Spatially Enabling Governments: A New Direction for Land Administration Systems

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SUMMARY

Most decisions involve a spatial component, though few people realize its significance. Technology is about to bring the spatial component to the forefront. A place on earth can be defined with precision on the ground and in computers. Digital data can be attached to a location as never before. Spatial identification and location enablement applications are now available in every significant type of software (word processing, spread sheets, professional applications, Web systems, GIS and databases).
Use of appropriate computers with interpretative software capacity now transforms computer language into understandable descriptions of places, Governments, business and communities can potentially use computers to identify "where" their policies and activities are happening. More significantly, the "where" component can be used as an organizing structure for most human activities and information. The challenge of these new technological and organizational opportunities is large. A nation's ability to reap the benefits of the spatial enablement of information requires the highest level input from its government and private sectors. Land administration systems (LAS) are the traditional means of spatial organisation of information: they are the obvious starting point for assessing new technologies in the context of different demands for land information for modern governments.

This potential to transform the ability of LAS to inform governments, business and citizens about their world led to the concept of ***iLand***, a concept of spatially enabled information for modern government.

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1. INTRODUCTION

Modern land administration as a coherent field of study is new even though it builds on well over a century of experience, publications and scholarship in cadastre, rural land management, land economy and land information management. The first major "land administration" publication in the modern sense was the UNECE Land Administration Guidelines that date back to 1996, followed by Peter Dale's and John McLaughlin's "Land Administration" in 1999. However for decades earlier, leadership in land policy and related issues came from such organisations as the UN Food and Agriculture Organisation's Land Tenure Service, the University of Cambridge's Department of Land Economy, the Republic of China's International Centre for Land Policy and Training in Taiwan and the University of Wisconsin's Land Tenure Centre. Importantly the FIG through its Commission 7 (Cadastre and Land Management) made significant contributions as early as pre WWII and continues to provide leadership to this day. Many countries had a Department of Lands for well over a century. For whatever reason, land administration is now an area of international scholarship covering issues in land from high technology to land reform in post-conflict countries.

But the roots of discipline began much earlier with surveying, the technical identification of land on the Earth's surface, with its dynamic history of 400 years. The great moment in surveying history was the Napoleonic era, when what we know as modern Europe was surveyed according to precise standards. This delivered enduring benefits. The success of cultures in these countries, their wealth, and their stability (despite disastrous wars) is directly related to their land management capacity. They built coherent land distribution systems which proved to be adaptable, formed the basis for efficient land taxation, formal land registration and transaction tracking, and eventually for effective land markets. These processes of surveying, registering, taxing and marketing land are now the standard components of land administration in developed countries.

The discipline is thriving. Its heritage of the scientific method, plus a modern multi-discipline approach, guarantee its role in improving land management. The traditional processes relating to land tenure, use, valuation and development are seen as central to national good governance (Enemark and others, 2005). They continue to form the essential part of most national land administration systems (LAS). These traditional administrative processes, and the institutions that support them, have already changed to reflect the more complex modern world, especially since 1990. However pressure to change will increase in future as national LASs respond to two pressures. The first involves satisfying government needs to implement information and accounting systems to monitor and evaluate efforts to deliver sustainable development. The second involves moving computer support for government and business activities away from large scale databases to spatially enabled technologies. These two demands are theoretically and administratively inseparable and will inevitably be intertwined. This paper describes these trends and uses a new concept of *iLand* to guide efforts to meet the future.

2. LAND INFORMATION AND SUSTAINABLE DEVELOPMENT

2.1 Land Policies and Information Needs

Land policies are articulated by governments for their national purposes, and by international agencies working in foreign aid and project delivery. Land policy statements in the mid 1970's focused predominantly on economics, reflecting the use of markets as primary method of land distribution in Western democracies. Later, pressures on land from growing populations and environmental imperatives added multiple objectives reflected in the **triple bottom line** of sustainable social, economic and environmental development (UN and FIG, 1999; Deininger, 2003; UN ECE, 2005). Implementation of these three goals, together with governance goals (for national governments and corporations), requires more inventive land management processes and improved information. Public engagement in the formation of specific national policies, their application and their evaluation is also essential: engagement processes also rely on information chains.

