will require smart initiatives, strong incentives and strong leadership.

**Victoria’s Cadastre and it’s role in Spatial Enablement**

With respect to the cadastral mapping and registration systems, the study demonstrated how most of the spatial legislation is managed outside these traditional systems. Whilst agencies within Land Victoria are responsible for maintaining the cadastre and land registry, many of the new legal spatial objects are not
related to these systems in any way. However, these systems still play a very important role in the management of certain interests, namely private and public ownership spatial objects.

The processes for maintaining the cadastre and registry underwent significant changes during the 1990s and 2000s. The cadastral map base is now known collectively as VicMap Property. It is currently composed of two parts: the Digital Cadastral Map Base (DCMB) and Land and Spatial Survey Information (LASSI). The DCMB existed first and was a result of a project that digitized a large number of crown allotment maps. LASSI came about in 2001 following the completion of the Victorian Online Title System (VOTS) project. Whilst LASSI is the superior system, both systems require maintenance: surveyors must be able to search plans that are not current and LASSI does not provide this function. The maintenance of both components of VicMap Property is performed by the private sector (Logica CMG).

The quantitative study revealed the relationship between new spatial statutes and the traditional cadastre and registry. Figure 4 reveals the limited links. Six categories were identified: ‘direct relationship’, those interests formally managed within the cadastre/registry; ‘possible relationship’, those interests which may use a elements of the cadastre/registry for organization, ‘no relationship’; ‘not Applicable (NA’; ‘unavailable’ and ‘in transition’ (administrative systems being redesigned). A large majority of interests have little or nothing to do with the registry. So while there are good registry and cadastral processes in place in Victoria, they are somewhat under utilized.

![Fig. 4: The relationship between new spatial statutes and the cadastre (by section)](image)

If the traditional land cadastre and register are not being used, what sorts of systems are in place? The quantitative study revealed the alternative systems being used. Many alternative registries exist and many have limited or non-existent spatial capacity. Some statutes are administered through multiple registries: examples include the hundreds of registries created by the Road Management Act 2004. Significantly, a large number of sections were found not to require any form of formal registration method (NA): the generic nature of the legal spatial object simply does not warrant it. Examples include the dumping of litter, or access to land by agents-of-the state. Overall, it can be seen that there are hundreds of alternate registration systems in use. Integrating the disparate systems would be a near impossibility in the short to medium term.

In summary, Victoria’s cadastral and registration systems are still focused on organizing land ownership interests. While it has undergone significant upgrades since the mid 1990s, it cannot be considered truly multi-purpose in terms of application: hundreds of legal spatial objects have no relation to the digital cadastre and even fewer are linked to the registry. This in itself does not mean that new objects are poorly managed: many are registered and mapped in other well-organized administrative structures (e.g. Liquor Control Commission, Aboriginal Affairs). However, a large number do appear to lack organization. A system for determining which interests require integration or linking with the land registry and which interests require administrative re-design is required. Moreover, a set of uniform requirements for the creation of administrative systems relating to legal spatial objects appears necessary.
Victoria’s Spatial-ICT infrastructure

The studies looked at Victoria’s spatial statutes in the context of technological capacity. In particular, how the interests were spatially represented and how spatial and information technologies were utilized was examined. In terms of ICT usage, the great majority of statutes had some component of ICT involved with administration. Five categories were established: ‘onsite’ (information and administrative services are only available at a physical location), ‘online – partial’ (information and administrative services are partially available online and from a physical location), ‘online – full’ (all information and administrative services can be located online), ‘not applicable’ and ‘unavailable’. Most legal spatial objects fitted into the ‘online-partial’ category (Figure 5): information about the object was available online and often printable forms were also provided; however, to undertake transactions phone/fax/mail and physical visits were required. This tends to suggest that while Victoria embraced the Internet as a mechanism for service delivery it still has some way to go if it wishes to achieve eGovernment visions.

