The Impact of e-Government on Cadastral Systems and the Role and Positions of National Mapping and Cadastral Agencies (NMCA's)

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Key words: Cadastre 2014, e-Government, Services, Geo-information, Business processes.

SUMMARY

Cadastre 2014 has proved to be a strong vision on the future role of the cadastre. Its objectives are or will be achieved in many countries. At the same time e-Government and e-Business will have a substantial effect on the position of cadastral organizations in government and value-adding chains in general. The situation even might arise that the objectives of Cadastre 2014 are fully fulfilled, but at the same time the cadastre as an organization has become invisible. In our contribution we revisit the original conclusions of Cadastre 2014. We will discuss the impact of e-Business and e-Government in particular on cadastres and possible improvements that are possible for end-users.

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1. CADASTRE 2014 AND E-GOVERNMENT

Cadastre 2014 provides an excellent overview of the roles and evolution of the cadastre. Since the time of its writing (1998) the Internet has created a new business paradigm. In its turn that has greatly influenced the vision of governments (be it national, regional or local) on communication and information. It is widely believed that information and communication will be the central processes in the future. With Internet the technologies to connect end-users, applications or services are available and are becoming increasingly mature. What is apparent, however, is that the service level is still very much dependent on the quality of the underlying data and knowledge. Furthermore all data have to be available (or at least accessible) digitally. We are at the stage that most cadastral organizations (and other government organizations) are able to service their own customers and/or user groups through the Internet.

For e-Government to work it is essential that also information between government organizations can be shared. A simple example would be a query by location where each government organization can provide information ranging from environmental to cadastral information. In that sense the layered structure as sketched in Cadastre 2014 has been achieved at least on the surface. To really provide added value, however, customers also want information to be provided in a meaningful relation to each other. This requires that information is based on objects.
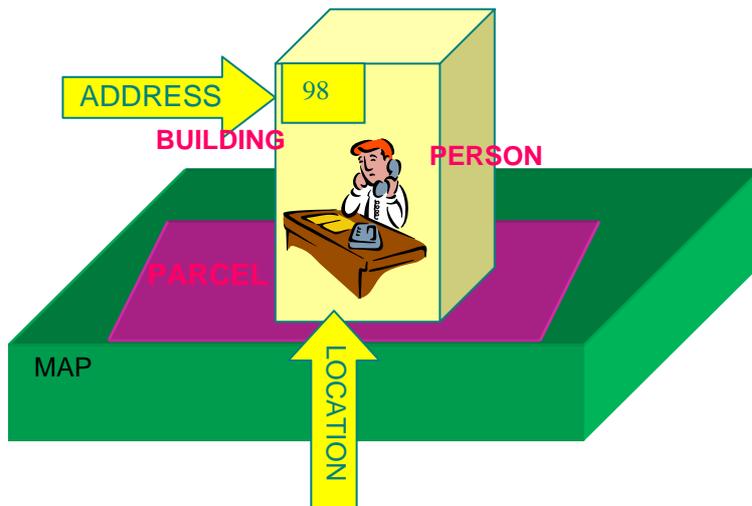
A legal land object, a building and a planning zone might be linked implicitly by location creating the layered structure presented in Cadastre 2014. More powerful is an explicit, uniquely link by means of objects, where for example the address is the common key. Then the layered structure is also realized truly interoperable at the level of information.

2. TOWARDS E-GOVERNMENT

For many purposes (simple queries, viewing) the location-based approach is sufficient. This basically requires that information is made available digitally and is related to a common reference frame. Google Earth shows us what is possible using such an approach. The intuitive ability of people to relate neighboring information is a powerful driver.

A higher level of service requires that also data objects are coupled. An example of such a process is the transfer of land. For this a much higher level of harmonization is necessary within and between organizations. In fact it requires an information architecture. Implementing an e-Government is also complicated because it changes the arrangements between government organizations and affects the business processes. Basic questions as how interdependencies and financing have to be arranged are part of the design.

At the ´operational´ level existing datasets have to meet the requirements of standards, correctness, consistency and completeness and the links between data elements (or level of interoperability) have to be defined. This requires a huge investment by governments. The benefits are, however, also substantial. Because data are coupled they have to be provided only once and because of the explicit relations the information remains up to date also if some of the objects change. This reduces maintenance costs, allows single entry and leads to consistent, up to date information. Not all data elements and/or data sets need to fulfill the highest requirements, but there is need for a basic, standardized set that can serve as a basis and a coupling mechanism for all other government information.

