



A roadmap to adopt the Land Administration Domain Model in cadastral information systems



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ABSTRACT

With the introduction of the Land Administration Domain Model (LADM) as an International Standard (ISO 19152), land administration organisations worldwide are considering the adoption of this standard into their current processes and cadastral information systems. Although LADM is a data standard, its adoption can have significant impacts on the process of managing cadastral information. These impacts include the influence on existing institutions and their operations, the description of cadastral information, the organisation of data in cadastral databases and the knowledge and capacity of human resources utilising and managing cadastral information. Therefore, the adoption of the LADM requires a holistic approach that considers the LADM not only as a data model for cadastral information, but also as a cornerstone in systems of land administration.

This paper aims to introduce a LADM implementation roadmap including important factors that can be used by land administration organisations when adopting the LADM. The paper methodology presents this roadmap using two case studies, the first in Victoria, Australia and the second in Belize, Central America. Using these case studies, this paper analyses the potential impact of the LADM adoption in a jurisdiction with an established cadastral information system (CIS) and in a jurisdiction that is in the process of establishing a CIS. These factors include consideration of organisational motivation, institutional arrangements, information interpretation, information organisation, involvement in the LADM governance and capacity building.

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Introduction

The LADM (ISO, 2012) passed the final vote towards becoming an international standard on the 1st of November 2012. ISO 19152 was formally published by ISO on the 1st of December 2012. Since then, there has been considerable movement in the land administration domain towards the implementation of the model. Examples of such implementations can be seen in Cyprus, Canada, Croatia, Brazil, South Africa, Portugal and other countries (De Almeida et al.,

2012; Elia et al., 2013; Pouliot et al., 2013; Santos et al., 2013; Tjia and Coetzee, 2013; Vučić et al., 2013). Most of these implementations, however, are limited to research and development in academia. That said, there are some land administration agencies which consider adopting the standard.

The above mentioned implementations often ignore that the LADM, as a cadastral data model, is integral to land administration processes and should be considered as the cornerstone of any land administration system. At a higher level, it achieves the following:

- translates the organisational mandate into information requirements; and
- formulates what data should be collected to support the business of the organisation.

Digital cadastral databases and services are derived and conceptualised through the cadastral data models. Data modelling underpins the design of information services that are expected for the organisation. Data models also formalise the information access and cross-transaction with stakeholders outside the land

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administration organisation in a digital language (Kalantari et al., 2005). Although the technical considerations (e.g. software packages, data format, database technology) are important when introducing the LADM; it is equally important to consider institutional factors (e.g. internal and external stakeholders, public demand for services, etc.) (Rajabifard et al., 2012).

Complementing the existing knowledge in LADM implementations, this paper takes a holistic approach and presents a roadmap for the adoption of LADM that is supported by two case studies in Victoria, Australia, and Belize in Central America, which differ in terms of maturity of their systems. For our study, we used Victoria as the case study that benefits from a well-functioning cadastral information system and Belize as a territory that has a functional CIS with a few exceptions. Victoria is located in the South-east of Australia. It is the smallest mainland state geographically, but the most densely populated and urbanised. Victoria has an estimated population of 5,791,000 as at June 2013 and a total land area of 227,420 km² (Abs.gov.au, 2014). Victoria has approximately 3.2 million land parcels in recorded in its CIS, Vicmap Property. 70% of the parcels are in Urban and Peri-Urban areas and 30% in rural areas (Land Victoria, 2011). Belize is located on the East coast of Central America, South of Mexico and East of Guatemala and includes the cayes located off the coast in the Gulf of Honduras. It has a land area of approximately 22,806 km² (www.cia.gov, 2014). Belize is a relatively young independent nation, having gained its independence from the United Kingdom in 1981. This selection provides us a broader ground for impact analysis of the LADM.