![Fig. 5: Utilization of ICT in administration of legal spatial objects](image-url)

The mapping status of individual legal spatial objects was also considered. This refers to the extent to which an interest had been mapped. Seven categories were evident (Figure 6 and 7). In decreasing order of sophistication they were: ‘online-dynamic’ (fully automated online GIS with transaction services incorporated), ‘online-static’ (non-automated map provided online e.g. .pdf or .gif files), ‘offline-computer’ (automated map available offline only), ‘offline-paper based’ (paper based map available offline), ‘none’ (no evidence of mapping), ‘not applicable’ (NA) and ‘unavailable’. Pleasingly many ‘online-dynamic’ maps were found. Additionally, over time it is expected that the online-static and offline map categories will eventually become full online digital map products. These were mainly controlled by DSE and DPI. On the negative side, a large percentage of objects had no evidence of any mapping, or if maps did exist, they were simply unavailable. Simple mechanisms and strong incentives for creating and incorporating spatial information are required. G-NAF, the Geo-coded National Address File provides an example mechanism: address data can quickly be represented on a digital map.

![Fig. 6: Mapping status of legal spatial objects](image-url)
The spatial identifier of the interests was also considered. Spatial identifier refers to the way in which the interest can be identified spatially. Five categories were used: ‘registry/cadastral’ (identifiers used by the traditional land administration systems e.g. Volume/Folio, Crown Allotment number, Lot/Plan number); ‘address’ (Stems from the postal system and is the most commonly understood spatial identifier); ‘other’ (incorporates all other identification methods e.g. GDA coordinates); ‘not applicable (NA) and ‘unavailable’ (Figure 8). A large number of interests still make use of ‘registry/cadastral’ identifiers, however, G-NAF and VMAS (Victorian Mapping and Address Service) will see ‘address’ become a more common and reliable method of spatially identifying an interest. Those using ‘registry/cadastral’ identifiers tended to have a close relationship or formal link to those systems. Results may be skewed because a large number (145) of identifiers could not be discovered. Interests classified as ‘other’ tended to be non-parcel based and related to mining and the management of natural resources.

Mechanisms for the delivery of information were also studied. The traditional land registry/cadastral systems deliver information both onsite (information provided at a physical location) and online. In relation to onsite information provisions, the Land Victoria office located at Marland House, 560 Bourke Street in Melbourne provides a number of services. All are computer based. The PVS (public view system) enables both the DCMB and LASSI (land and spatial survey information) to be accessed.

In relation to online information provision, three main websites (partially integrated) are available. Land Channel, a ten year old web portal, allows a number of Vicmap products to be overlaid and viewed as online maps. Simple property reports and GIS functions can be utilized. These datasets themselves can be purchased from Value Added Resellers (VARs) in the private sector. Land Channel was originally intended to act as a portal to provide all land related information and services; however, this vision remains largely unmet. Land Channel still concentrates on information provision rather than service
provision. Landata, another related web portal provides access to all the documents stored in the land registry: For example, titles, plans, mortgages and covenants. It aims to be a one-stop-shop for all information required to complete a land transaction, however, in essence it only provides registry documents; all other data documents (e.g. other interests) are accessed from other agencies and can take up to ten days to be sourced.

These websites are some of the most highly visited Government sites. They are an integral part of Victoria’s online service delivery; however, they focus on traditional land administration datasets. The hundreds of new legal spatial objects are generally not available from these sites. Information relating to many of the interests is still not online and can only be accessed onsite at multiple government agencies. Figure 9 shows the access point for all legal spatial objects. Those considered fully online tend to be those relating to the registry/cadastre. Many are partially online, however, an overwhelming number are still not online or are simply unavailable. Figure 10 shows the prices involved with accessing information. Pleasingly a large number of interests can be accessed for free. Again the large number of unavailable interests potentially skewed the results. Figure 11 shows the method available for altering land interest information. While the information relating to a small number of interests (38) can be fully edited online, the majority can still only be edited offline or at best have printable online forms. Again the large amount of unavailable information could skew results.

