GIS/LIS: the Role of Technology in Land Administration

Land Administration umfasst die Aufgaben der amtlichen Vermessung und des Grundbuches, aller privaten und öffentlichen Rechte an Grund und Boden, aber auch weiterer Informationen zu Liegenschaften, Planung und Umwelt. In Zukunft werden diese Informationen in Land- und Geoinformationssystemen verwaltet werden und allgemein zugänglich sein. Die GIS und LIS werden heute hauptsächlich als Hilfsmittel verwendet, um Geoinformation zu speichern und abzurufen und sie graphisch anzuzeigen. Um einen grösseren Nutzen zu erhalten, sind Mechanismen zu entwickeln, die eine bessere Nutzung der Daten erlauben. Die Informationstechnologie bietet laufend neue Möglichkeiten, vereinfacht die Anwendung und ermöglicht damit den Zugang für Nichtspezialisten. Der Fokus muss sich aber vermehrt auf die Informationen selbst richten.

La gestion du territoire comprend les tâches de la mensuration officielle et du registre foncier dont la description de tous les droits fonciers publics et privés fait partie intégrante, ainsi que d'autres informations concernant les immeubles, l'aménagement du territoire et l'environnement. A l'avenir, ces informations seront gérées dans des systèmes d'information du territoire ou systèmes d'information géographique et seront accessibles à tout le monde. Aujourd'hui, on utilise les SIT/SIG surtout comme outils permettant de mémoriser, de consulter et d'afficher graphiquement des informations géographiques. Afin d'en tirer un plus grand profit il faut développer des mécanismes qui permettent une meilleure utilisation des données. La technologie informatique offre constamment de nouvelles possibilités et simplifie l'application. Elle donne ainsi accès aux non spécialistes. Toutefois, l'intérêt doit davantage être concentré sur les informations elles-mêmes.

La gestione del territorio comprende i compiti della misurazione ufficiale e del registro fondiario, di tutti i diritti pubblici e privati legati ai fondi e al suolo nonché di ulteriori informazioni su immobili, progettazione e ambiente. In futuro, queste informazioni saranno gestite dai sistemi d'informazione geografica e del territorio. Oggi, i SIG e i SIT sono prevalentemente utilizzati come strumenti ausiliari per memorizzare, richiamare e visualizzare graficamente le informazioni geografiche. Per pervenire ad una maggiore redditività bisogna sviluppare dei meccanismi che permettano un migliore sfruttamento dei dati. La tecnologia dell'informazione continua a offrire nuove possibilità, semplifica le applicazioni e offre l'accesso non solo agli specialisti. Tuttavia, l'accento va ulteriormente posto sull'informazione stessa.

P. Dale

Introduction

The last decade has witnessed an unprecedented period of social, political and economic change. The stimulus for this has in part been developments in technology that have provided greater access to information. These developments are

having a major impact on the operation of land administration systems, many of which are being re-engineered to accommodate new methods of service delivery. Although there is a trend towards conformity in the technical operations of data capture, storage and presentation, convergence within the legislative framework is still a long way off, especially in Europe. In the activities that have become known by some as geomatics, some as geo-engineering but for which some still prefer the old-fashioned name surveying, con-

formity is happening at many levels. At the local level, survey instrumentation and data handling software are forcing standardisation in the ways and means whereby the surveyor carries out his or her work. At the country level we are seeing the emergence of national land information systems that ostensibly produce new products and services but all too often computerise the mistakes of the past. Regionally, in Europe, there are organisations such as CERCO and EUROGI that are trying to provide umbrellas under which we can all shelter. Similar regional groupings are emerging for instance in South East Asia. At the international level there are global geo-information databases covering the world at a standard map scale of 1 to 1 million. There is even an initiative currently being launched to create an ISO standard qualification for geomatics practitioners (as part of TC211) so that those holding this certification can obtain employment anywhere in the world.