2.2 Sustainability Accounting and Information

Sustainability accounting involves measuring the outputs of land administration processes against sustainability outcomes among countries at all stages of development and across social, environmental and economic spheres. "Accounting" in this sense is not technical, but shared approaches appropriate to land administration activities that measure activities against outcomes. There is no universal methodology, though two methods stand out. The results-based monitoring and evaluation system aimed at development practitioners (Kusek and Rist, 2004) provides a comprehensive and adaptable methodology to measure results of public management activities and is entirely workable LAS. A second popular and useful methodology uses the familiar method of international comparisons. The most influential relate to the economic aspects of land. The **Doing Business Reports** of The Wold Bank, especially *Understanding Regulation*, 2004, and *Removing Obstacles to Growth*, 2005 used detailed economic comparisons to identify which national LAS most successfully support land markets, remove corruption, and manage disputes. Specialist comparative information about institutional structures is also increasing, as evidenced by the Cadastral Template initiative

(http://www.cadastraltemplate.org/). Complex economic activities facilitated by national governments generate even greater demands for information access, reliability and multi-purpose uses.

Land administration involves more than providing an infrastructure supporting land markets, though this is a primary role in developed countries. Activities aimed at delivery of security of tenure, equality of access to land and gender equity are much harder to evaluate (ESSD

Week, World Bank, 2005). The social impact of any LAS and the engagement of intended beneficiaries in land administration projects and land reforms are acknowledged as essential. However, these outputs from land processes and activities are largely social changes, requiring longer observation periods and relatively intense monitoring and evaluation. The land administration principles of the UN ECE, 2005, identify a much broader range of activities than purely market based activities, as falling within the "land administration" banner, even though they focus on the traditional, free market in the context of the LAS framework used among EU members and aspirants. These principles identify public trust in LAS, institutional independence (page 7), and a multi-discipline approach to establishing land policy (page 12), in addition to the standard institutional array and processes used in LAS in developed countries.

Assessment of LAS in underdeveloped countries has also undergone a similar broadening. Since 2000, assessment of methods of delivery of security of tenure has been driven by the Millennium Development Goals (MGDs) adopted by 189 UN member countries and numerous international organizations. The MGDs particularly drive sustainability accounting for social and environmental outputs in land administration. These activities and the growth in country information on generic web sites (among many are those of the Department of International Development (DFID), Oxfam, The World Bank, Central Intelligence Agency (CIA), and the International Institute of Economic Development (IIED), and on specialised LAS web sites, provide significant comparative information about how people are affected by national institutions and LAS processes. Activities of UN agencies, particularly UN-FAO and UN-HABITAT, continue to build much more LAS functionality, accountability, and professionally measurable improvements in land management for developing countries. Comparative information about dispute management and gender equity is also being systematically collected and fed back into land administration project design. The focus on social and environmental sustainability has resulted in identification of social tenures as common and legitimate systems, the global land tools network (UN HABITAT, 2006), and introduction of good governance criteria in land delivery systems (FAO, 2006). These are tangible improvements in international land management processes and in global capacity to manage land for sustainable outcomes.

These efforts, and many other efforts of the last five years (including the explosion of environmental management capacity which, for brevity, is not explored here), stimulated changes in LAS. One group of innovations centred around pro-poor land management initiatives to meet situations of intense stress involving slum-dwellers, the rural poor, and post-conflict traumas. These new land management and access protection tools require on-ground assessment as a prerequisite. The innovatory tools in land stabilisation therefore reinforce the demand for accurate information about uses of land and changes in people to land relationships.

Sustainability accounting requires cross-country comparison of land management processes, including LAS outputs. It is no longer sufficient to gather statistics about how many parcels are registered and what processes are involved in transfer of ownership. Global comparisons now require much more people-based, social information. Women's *de jure* and *de facto* access to land, inheritance systems and the capacity of the formal LAS to reflect them, the relationship between land and resource tenures, the nature of land disputes, and the performance of related markets in money, agricultural products and agrarian labour, are starting points for information collection. These newer kinds of information build the capacity of land policy makers and administrators to take local conditions into account, while being aware of inter-country comparisons and world best practices.

