

# BENEFITING FROM TECHNOLOGICAL INNOVATIONS

# ICT and Land Administration

All land administration organisations face similar challenges: they need to become less bureaucratic, simpler, cheaper and more transparent. Design and implementation of traditional approaches is so time-consuming that land laws are adapted to provide for simpler procedures. Unconventional approaches are urgently needed, both conceptual and technological. The author reviews recent examples of both.

Technology is a major facilitator for process acceleration. Countries now at a more advanced stage of development enjoyed the bene-fits of IT application at an earlier stage. Many now face renewal of their IT architecture to cope with evolving customer demand and IT opportunities.

#### Strategic Alignment

All land-administration organisations expend much effort in determining, registering and disseminating information on ownership, value and use of land. The large amount of data involved is subject to many changes, needs to be kept up to date and must be accessible for retrieval. Consequently, operations can only be carried out efficiently and effectively with ICT support. However, what is the appropriate approach to organisational objectives in relation to the opportunities offered by ICT? The †strategic alignment model', as developed by Henderson and co-workers at the Massachusetts Institute of Technology in 1992, is of use in choosing an approach. The strength of this model is that it relates strategic and operational aspects of an organisation's objectives to its ICT policy.

#### **GI** Managers

In the past, organisational objectives were specified prior to selection of the technology requisite for achieving these. In contrast, today developments in technology in part determine the objectives. Examples are the;

- rapid supply of land information to customers enabled by internet technology
- · daily maintenance of up-to-date information enabled by database technology
- rapid and on-line delivery of notarial deeds and title documents enabled by digital signatures and the associated security measures.

The formulation of objectives is thus a duty shared by general and ICT managers, or more precisely by those with sufficient insight into both types of management: the geo-information managers. The strength of the model thus also lies in its explicit indication of the need for changes in strategy (referring to both object-ives specified for the organisation and for the ICT marketplace) to be accompanied by changes at operational level.

#### Standardisation

Users and industry accept standardisation efforts made by The Open Geospatial Consortium (OGC) and the International Standards Organisation (ISO), such as ISO T211. The comprehensive OGC set of OpenGIS standards on spatial-data management is adopted by the GIS and database industries and their support for interoperability, data access for warehouses and easy data exchange create new perspectives for existing and new cadastral systems. The first internet-GIS applications are already operational within a cadastral context.

Standardisation of the Cadastral Domains is relevant because computerised cadastral systems can support a customer and market-driven organisation with changing demands and requirements. Customers require an efficient online information service linked to the database(s) of cadastral organisations. The application software for support of cadastral processes is in many countries being continually extended as a result of changing requirements. In the future the volume of cross-border information exchange is expected to increase, particularly within the European Union.

#### **3D** Cadastres

PostgreSQL is advanced Open Source database software with sophisticated spatial functionality, including 3D, history tracking and spatial clustering. The MySQL database server is a popular open-source database and includes spatial functionality. Apart from Open Source databases, GIS and platforms such as Linux are available. Indexes of Open Source/Free GIS-related software projects are published on the Web with references to OSRS, FreeGIS.org, Metalab Linux Archive and Fresh Meat.net, and webmapping with Scalable Vector Graphics. Sweden's Lantmäteriet and ESRI have co-operated to develop ArcCadastre, a tool adapted for cadastral and mapping activities. It makes use of different kinds of spatial management in different situations and extends mapping functionality with survey and cadastral functionality. Companies such as Caris, Intergraph, and Bentley now also provide software for cadastral applications. The number of tunnels, cables and pipelines, underground parking places, shopping centres and the like have increased greatly over the last forty years. Is traditional cadastral registration, as based on the 2D-parcel concept, able to register all situations that present in today's

world? Although a 3D approach to cadastre is new, some countries have already solved (the legal aspect of) the problem of 3D-cadastral registration.

# Data Acquisition

Earth Observation Satellites such as Landsat 5 and 7, Ikonos, SPOT 5, Radarsat-1 and Quickbird provide geo-referenced, high-resolution images used in mapping, city planning, GIS updating, agriculture, land-use monitoring and land administration. New approaches should be investigated in relation to Lidar (Airborne Laser Altimetry). These are multisensor systems operating from aircraft or helicopter and consisting of a reflectorless laser range system and a positioning system. Combination of the results with tape measurements (street-level) and GPS (inner side of street blocks) could result in cadastral maps produced in an efficient way. Experiments with handheld GPS using point positions to relate property identifier number, land cover, crop type, soil condition and number of structures etc have been performed. Combinations of digital video, GPS and GIS derived from rapid ground-data capture from a car have been tested. See further the use of the Cyclomedia system in some European cities or the use of video cameras for mapping from planes.

Technologies for 3D Lasermapping (Terrestrial Laser Scanning) are rapidly evolving for capture from ground stations of objects such as 3D point-clouds. Here there are relations to developments in 3D Cadastre. In the near future Galileo will double the number of positioning satellites, resulting in improved efficiency, better positioning in urban areas and enormous new impetus behind location-based services. These developments deserve much more attention on the part of the cadastral community.

#### e-Government

Technically, digital land-information products offer considerably more possibilities for perfect reproduction and fast, inexpensive and easy distribution. Variation in product range is possible in many ways. Customers want to be served in a professional way, with user-friendly tools and one-stop-shopping (integrated service delivery). The information on offer should be timely, up to date, reliable, complete, accurate, relevant and, if necessary, customised and well-integrated with other relevant datasets from other suppliers. The systems should also be compatible with customer's working procedures. Customers want electronic conveyancing techniques such as electronic signatures, encryption, hash values and measures against bit-loss. Workflow management techniques will become applicable which will have a positive impact on the management of daily fluctuating supply and demand as allocation of workload becomes possible at the site at which a work force is currently available.

## **Concluding Remarks**

Developing countries face the challenge of pro-poor land management and administration and are aiming for as prompt as possible enhancement of authority services. These countries face the issue of how to organise land information in support of their governance. The World Bank, an important funder of Land Administration in many countries, and other international organisations, see low-cost approaches as sometimes conflicting with ICT. This vision may be challenged: low-cost approaches will probably eventually require high technology. Many leaders of land-administration organisations are kept away from strategic issues and are too busy with the daily problems they experience in service delivery. However, leadership is necessary to develop the future in accordance with clearly set government requirements.

## Further Reading

- Barodie, G., Barry, M., 2004, Palmcomputers for spatially referenced social survey in upgrading informal settlements, New Zealand Surveyor No 294.
- Henderson J.C., Thomas J.B., Venkatraman N., 1992, Making sense of IT: Strategic Alignment and Organisational Context; Centre for Information Systems Research, MIT, Cambridge, Massachusetts.
- Home, Jackson, 1997, Our Common Estate: Land Rights for Informal Settlements: Community Control and the Single Point Cadastre in South Africa; RICS.
- Montoya, A.L., 2002, Urban disaster management: a case study of earthquake risk assessment in Cartago, Costa Rica; PhD thesis, Utrecht University and ITC.
- Stoter, J. 2004, 3D Cadastres; PhD, TU Delft, The Netherlands.

https://www.gim-international.com/content/article/ict-and-land-administration