Wearing for a moment the hat of President of the International Federation of Surveyors or FIG, an organisation that has been around for 120 years, I can say categorically that we oppose too much prescription. Although we believe in high standards and have issued our own ethical code and guidelines for professional conduct, we do not expect everyone to be the same. «Vive la différence» as the French would say. And I am pleased to note that in the cadastral field MOLA, the Meeting of Officials in Land Administration set up by the United Nations Economic Commission for Europe (UNECE), is not yet seeking to achieve a single cadastral system for the European region. There is a fine line between having the convenience of modern technology so that we can do what we want, and being dominated by that technology so that we are its servant rather than its master. While praising the contribution that the IT industry is making to the developing world scene, I caution against too much conformity especially in the field of land administration, part of which is known to many of you as the cadastre.

Information Technologie (IT) and Land Administration

Land administration is the processes of regulating land and property development and ensuring the proper use and conservation of the land. It includes the resolving of conflicts over the ownership and use of the land and the gathering of revenues from the land through sales, leasing and taxation. It is concerned with three broad attributes of land – its tenure, its value and the way in which it is used. At the heart of most land administration systems is the cadastre, an institutional arrangement that has been around for so long that the word now has many different meanings. It was because of these diverse interpretations of the term that the UNECE chose to use the title «Guidelines on Land Administration» rather than «Guidelines for the Cadastre» for one of its contributions to the Habitat II Conference in 1996. Rather than focus on the juridical, fiscal or multi-purpose cadastre and treat land ownership or land values or land use as separate entities, the guidelines sought to focus on the inter-relationships between these categories of land information. This has important implications for the future, especially when we are seeking to apply modern technological solutions to old problems.

The problems of the cadastre have been around since the Pharaohs ruled Egypt – where for instance duplicate records were kept of all the grain harvests and the taxes due. One set of stone tablets recorded the annual yields and was kept in the Pharaoh's Palace while another was kept in the Treasury. The creation of back-up systems is not a new idea – the Pharaohs knew all about what happens when you lose data.

Nor is it a new idea that we should look holistically at the ownership, value and use of the land. The Pharaohs controlled all three attributes so that they could reallocate land each year after the seasonal flooding of the Nile delta and tax the land users. Since those days, the processes of managing land as a resource have become fragmented. In much of Europe, for example, this has led to the separation of the tax-oriented Kadaster from the land ownership records held in the Land Books or Grundbuch. The control of land use has in general become a local rather than central government responsibility and in many countries would-be purchasers of land have to make separate enquiries to find out what they can do with any land that they want to buy. Use rights and ownership rights are all too often treated in separate ways by separate organisations. What is new today is that we are now using IT in land resource management to achieve goals that were established millennia ago.

I have argued elsewhere for the need to take a more integrated approach to land administration. It seems to me self-evident that the way in which the land is used affects its value, the manner of use being dictated both by its physical characteristics and planning laws. Conversely, the state of the land market will influence the way in which the land is used and whether for instance it is left derelict or is the focus for construction and development. The form and stability of the real estate ownership rights will likewise affect any property values and the manner in which the land is used.

If we are to talk about sustainable development then surely we must manage the information about land and property in a way that allows land resource managers to understand what is going on. Yet I have heard physical planners say that they are concerned only with the way that space looks and operates and not with what the market will pay for it. I have seen tax authorities ignore the impact that land and property taxes may have on the way that land is used. And I have talked with registrars of title to land who have no concern other than to record how and by whom the land is currently owned.

I stress this particular trinity for two reasons. The first is that we can do something about it since the IT industry has created some appropriate technology. Both geographic information systems (GIS) and Java, the theme of this conference, are, more than any thing else, integrating technologies. What should differentiate GIS from digital mapping with a data base attached is its potential to bring different pieces of information together so that the inter-relationships can be revealed. Java likewise helps to integrate the flows of data, as has been demonstrated so impressively at this Summit. In land administration we not only have problems that desperately need an integrated solution but also, increasingly, we have the appropriate data in digital form. In theory at least it should now be easier to achieve the optimum management of our land resources.