Comprehensive integrated land management built on digital information about land and the way it is used is the focus of the future. This should change the ways governments and the private sectors produce and use land information and, ultimately manage land. Sustainability accounting processes increasingly rely on modern technologies to overcome the historical land information focus of silo agencies that collected and organised data for their internal purposes. Advances in information communication, land information and geospatial technologies facilitate using these various types of information to deliver informed and holistic land management, better implementation of key policies of sustainable development, and achievement of national monetary and budget goals.

Even this short review shows an integral connection between sustainability accounting and land information. Information is also central to other emerging theories and processes in modern land administration. These include the land management paradigm (Enemark and others 2006), spatial data infrastructures (SDI), and spatial enablement of governments (Wallace and others, 2006).

2.3 Changing Nature of Land Information

Information in survey plans and geographic information systems (GIS) reflects reality and is capable of being tested against what is seen on the ground. It is constantly subjected to efforts to make computer information verifiable by scientific methods. By contrast, modern land information increasingly involves relativities inherent in complex socio/legal constructs dependent on the cognitive capacity of citizens (Wallace and Williamson, 2006), and on the competence of land administration agencies. The relationship between these socio/legal abstractions on the one hand and the physical land parcels on the other depends on LAS institutions and infrastructure.

The land registry provides the framework information about people's interests in land. The framework underpins the legal construction of property rights, the social meaning of land ownership and economic opportunities essential in a vibrant, multi-tiered land market. The integrity of relationship between the recording of ownership, and the abstract socio/legal arrangements protected by the recording, form the foundation for leveraging simple land markets into complex commodity trading, which in turn accelerates wealth of a nation (Wallace and Williamson, 2006).

Accuracy of formal land ownership information is not verifiable by standard scientific methods. In a Torrens registration system, the administrative act of recording an owner is combined with the announcement of its legal meaning and the cognitive response of the public. The land might be visible and observable, but the socio/legal reality is not. Paradoxically, the need for these socio/legal realities to be supported by accurate, complete and high integrity registers is overpowering. Quality and reliability involve different protections, checks, verifications and support systems. No country can run a successful, formal economy if its land registers contain "dirty" data. While much of the information collected about land is scientific and technical in quality, an increasing amount of land information is dependent on other systems of verifiability, particularly administrative, legal and moral normative systems. The principle functioning of a LAS is to guarantee this "relative" information. Understanding the fundamental differences between types of land information is essential to understanding the next trend: spatial enablement.

3 SPATIAL ENABLEMENT

3.1 Central Role of the Cadastre

Digital information about land is central to the policy framework of modern land administration and sustainability accounting (Williamson, Enemark and Wallace, 2006). The cadastre, or the large scale, land parcel map, is the vital information layer of an integrated land management system, and, in future will underpin information systems of modern governments. The characteristics of the modern digital cadastre are:

- the large scales of its data (typically 1:500 - 1:1000 in urban areas with 1:2000 - 1:10000 in rural areas) covering very small areas of land, such as street blocks or local government areas
- the complete seamless horizontal or two dimensional representation of human occupation in both urban and rural
- the data collection process which relies on rigorous methods to measure and mark the Earth used by surveyors who establish the legal boundaries of parcels. The cadastre is the only "map" with both definitive legal authority (as a socio/legal construct) and definitive technical capacity (as a scientifically verifiable data set). Geo-referencing information in the cadastre therefore has special determinative qualities in many normative systems, not in a technical, scientific system. This applies whether or not any survey plan accurately reflects on-ground configurations of parcels in terms of the latest available technology and standards. Most surveyors know that instrumental capacity for land measurement changes over time and according to the technology used. They also know that information provided by surveys, both new and old, functions to identify parcels. The cadastre is nevertheless always legally determinative, even if the machinery used for standard surveys is now obsolete.

While some developed countries do without a formal "cadastre", all generate digital parcel maps reflecting land allocation patterns, uses and lay-outs and they often keep sophisticated large scale parcel maps showing roads, land lay-out and even addresses and photographs. Without these digital facilities, modern governments cannot understand the built environment of cities, manage land competently, utilise computer capacity to assist policy making, or retrieve significant value out of land.

