Spatially Enabling Societies by Shifting the Basic Building Block

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1 Introduction
Moving towards spatially enabled societies, governments have turned to best preserve, develop, allocate and use land, incorporating all interests in land. Generally, land registries contribute to recording the important interests in land such as ownership, land use, covenants, caveats, leases, easements, and mortgages in land parcels (Williamson 2002). At the same time land mapping agencies are responsible for recording land parcel dimensions to identify the extent of the interests.

In a theoretical framework, Bennett et al. (2006) analysed the problem of management of interests in land and classified them into three categories. Firstly, some interests have been poorly designed. They may be unenforceable by authorities or may provide little incentive for those who are supposed to adhere to them. Secondly, some interests are poorly administered. The administration system may offer limited public information access, have slow permit and licence processing times, or might be administered in isolation from other related interests. Finally, some interests do not exist where they ought to exist.

In a practical context, the parcel based organization of interests mentioned above encounters two problems: the interests in land are not necessarily limited to those mentioned earlier, and the interests are not necessarily restricted to specific parcels. In other words, the interests in land are diverse and some of the interests can not be defined by boundaries.

An efficient technical solution for organizing the growing number of interests in land information systems remains a challenge. The solution suggested in this chapter redefines the relationship between land and interests in the context of modern land administration systems.

2 Modern land administration systems
A modern land administration system is an institutional framework complicated by the tasks it must perform, by national, cultural, political and judicial settings, and by technology (Enemark et al. 2005). Four subsystems contribute in a modern land administration system: land mapping for production of spatial land information including positions and dimensions, land registration for recording interests in land, land development for recognising land and land valuation for the assessment of land and land related commodities for revenue (Kalantari et al. 2005).

These subsystems must collaborate to manage land in a holistic way. An appropriate cooperation between registration and valuation agencies leads to establishment of an efficient market in land and land related commodities supporting the creation of wealth for economic purposes (Williamson 2004). An efficient interaction between registration of peoples’ interests in land and the land development function serves the society in a sustainable way with all private and public interests in place (Molen 2004). Finally, a combination of the land mapping and the land registration agencies demonstrates the way towards having a sustainable living environment.

Therefore, a modern land administration system promises to deliver broader information for sustainable development objectives including social, environmental and economic interests in land. Organization of interests in a land information system requires redefining the relationship between land and interests.
3 Administrative relation between land and interests

From an administrative perspective, interests in land are all those matters that an owner, a prospective owner or other interested persons would know about. These matters are identified by many individual laws. They include private rights to own, possess or use the land, hundreds of restrictions, compliance processes, licences and other land related information (Figure 1).

In an administrative context, there is no difference between private rights, public restrictions or a licence for organizing interests in land. Some relate to parcel and some do not however they must all be transparent. To achieve transparency all these matters are treated as generic “interests in land”.

When an interest is recognised and recorded, whether in a parcel basis such as right of ownership or in non-parcel basis such as roadside walk restriction, then the spatial dimension to which the interest applies becomes a legal entity. Each interest in land with its spatial dimensions forms a specific legal entity; thus, when the interest is abolished the legal entity will cease. Consequently, the relationship between an interest and its spatial dimension is that, they together are a unique entity in the real world.

Accordingly, to organize interests in land, this very close relationship between each interest and spatial dimension of it in the real world should also be recognised in information systems. To put it another way, they should be maintained together as a unique entity in a land information system. This unique entity must define both interest and its spatial dimension. The interests are open-ended and can include all the political, environmental, social and economic interests. The spatial dimension of the interest can include a variety of shapes; however, it is limited to the ability of computer systems to present them. The spatial dimensions can currently be presented in points, lines, polygons and volumes. The combination of the interests and their spatial dimension creates a variety of the legal entities (Figure 2).
In land administration systems, the role of the legal entities has so far been played by land parcels with a bundle of associated interests. It should be mentioned that land parcels have different meanings in different countries and are often used in conjunction with the term property (Steudler et al. 2004). However, this chapter uses land parcel as a generic term for the smallest spatial unit in land administration systems. The land parcel in a two dimension environment organises a limited number of interests in a bundled form in land information systems.