The second reason for focusing on the inter-relationship between land tenure, value and use is because land is every nation's most important asset. Without land no nation would exist. Land is vital to every living creature and especially to humankind. In some countries, especially in Eastern Europe, buildings are regarded as separate entities and not parts of the land – you can buy a building without owning the land on which it stands. Here I am using the term «land» in a western European sense to include buildings, things growing in the earth, minerals beneath the surface, and the air above it – in effect all things connected to the soil. As such, land has been estimated to be worth approximately a fifth of any nation's GDP. Yet our knowledge of how land markets really operate and whether their fluctuations are the causes or the effects of national economic performance are not well understood – precisely because the data have not been easily available and have in some countries been regarded as secret. All this is beginning to change. There is already a critical mass of data available for analysis. Many nations are beginning to build their own national land information system or what in the UK we choose to call our national land information service. In the UK we are also struggling to create what is known as «joined-up government» in which there are horizontal flows of information between central and local government departments and improved access to information for the public. The

reasons for this greater openness are in part because of the opportunities created by technology but also because of the need to respond to the challenges that were so well set out in the UN Agenda 21 and the Global Plan of Action. As life becomes increasingly complex so we need to understand how things inter-relate, and to do so in a simple way that lay people can understand. Too much sophistication is not what is required.

Are we therefore at the beginning not only of a new millennium but also of a new understanding of the importance of real property in society? I hope that the answer is «yes» but there are still a number of institutional problems to be overcome before we can reap the benefits of what the IT industry is helping to create.

Constraints on IT Innovation

The Politics of Land Information

It has often been said that if you can think it then you can do it, given enough time and money. We can go to the moon or clone living creatures, including no doubt ourselves. Many ideas that started in science fiction have become science fact. The issue is one of priority and whether there is a consensus amongst the leaders of society that any particular initiative will give rise to significant benefits, preferably in the near future. Unfortunately, developing the cadastre is something that in general fails to capture the imagination of politicians. Most parliamentarians understand that good land records are an essential component of good land administration and that land is a resource that must be handled with care. But therein lies the problem. Many politicians consider that land is too sensitive an issue to be debated in the public arena.

This is especially the case in east and central Europe. Many of the countries seeking entry into the European Union have sensitive land issues that will need to be addressed if they are to satisfy the *acquis communautaire,* the rules and regulations that all nations of the union must accept. These include the opening up of their land

markets to all members of the European community. When, for example, Poland and the Czech Republic join the EU then it should be possible for any member of the Community to buy land in areas such as Prussia or the Sudentland, areas that were formerly occupied quite legitimately by people who are no longer national citizens. This is seen as a threat rather than an opportunity by many of the indigenous peoples. The more effective that you make the land market, for instance through the use of IT, the easier it will be for the economically powerful to dominate the weaker and poorer, adversely affecting both nations and individuals.

Land ownership raises deep emotions. Consider the case of Slovakia where there are individual fields of 20 to 30 hectares that are of a good workable size for modern farming but which have more than 300 hundred owners and more than a thousand co-owners. This causes a great deal of difficulty for those managing the spatial data bases that have been set up to record all these interests since every interest has to be recorded and kept up to date. It also makes land management difficult. Few people will be willing to buy or institutions willing to lend money on the security of land such as this. Yet in Slovakia the ownership of land is regarded as a basic human right and when proposals were made to reform the system they were opposed by human rights activists. The system cannot be changed without changing the Slovak Constitution and whereas laws can easily be amended, altering a Constitution is much more difficult.

In consequence, many of the countries in east and central Europe are rebuilding their systems in conformity with the past. There is a reluctance to accept change except in so far as the technology of data handling. This is in part because errors in the cadastral data base can lead to civil strife, so emotive are the issues surrounding land. In topographic mapping we tolerate our maps being less than one hundred per cent accurate. The data in the cadastre must be up to date and accurate at all times and must be handled

with integrity and care since land administration touches a nerve centre in every society. Any reform of the system must take into account social and political sensitivities.