While digitization of survey plans varies due to different technologies, a country's digital cadastral data base (DCDB) is its core information layer. Since most of the information is derived from survey practice, digital surveying systems are used to support cadastral functions and manage large scale spatial data. The software managing geographic information and maps in GIS, much of it held as images, is different. This incompatibility is, however, shrinking fast (Elfick, 2005). The DCDB, meanwhile, is destined for a much broader role as fundamental government infrastructure equivalent to a major highway or railway, though it was originally created on behalf of taxpayers merely for better internal administration of taxation and titling of land.

The greatest potential of the DCDB lies with the information industry at large, as the principal means of translating geographic coordinates and spatial descriptors of land parcels into meaningful descriptions of places. Land parcels describe the way people physically use and think about their land. The familiar configuration of parcel based descriptions in the DCDB ensures people-friendly identification of precise locations of impact of private ownership and, more vitally, of government, business and community policies, regulations and actions.

Despite the importance of the cadastre (or its equivalent), many of the pressures on modern government threaten its future. DCDBs (or, indeed, reasonable hard copy cadastres) are expensive to create and to maintain, especially if their use is limited to mapping land parcels and subdivision. The opportunity to cover the cost of DCDB maintenance by attaching overheads to new parcellations or subdivisions is limited because the charge per parcel is excessive, and there is no justification for using creation of new parcels to subsidise the security of digital information pertinent to all others. Given large construction and maintenance costs, "marketing" DCDBs at prices aimed at cost recovery limits their use, in and out of government.

Access and pricing questions must continually addressed by any information vision. Ideally, taxpayers and businesses (especially the utility providers) should access the DCDB free, or at very affordable charges, and through convenient information exchange arrangements (Onsrud and others, 2004).

3.2 Complexity of Spatial Information

A geo-coded digital cadastre (ie DCDB) is a special kind of spatial information, noting there are many other kinds. Spatial information includes position, time, distance, measurements and relationships of persons, places or things, typically held in a geographic information system (GIS), but also in any system that understands the world in geospatial terms. Spatial information is based on coordinates (longitude and latitude, or X and Y, and sometimes, height, Z). Spatial enablement allows positional functions in digital equipment to track a place on the Earth's surface, and to present measurements, relations (notably times and distances) and, most usefully, images on a screen. Spatial data is not the same as integer, alphanumeric or symbolic data for a number of reasons: spatial data is scale dependent; spatial queries are inherently complex; all spatial queries, analysis and modeling are dependent on data models which have many and varied dimensions; and integrating spatial data with other data types is particularly difficult due to their different data structures. So, while spatial data can now be included and manipulated in large databases, the collection, management, manipulation, integration, use, presentation and querying of spatial data is complex.

Given modern computer capacities, complexity no longer impedes the take up of a good idea. Perhaps, the reverse is true. The popularity of GISs jumped by orders of magnitude with improvements in capacity to handle map and geographic information production, shrinking and enlargement, and overlaying and access. The move of GIS into personal computers, combined with universally and freely available spatial information tools via the Internet, allow ordinary people to use spatial information. These new digital processes underpin **location or spatial enablement**, a facility that allows databases, GIS, mapping and other computer applications to identify places and positions of items and, increasingly, to organise and make viewable useful details about their characteristics. Location enablement can run on any scale: from management of items as they move around inside a factory or shopping centre, to global tracking systems using geocoding. To understand the power of spatial enablement, imagine managing international airports without it. The GOOGLE Maps phenomena is just a glimpse into the future of spatial enablement of society.

The high take-up of spatial information technology by organisations seeking better land management and information access opportunities is well known. The growth was so spectacular that an entirely new concept, the SDI, was designed. The SDI is now a world wide phenomenon (Groot and Mclaughlin, 2000, Van Orshoven and others, 2003; Williamson and others, 2003, Masser, 2005). The utility of spatial information is visible in many Web applications, digital phones, GPS equipment and thousands of other tools of daily trade. However, the take up of spatial enablement in LAS agencies has been relatively slow. This will change rapidly.