A roadmap as such is needed because it assists in analysing and expressing the adoption of LADM as a combination of elements and components that are critical in the adoption. This roadmap builds on the existing technical knowledge on LADM implementation and fills the organisational knowledge gap of the adoption. It considers both technical and non-technical aspects of the adoption through a six-stage approach based on the authors' longstanding experience in introducing technologies into land administration organisations (see Fig. 1). The six-stage approach is derived through the result of logical grouping of the technical and non-technical aspects. In each stage, important components, elements and variables are identified as sub-categories. We have taken a top-down approach in preparing the roadmap starting from strategic considerations of implementing a new technology in organisations trickling down into the technical matters of the implementation (Kalantari et al., 2006). This method of adoption, as opposed to the agile software development method, is more suitable in land administration systems which are inherently conservative public entities.

These stages include the following:

1. organisation motivation
2. institutional arrangement
3. information interpretation
4. information organisation
5. governance and engagement
6. capacity building

The remainder of the paper is organised as follows: in sections 'Organisational Motivation Overview' to 'Capacity Building' of the paper, each stage of the roadmap is described, applied against the two case studies, and the important considerations are summarised for each. The results of the respective case studies are then summarised in sections 'discussion on the results' and 'conclusion' as discussions and conclusions.

Organisational motivation overview

In terms of advancement in CIS, broadly speaking, land administration organisations can be classified in a continuous sliding scale from advanced CIS to no CIS. One end of the scale includes organisations with well-functioning CIS such as land administration organisations in Australia, Netherlands, France, etc. In the middle, we have organisations with working CIS, which are only able to provide partial services to the public such as land administration organisations in some of the African, Asian and Middle Eastern countries. And the other end of the scale includes organisations that have no or non-functional CIS.

First, the organisations with well-functioning CIS; these information systems are typically built around the organisational mandate which is by and large driven by the public and their stakeholders' needs. For this category, CIS are stable. Upgrade, improvement and maintenance regimes are commonly in place, so the ability to address the ongoing demands of the public and stakeholders are built into the systems. Such CIS are typically sophisticated in terms of their integrated organisational workflows. They are also multi-faceted in terms of data entities and the relationship between the entities. Any changes outside of the usual upgrade, maintenance or improvements, requires additional considerations and approvals so as to evaluate the potential financial and resource implications. For these 'advanced CIS' organisations, the adoption of the LADM is considered a major variation in the existing implemented CIS because it has not been identified as critical as a result of public or stakeholder need. Such a foundational change may not be justified because of the absence of such an organisational mandate. Having said that, when maintaining a well-functioning CIS, a routine upgrade that implements the LADM can be beneficial.

The second category includes the organisations that also have working CIS, but these systems are only able to provide partial services to meet the public demand. Additionally, these CIS are mandated in the organisational directives. In this category, the land information systems are not stable, and more efforts and resources are put forward for system improvement. Such organisations constantly scan the environment for best practices in terms of CIS and related services. The introduction of LADM can be considered as a significant change. LADM as an international standard is often seen as a solution for the shortcoming in the current CIS.

The third category is the organisations that have no CIS or a non-functional CIS. These organisations are in early stages of the CIS development. The introduction of the LADM can be easily integrated and built into the system development without placing extra cost and resources on the development process.

Although the introduction of LADM in the third and second category organisations looks more straightforward, there remains an important question: why use the LADM and why not use the data models of the countries with well-functioning systems?

Organisational motivation – case study 1, Land Victoria

In our first case study 'Land Victoria' the land administration organisation of Victoria was studied. 'Land Victoria is the authority responsible for registering land titles, cadastral surveys, property information services, and valuation. Its mission is to provide Victoria with authoritative, comprehensive and easily accessible land administration and provide land information to facilitate effective decision-making and the appropriate use of land. Within Land Victoria, the Surveyor-General of Victoria is the primary government authority on surveying and the cadastre (land property boundaries and tenure). Roles and responsibilities for the Surveyor-General include land administration, planning, surveying electoral system, geographic place names, regulation, geodetic infrastructure and survey control

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