Costs and Benefits

The second stumbling block in the way of introducing new technology into land administration is the uncertainty about costs in relation to possible benefits. Given that many countries have Land Offices located at the local level so that the public can obtain easy access to land records, the equipping of the Head Office of the Cadastre with new technology solves relatively few problems. There must be a multiplying factor to ensure that all citizens benefit, not just those close to the administrative headquarters. In Greece, for example, there are currently around 400 local land offices. Servicing that number will cause economic problems while reducing the number would create political difficulties and reduce the accessibility of the system. Sweden has of course solved such a problem by wide area networking but the Swedes have been building their system for nearly 30 years. In many countries the level of investment in IT is not nearly as high as that in Sweden, nor is the infrastructure so good.

It is of course a truism that the costs of hardware and software pale into almost insignificance compared with the costs of data. People have long ago learnt that the price of computers and computer packages correlates poorly with the cost of setting up a computerised cadastral system. Fortunately a great deal of effort has already gone into data conversion so in theory the benefits of this can now be reaped. In reality however the objective has almost always been to provide a data input and retrieval service rather than a facility for data analysis. Hence the full benefits cannot yet be realised.

Data conversion is a necessary but insufficient process. Keeping the cadastral data up to date is the major challenge, both technically and organisationally. The rate of change of cadastral data is difficult to predict since it depends to a significant

extent on the current performance of the land market. This fluctuates in a way that is often difficult to model since the price of property depends on so many externalities. This is especially so in the countries in economic transition where the market is developing only slowly. Predictions of what resources will be needed for next year's land market can seriously under or over estimate what will subsequently turn out to be that case. And since the cadastre is normally a central government responsibility and most governments have limited flexibility when hiring or firing additional staff, the result is usually wasted resources or a failure to meet demands.

IT vendors often underestimate or are unaware of the difficulties in implementing their solutions since they understand the technology but do not always understand the environment in which it is to be implemented. A few are, in modern political jargon, economical with the truth and as in every profession it is these few that give the industry a bad name. It will be interesting to hold a «post mortem» after the so-called millennium or Y2K bug has done its damage. How an industry can leave to so late a problem that has been known for nearly fifty years is a mystery and does the industry no credit. It may be no bad thing that Y2K will create a significant element of distrust in computers by the public and more especially by those commissioning IT. It will not help the fainthearted when they consider whether or not to invest in computer systems. Such people are already worried about the many unseen costs and the lack of tangible benefits.

To date there have been few post-implementation studies to prove whether investment has been successful. There are, of course, significant difficulties in carrying out any rigorous form of analysis since there are often major costs up front while the benefits are longer term. Indeed many benefits do not arise until years after the initial investment. In the case of land administration a recent study under the EU ACE programme has tried to quantify the progress of a number of former command

driven economies as they move towards a fully operational land market. The report found that progress is slow until a point of critical mass is reached when the market suddenly begins to accelerate. The findings of post-implementation studies are likely to differ significantly depending on how soon after the investment the studies take place. The problem is to persuade the proverbial cheque signers of the need to focus on long term rather than short term goals.

The land information commodity market

Land related information is a valuable commodity and there is no doubt that in time it should be possible to add further value to it. Information markets are developing but there are a number of problems that have yet to be resolved with regard to the marketing of government held data, especially when those data are partly of a personal nature. In countries such as the Netherlands, Sweden and Austria there is already a tradition of open access to the data and pricing strategies have been worked out to allow the public online access from remote terminals. Many countries have yet to reach such a state for political, social and technical reasons. There are, for instance, many issues under Data Protection legislation that need to be addressed. In the UK almost all data can be said to be personal, even if they relate to bricks and mortar since a house can be said to identify its occupants. The use to which personal data are put must be registered and these uses are not always easy to foresee. Further, consider the case of a postal address. It is not unreasonable if there is a high level of crime in the area where you are living for the insurance premium on your property to be raised. But is it fair if several people in the street where you live fail to pay back money borrowed from the bank and you are refused a loan on the grounds that you live in an area where there is a high risk of default on repayments? How· much spatial information should be in the public domain and what if any should be the restrictions on its use? Uncertainties over

what may be done legally or illegally with data is inhibiting the growth of the spatial information market and hence the ability to recover the cost of investment. Or consider the issue of copyright. While the laws governing the copyright in individual data sets are now fairly clear, the rights to exploit the value of what is added by combining data sets are still uncertain. Given that the key benefit of using GIS technology lies in its ability to add value, these legal uncertainties in what can be done hamper the growth of the information market and hence of the use of the technology.