Digital *land information* about physical parcels now stands to be revolutionised by location or spatial enablement**.** Imagine a land registry computer applying software (usually a location enabled database or a GIS) to accurately identify and visualise all parcels with first mortgage securities to particular lenders on a national or even global basis. If other LAS agencies performing valuation and land use planning functions are similarly spatially enabled, combinations are possible. Integration is an outcome of spatial enablement which, at its best, could combine cadastral information about individual properties (or parcels, technically) with information about non-parcel attributes of land. For example, if all data were spatially enabled, the computer could automatically and *graphically* combine survey defined property polygons with particular attributes of owners, interests, boundaries, size or area, tenure, lot/plan, with more general attributes such as land cover, land use, zoning, reserve, suburb, and postcode. The distinction between information derived from scientifically verifiable sources and from sources verifiable by other normative systems would diminish. The test would lie in the utility and reliability of the information combinations.

Other information derived from peripheral activities like rate registration number, electricity account number, building permit, occupation of the land (term, identity and use), and so on, could be provided easily, though it is aspatial in nature. Once core information, such as street addresses, is geocoded in a location enabled system, any information related to the underlying property or parcel polygons could be shown on screens of digital devices. The difficulties created in LAS when agencies variously rely on properties, parcels or business areas would be manageable. Much more coordination of the fragmented and localised definition of real estate units used around the globe (UNECE, 2004) could be achieved. The information could be presented as georeferenced data, images or pictures, without losing the analytical capacity of relational databases. Spatial enablement of information offers solutions to otherwise intractable problems about organising information to deliver more equitable and effective administration of land and resources.

3.3 An "Authentic Register" of Parcel Information

A flagship or lead project is required to drive the use of spatial information. In Australia, for instance, the designation by governments of their digital cadastres as collectively the national "authentic register" of parcel information is a first step. The idea of the authentic registers comes from efforts to rationalise national administrations in the European Union. Behind this concept is the idea that governments identify a single authoritative register in a key administrative area which *all government and non-government sectors should use.* In the Netherlands in 2002 the Council of Ministers formally designated six databases as the core of a system of authentic registers. By 2004, two registers were established**: persons** (municipal personal records database) 'owned' by the municipalities, and the **cadastral parcel** (property information) 'owned' by the Cadastre, Land Registry and Mapping Agency. Two were under development: **geography** (topographical database 1:10,000), 'owned' by the Cadastre, Land Registry and Mapping Agency, and **businesses**, 'owned' by Chambers of Commerce. Registers under preparation were **buildings**, in pilot phase, and **addresses**, for which a feasibility study was finished (van der Molen and Welter, 2004). In every one of these registers, spatial elements are crucial, even in people registers: think of problems involved in identifying people without "places of birth, marriage and death". The parcel or property information layer is the key to digitally connecting addresses, business activities and people with places. The concept of authentic (or an authoritative) register for parcels could help overcome many of the issues of national cooperation in Australia.

4. SPATIALLY ENABLING GOVERNMENTS

4.1 Bringing Spatial Enablement into Land Administration Systems

Useability and utility of land information are significantly improved by spatially enabling information, geo-referencing significant core data, graphical mapping, and overlaying of details and descriptions. Spatial enablement and interoperability of the core information layers enables hierarchical access and use (among other uses). Real-time, pin-point accuracy in land identification and measurement might be thought necessary: indeed demands for land information accuracy, comprehensiveness, completeness and accessibility through the hierarchy of local, regional and national governments in a country are frequently voiced. However, a land information policy cannot wait for accuracy in information sets, including in the DCDB. Every nation begins the transition from current to new systems despite having something less than the ideal to work with. The savings generated are then put into improvement of data. If it were otherwise, pass-books would still be used for banking.