The land parcel is the basic building block of current land administration systems. The land parcel has legal descriptions which not only describe its boundaries but also contain information concerning interests. However, it is not sufficiently flexible to accommodate or support the growing number of complex commodities (e.g. water, biota, mining, carbon credit) and other interests (e.g. environmental, heritage, use restriction) in land. The increasing recognition of neophyte interests in land has caused the basic building block of land administration systems to undergo change.

4 Legal property object

Interests in land have historically been organised through land parcels. A limited and important number of interests are generally recorded in the extension of surveyed land parcels. For example, easements and use restrictions are organised through land parcels. However, in modern land administration thinking, interests which are the results of the cultural, social, environmental, economic and political activities (Lemmen et al. 2005) are diverse and are not necessarily applied on a land parcel basis.

For examples, biota exists as an interest that often appears to be attached to land. It can be implicitly part of the bundle of rights conveyed into private hands by freehold title. Some aspects of biota may be either sufficiently mobile, or sufficiently distributed, to make a linkage to specific land titles impossible. The commercial exploitation of the potential opportunities arising from biota may not neatly align to individual land parcels (Sheehan & Small 2004). The challenge of organising interests such as biota lies in harnessing these departures from the land parcel without producing such a degree of independence as a legal entity.

The introduction of the concept of the legal property object—“an entity defined by a law or regulation which relates to a physical space on, below or above the earth”—addresses the problem of organising interests in land information systems.
This definition covers all the spatial dimensions which might be applied to an individual interest. For example, roadside walk restriction might appear in one dimension or in two dimensions and biota property rights may apply in three dimensions in the land information system.

In addition, legal property objects also combine each interest in land with its spatial dimension and represent them as a unique legal property object. For instance, the rights of timber as a legal property object are presented as a separate layer of information from the rights of land ownership in land information systems (Figure 3). The concept can be therefore open-ended and scalable to accommodate growing numbers of interests.

![Figure 3: Separate layers of information from intangible interests](image)

With the comprehensive inclusion of interests, the legal property object allows interests to be unbundled. For example, the agricultural rights, ground water rights and mineral rights over an extension of land are separated from the right of ownership of the same extension (Figure 4). However, these separated entities are still related through the spatial dimension. In simple terms the spatial dimension organises the legal property objects and not the actual land parcel.
Furthermore, the concept can comprehensively cover new land related commodities such as water and mining rights (Wallace & Williamson 2004) which are not physical realities but are institutional creations that may be owned in public or private sectors. Thus, although new commodities are not pieces of land, they have a position and dimension on land. Position and dimension of the commodities enable them to be treated as legal property objects. As a result, new commodities can be assumed as land related objects with spatial and legal descriptions and therefore each commodity is a legal property object.

Consequently, legal property objects facilitate the creation of virtual information layers from intangible interests and commodities upon the Earth’s surface. They enable us to incorporate interests into land and spatially represent them in a land information system. More importantly they enable land administration system to promote land information organisation through legal property object as a new building block.

5 Conclusion
This chapter describes the relationship between land and the interests in land and explains that interests in land are not separate entities from their spatial dimensions. It articulates how land and interests in land should be maintained together as a unique entity in a land information system.

This chapter reveals that land parcels have so far played the role of the unique entity and how unfortunately governments are still trying to organise the new commodities and interest in land through the traditional land parcel based approach. It argues that land parcels are not sufficiently flexible to accommodate or support the growing number of complex commodities and other interest in land.

A shift to the basic building block of land administration from land parcels to legal property objects has been proposed. The legal property object is open-ended and can include complex commodities and all interest in land. Legal property objects allow creation of virtual information layers from intangible interests, and commodities upon the Earth’s surface.
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7 References


Biographical notes
Mohsen Kalantari is a PhD candidate in the University of Melbourne working on cadastral data modeling and ICT enabled land administration. He was awarded a Bachelor of Surveying Engineering and Master of GIS by KNT University of Technology in Tehran, Iran. During his M.Sc. studies, he was involved in various research projects in the Geodesy and Geomatics Research Centre at KNT University of Technology. During his final year of M.Sc. Mohsen worked as a teaching assistant in the GIS department and was involved in tutoring GIS students. After finishing his Masters degree in Dec 2003, he became R&D director in GlobeArray (Geomatics Private Research and Development Company) in Tehran.

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