



"Access to cadastral data on mobile devices is now out of the box"

Brent A Jones, PE, PLS , Global Manager , Cadastre/Land Records, Esri shares his views on trends and challenges in cadastre

What are the technological advances in cadastre?

There have been many technological advances in cadastre, particularly with the workflows of how parcel data is managed and published. It's obvious that data collection via satellite imagery, total station, and GPS have all advanced, but lesser seen is the management of this data, particularly maintaining all aspects of parcel data, which include history and maintaining data integrity. The parcel fabric is a new data structure purpose built to manage parcel data. This model enforces survey methods and properly handles parcel data, ensuring a new standard for data integrity. It also allows the use of what data a cadastral agency has and provides new tools for improving data quality employed with standardized workflows designed for production efficiency. The parcel fabric incorporates old and new record measurements, enabling the incremental improvement of data quality over time.

Public data access is another area where there have been recent significant technological advances. Publishing cadastral data via web services enables the use of this data in web browsers;

other applications; and, importantly, mobile devices. Access to cadastral data on mobile devices is now out of the box.

Cadastral technology is headed for modular, configured solutions operating on a common platform, using standard data models, and leveraging cloud capabilities. It is very costly to develop and maintain custom solutions. Commercial off-the-Shelf (COTS) solutions give cadastral agencies the ability to configure software to their organization's requirements while realizing the benefits of supported commercial solutions.

Given the poor state of the land records are in many countries, is it really difficult to incorporate modern technology in cadastral systems?

Successful cadastral systems that started with very poor land records have been built around the world. Success depends on high-level commitment to the endeavor, changing the culture in the organization, and building a system of sustainability. It's not difficult, but it takes sustained commitment. Even with modern cadastral

systems, the effort of sustaining the systems is a challenge. Many IT managers in all areas of government are working to implement COTS that can be sustained. When large custom cadastral systems need updating, it is costly. Managing a COTS solution is much easier and less expensive to maintain with the added benefit of new capabilities with new releases.

GIS can provide a powerful backend support to any cadastral system. Do you think that users are ready to use it given the fact that still in several countries, land records are still maintained in traditional way?

GIS is the platform technology for cadastral systems, from collecting and managing data to producing cadastral products and sharing data within government and with the public. With new cloud GIS technologies, it is becoming easier to implement cadastral systems. Some organizations implement GIS-based cadastral systems that mimic the traditional process but use new technology. This gives a good foundation to update and modernize. Some more progressive organizations build a completely new process and system. The most important parameter is leadership and to have a champion to follow through to ensure the system is properly implemented, personnel adequately trained, and the resources are in place to sustain the system.

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Is affordability of the technology is also one of the factors?

When the return on investment (ROI) is part of the equation, affordability rarely is a factor. Good cadastral systems return manifold their cost in economic benefit. In fact, many people, including Hernando de Soto, author of *The Mystery of Capital*, believe that a successful cadastral system is a necessary precondition to a successful economy. When dealing with custom systems, the cost of developing and maintaining them is certainly a factor in success, but with the new capabilities of GIS technology and the use of standard data models like Land Administration Data Model (LADM), ISO International Standard 19152, the cost and complexity are considerably less.

Is lack of capacity another factor in some countries?

The lack of capacity is certainly a factor in developing economies. We are working to address this. We have recently made freely available the book *Land Administration for Sustainable Development* from Esri Press in e-book format at <http://esriurl.com/SusDev>. Along with this book, which is currently being translated into Spanish and French, the Centre for Spatial Data Infrastructures and Land Administration is developing land administration GIS exercises based on LADM to complement the book. With other contributions from the authors, we will have a complete curriculum in land administration and GIS that we will freely distribute.

How do you see the application of such technology in conflict management at local levels related to land?

Many conflicts over land occur when information about ownership and location is not available. Developing property ownership information and making it easy to find, use, and share are key to avoiding conflicts. GIS-based cadastral systems have the core technology to collect

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and manage ownership information, and they have the core technology to share information in many ways—automated map generation, web maps, and maps on mobile devices are some of the ways that data can be published. Public access to current, authoritative cadastral data is key to avoiding land conflicts.

How do you look at 3D cadastre? Is it an oversold concept?

Societies have been working with 3D property rights for a long time—underground utilities, mineral rights, submerged lands, etc., so as a concept, managing 3D cadastre is sound. Some of the concern comes in when dealing with 3D in dwelling/condominium-type units and how to manage that data with technology. For a developing economy, developing a sound cadastre is not exclusive of 3D, and LADM allows the inclusion of the third dimension, but perhaps focusing on this for a developing economy may not be as productive as getting a solid two-dimensional cadastre in place but leaving the provision for 3D when the demand is there. For highly developed economies with high-rise complexes, such as Singapore and Hong Kong, 3D cadastre is a necessity and core to the continued development and management of their cadastre infrastructure.

What could be the role of technology providers to encourage the effective implementation of modern cadastral systems?

There are several roles of technology providers to the cadastral industry. First is to provide a platform that helps cadastral organizations work more efficiently and meet ongoing changing needs. We do this by working with many organizations around the world to understand and develop best practices and build solutions around these practices leveraging new technologies. This delivers to the cadastral organization solutions that the technology provider tested and then built into core technology. This helps minimize costly software customization. For example, in the United States, there are over 3,000 organizations (primarily counties) that maintain parcel data. We have spent years studying workflows, common challenges, and common outputs. As a result, we developed a solution (ArcGIS for Land Records) that meets these needs and provides efficient workflows for common tasks. This allows local governments to use COTS technology that costs less and requires much less ongoing IT support than customized solutions. Additionally, organizations can take advantage of new core technology releases by using COTS technology and avoiding being locked into a particular software version because of extensive customization.

Technology providers also play a key leadership role in developing new solutions that respond to both the needs of cadastral agencies and new technologies as they become available. A good example of this is the challenge of maintaining IT infrastructure, publishing data, and the cloud. Building a GIS environment in the cloud enables cadastral agencies to publish data for public access, share internally, minimize IT infrastructure investment and maintenance, and deliver new capabilities for cadastral data to be consumed on mobile devices such as smartphones and tablets. We understood the need, developed the capabilities on new technology, and delivered solutions and new capabilities. ▽