Innovation in public sector information policy is the key, but not enough. Technical capacity in spatial information systems is developing more quickly than governments are able to react. Given the time taken to design and install new systems, they are often out dated when initiated. This international problem is addressed by identifying forward strategies capable of directing the take up of technology without constraining opportunities. The European Commission proposal (SEC (2004) 980) for a directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (Infrastructure for SPatial InfoRmation in Europe (INSPIRE), or the European SDI, show how ideas about organisation of information can set the path for reform of both services and governance. The cross-jurisdictional European approach is generated by cooperation in establishing a broad framework for development of and access to spatial information, building on the already well established, national, DCDBs. One of the major efforts involved articulation of a set of first principles for the INSPIRE framework of spatial information that are worthy of consideration by all governments. With some adaptation, these can serve the international community:

Spatial information framework principles

- Collect once and use many times
- Maintain at the level most appropriate
- Seamlessly combine spatial data from different sources across a study area and share it between different users and applications
- Collect spatial datasets at one level of government and share them among all other levels
- Ensure that spatial data essential for good governance is widely available and not restricted by excessive conditions, and
- Ensure that spatial data is available, that its fitness for purposes is stated and the conditions of its use are stated.

These principles form a digital land information framework aimed at facilitating use of spatially enabled information. They are especially important in LAS which otherwise will continue to convert out-of-date digital systems in individual agencies into more expensive, local, silo based, digital systems.

Improvement in understanding of spatial information and what it can and might do requires basic definitions and functionality to be re-stated constantly. A decade ago, misconceptions arose because GIS, GPS (Global Positioning system), LIS (Land Information system), RS (Remote Sensing) and AM (Automated Mapping) were interrelated and often mistaken for one another (Bishop and others, 2000). The technological framework is now much more sophisticated and misconceptions are even more likely because claims for new technologies are often unrealistic.

A cautious advance is therefore recommended, building on familiar strategies (Bishop and others, 2000) -

- Improved hierarchical sharing of land information, especially between the local and national levels
- Development of authentic (or authoritative) registers of information and their spatial enablement and methods of creating homogeneity of land information
- More emphasis on the arrangement of information to deliver inter government capacity
- Building land management capacity using land administration processes, and
- Building capacity to create opportunities for government and the private sector in using spatial information in the ICT environment.

4.2 Shaping the Change - the *iLand* Vision

A vision of the future serves to guide organisation of information and take up of technology. A land information vision needs to incorporate the technical opportunities of the future and to deal with the country's issues. Australia's land information system is particularly challenged by gaps in essential data. Unlike Germany, The Netherlands and Denmark, much of the information about building capacity, type, structure, age, and the permits for building construction and renovation, is not kept in a nationally coherent fashion. Administration of building information is spread through government, semi-government agencies and the private sector, and predominantly managed by the 700 or so Australian local governments and private businesses that exercise planning and building approval powers. Information management capacities vary greatly. Similar problems relate to land valuation and price information, transaction tacking, and security interests.

While information gaps provide a challenge, changes in the demand for land information are much more significant; they are generated by two processes: *land regulation*, including regulation of land markets, and *land taxation*, using land to generate public revenues. The *iLand* vision assumes that both of these processes could benefit from spatially enablement of relative information data sets. Both involve an increasing demand for land information that is relative and socio/legal in nature. Given advancement in capacity, state and national legacy database systems might be able to service these combinations, but the utility of using multiple databases is challenged by the new spatial technologies.

The *iLand* vision focuses government and business institutions on building interactive, integrated spatial information available on the Internet (Figure 1, below). The digital cadastre (DCDB or its equivalent) is the fundamental data set in a national SDI and a successful land market. *iLand* makes the cadastre even more significant: modern land administration demands a cadastral infrastructure as the fundamental layer of land information capable of supporting those "relative" information attributes so vital for land regulation and equitable taxation. Simply put, the DCDB as the authoritative system reflecting actual land arrangements becomes the definitive location identifier for whole of government purposes. The outcome is not only better organised land and spatial information, but better organisation of place information throughout government to enhance policy making for sustainable land management, tax equity, and business-to-business ease of operation.

iLand is similar to what the Open Geospatial Consortium (OGC) calls the "Spatial Web". The spatial component of land information is the universal need in all systems of information about land, whether they catalogue street furniture or collect Capital Gains Tax. The advantages of these new computer tools are visualisation of information and interoperability, presupposing a workable level of semantic consistency. Indeed, visualisation is the most popular output of spatial systems, though it is far from easy (Bruce and Kahn, 2005).

iLand goes further by identifying location as the stable component of most government decisions and means of organisation of complex relative information. Governments can use location to coordinate other information that, by its nature, changes constantly and rapidly. Information can be organised around the "where" component of government policies and day-to-day operations. And the "where" can be made understandable because computers turn X,Y and Z coordinate information into addresses and identifiable places. While technology is not yet at this comprehensive stage, it is clearly heading in this direction.