Similarly, uncertainties arise over privacy, especially when the combination of data sets reveals information that is not apparent in the data when held in separate files. What constitutes privacy and what rights the citizen has to restrict access to personal data are often obscure. The laws on intellectual property and the rules governing the distribution of public and private data are still in the making. Until all these problems are addressed, there will be a reluctance to exploit the data. Because of this, there is for instance a discussion document from the European Commission Directorate General XIII currently on the web (at http://www.echo.lu/legal/en/access.html) raising issues concerned with the use of public sector information as a key resource for Europe. Likewise a project known as ELADIS is under way investigating information systems in local authorities in Europe. Thus in the European context, progress is being made, although it is slow.

Conclusions

In many countries in economic transition there is a reluctance to focus on the needs of the so-called «man or woman in the street». Their administrative systems have over the last fifty years focused on the immediate needs of politicians and administrators rather than on the public at large. All too often, technology is being used to improve the internal workings of the administration rather than to produce new products and services; indeed all too of-

ten the technology is being used for technology's sake and not for the benefit of the public. Even in Western Europe there is a reluctance to treat land-related information as a corporate resource. The motive behind some IT investments has been to reduce the number of civil servants rather than to provide the public with better access to data that are held about them.

Yet the technology is merely a transitory thing with a shelf life not much longer than frozen food. Data, especially data for land administration, must stand the test of time. Discussions on IT tend to focus much more on the T than the I, just as in GIS it is the system more than the information that is the focus of attention; data are needed to feed the system rather than systems needed to exploit the data. There needs to be very much greater understanding of information and its role in society than heretofore.

The excitement about the new technologies was inevitable in the early days but now is the time to make a reappraisal. Y2K has already started this process for we are all being held ransom for the most trivial of reasons that anyone in the IT business with a gram of common sense should have foreseen. Systems are still insufficiently user friendly though progress on the hardware side has in general been excellent with market forces weeding out the inefficient. Software is an altogether different story and the market has killed off many tender shoots before they could

grow to maturity. Many packages are too clever for their own good so that in seeking to please all the people all the time they often end up collapsing or confusing. There are very few people who want to or can use the full functionality of many packages, or have the time available to learn the full system. Simplicity is what they want, together with their own control over what they are trying to do. If JAVA and the other developing technologies can achieve this as has been suggested at this conference then that truly will be a great step forward.

What people really want is a simple life with idiot-proof systems that are easy to operate. In the UK up until now most training in GIS, for example, has been at the post-graduate level. You have needed the intellectual capacity and maturity of a graduate before you can be a qualified operator of GIS. What nonsense it all was – and still is. If we are to create wealth through information – and that certainly is possible – then ordinary human mortals must be able to take advantage of what is being created. Already we have the data rich and the data poor and this distinction correlates with the financially rich and financially poor. A lot of effort has been put in by the IT industry to improve the quality of the «front end» but more needs to be done, especially in GIS or whatever technology replaces it.

People undoubtedly want access to data. Throughout the UK there are a number of local authorities that are providing train-

ing courses for rural communities. For instance a minibus equipped with 8 computers arrives once a week in the Scottish village where I live and 8 members of the local community (incidentally, all women) are learning word-processing, spreadsheets and Internet surfing. There is already a queue for places on further courses. The explosive demand for access to information on the Internet is all too evident. It is simply a matter of time before the market in land and property data begins to take off. Achieving long term sustainability depends on exploiting the tools that the technologists have created, and will continue to create, in ways that serve the needs of all people, not just the fortunate and the computer literate. We need stronger links between you, the IT industry, and us, the IT users. You need to understand us better, but we the users also need to define our problems more clearly and to take a more innovative approach to interpreting the data that are now at our disposal. The problem is that solutions are much easier to develop than problems are to define.

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