![Fig. 9: Access points for information regarding different legal spatial objects](image1)

![Fig. 10: Access price for information relating to different legal spatial objects](image2)

![Fig. 11: Method available for altering land interest information](image3)
In summary, Victoria had some early success in spatial technology implementation. It was an early leader in integrated spatial information provision; however, these early systems are now dating rapidly and reassessment is needed to ensure most appropriate future development. It is still unclear whether existing systems are capable of underpinning the spatial enablement of the wider government. Is new government provided infrastructure required or should more use be made out of existing products such as Google Earth? Whatever direction is chosen, stronger leadership is required, in particular the administrators of the hundreds of land interests organized outside the existing Victorian SDI need to be engaged. Standards for identifiers and mapping legal spatial objects need to be made clear and simple. Successful innovations in similar jurisdictions should be studied (e.g. SLIP in Western Australia).

**Victoria’s Human Resource Capacity**

In terms of the human resource capacity, Victoria fares reasonably well on individual, institutional and societal levels. On the ‘individual level’ Victoria has an increasingly well-educated population. Large proportions of the population have access to Internet, increasingly at broadband speeds. Individuals are comfortable with the idea of e-service delivery and are increasingly demanding it, especially in relation to land transactions. The Land Channel, Land Exchange and Landata web portals are some of the most accessed government sites. However, if anything, Victoria’s online information and service provision lags behind the expectations of citizens. Citizens are not concerned with government structures and the custodians of data; they are interested in accessing services and information seamlessly and quickly.

At the ‘institutional level’ the state has embraced e-government service delivery and undertaken many projects to streamline and enhance land information and service delivery. However, there is still an inherent inertia within many Government departments. Despite initiatives such as Land Exchange, Land Channel, the PIP project and the creation of VSC and VGSC, a lack of formal collaboration between holders and managers of land interest information exists. Silos are still prevalent. In part this is due to the government business models introduced during the 1990s which restricted data sharing and pushed departments and agencies towards commercialization. There is now a need to overcome these structures and push for more cross-agency coordination of spatial information; specifically, dialogue between built environment information managers and natural environment information managers require nurturing. The Spatial Information Infrastructure (SII) forming links to other arms of Government may assist this process; however, as SII moves away from property information management into the wider realm of information management, it potentially risks trivializing the cadastre: arguably the most important spatial information layer.

**CONCLUSION**

In summary, Victoria has a large and growing body of laws, many reveal a spatial footprint indicating the potential for spatial enablement. Victoria’s early strides down the path towards spatially enabling government were grand. However, the steps taken were focussed on traditional areas such as land administration: many other areas such as health, education and human services are yet to fully realize the benefits of spatial enablement. This puts Victoria in an opportunistic position: the heavy initial investment in creating well-managed fundamental SDI layers offers the framework upon which to spatially enable many government at reasonable cost. As the spatial nature of most legislation and government activities becomes clearer at a societal level, Victoria will be well placed to implement wider spatial enablement. However, a number of obstacles still remain. Updates to existing cadastral/registry systems have improved process efficiency and accessibility; however, it is highly doubtful whether these digitized systems would be capable of incorporating the hundreds of new legal spatial objects: the systems were not re-engineered and are still encumbered with the mindset of paper based transactions. Additionally, Victoria’s institutional arrangements are also encumbered with historical legacies: a large-scale re-organization would be costly and unlikely to improve spatial information management. Spatial technologies appear to provide the best option for improving levels of spatial enablement. Web services are already prevalent in Victoria’s land management systems, however, strong leadership, collaborative approaches and more investment is required.
REFERENCES


BRIEF BIOGRAPHY OF PRESENTER

Dr. Rohan Bennett works the Department of Geomatics, The University of Melbourne. He completed his PhD in 2007 where he focussed on the spatial management of new property rights, restrictions and responsibilities. He is currently working with the Centre for SDI and Land Administration on a number of projects and is also involved with the implementation of the Melbourne Model for teaching, in particular, the new Bachelor of Environments and Geomatics Masters programs.

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