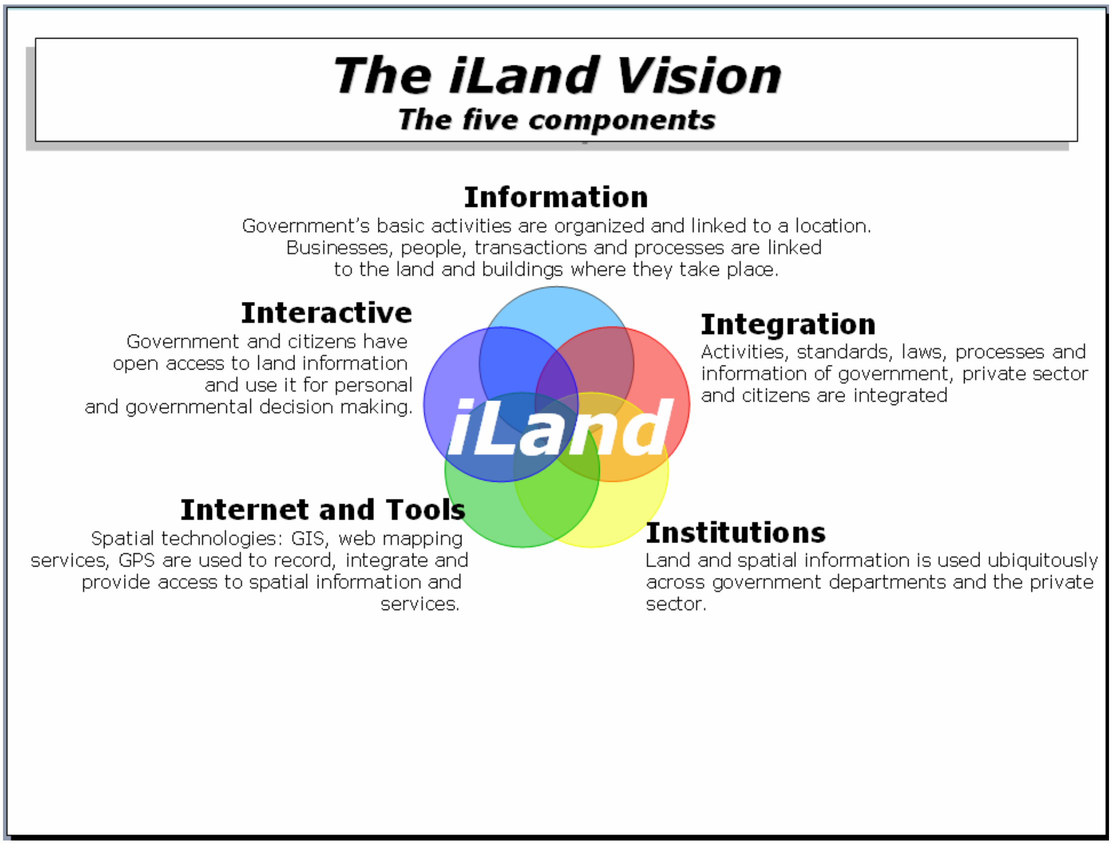

Figure 1 – The *iLand Vision*

5. CONCLUSIONS

Information needs are extending in response to the drivers of sustainability accounting and spatial enablement of government. Information, of itself, is not the goal. Only when information serves the purposes of government in delivering sustainable development is it worth the efforts of collection and maintenance. The new world of digital land information will find much greater computer assistance to the whole of government if the *iLand* vision is achieved. Central to this vision is the spatial enablement of land administration systems, and the parallel spatial enablement of other key government sectors. Computers are getting better at providing "where" information. In *iLand*, the information about place becomes the key organiser of all those sets of data where location or place is a component.

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