Figure 1: Relation between basic objects parcel, person and building and the access keys of address and location.
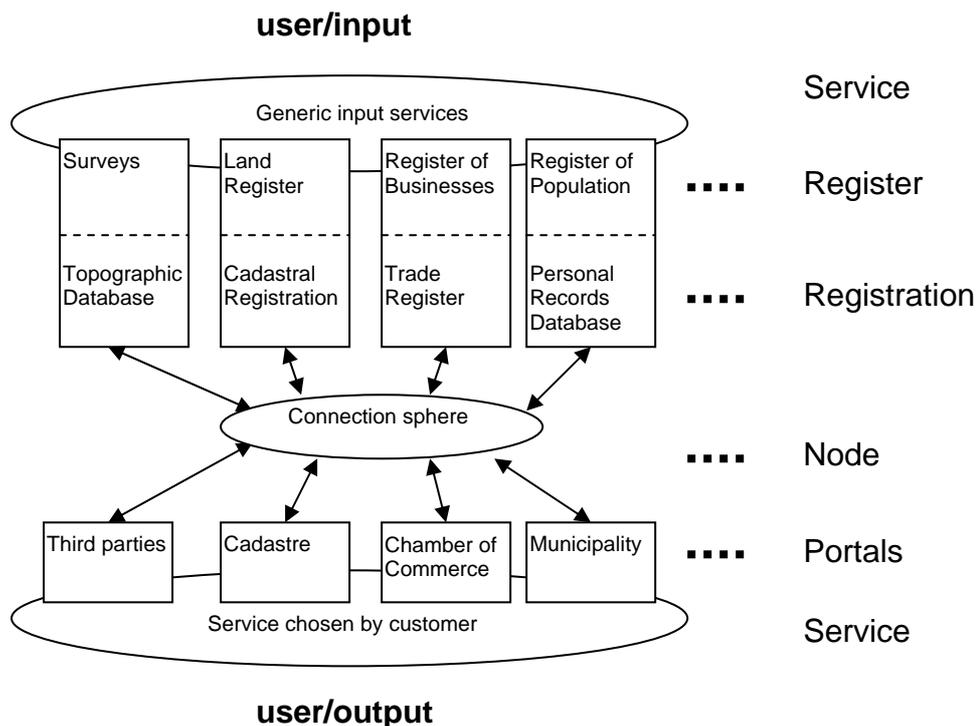
Figure 1 gives an overview of a possible set up of a basic data structure for a future multipurpose cadastre. Much information is coupled to parcels, buildings and legal persons (citizens, businesses and institutions). What has to be created is a common 'interface' between these objects. Location is the most general one. Moreover, many objects have an address. Creating the above relationships at the national level requires a large effort. Let alone at, for example, the European level. In it not by accident that the European INSPIRE initiative heavily relies on the coupling through location.

3. A VIEW ON THE FUTURE INFORMATION AND COMMUNICATION CHAIN

In the future we will arrive at an information- or service chain as given in Figure 2. Services (encompassing information and communication) will be the central element. For example: no longer the data on the legal land situation is required by the user, but the guarantee that for a certain area information is correct, up to date and complete. The end-user will communicate and will be informed through services. These services will be centered at (life-)events or decision points in processes and will often be invoked by services at the user-end. In order for

such a service to operate all data have to available digitally and have to be connected. Apart from the information chain also the communication chain will substantially grow. It is not only the information but also the way the information is or can be used (or which information is needed) that are of interest to the user.
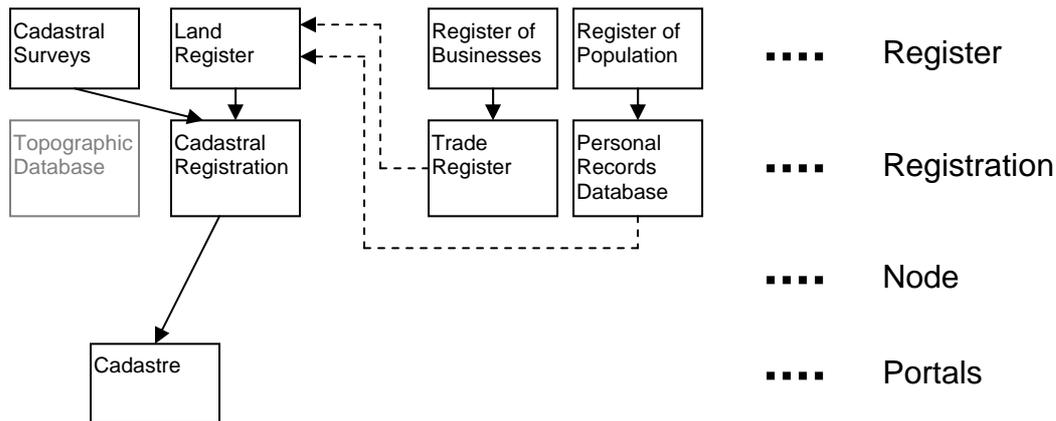
Both public and private sector will provide services. In the land market, for example, information on legal status, funds (mortgages), taxation, insurance, zoning information, soil and building characteristics, etc. are required for a real-estate transaction. Therefore services are based on components of cadastres, banks, notaries, real-estate agents, governments, etc. All parties involved will have a role in the structure presented in Figure 2.

user/input

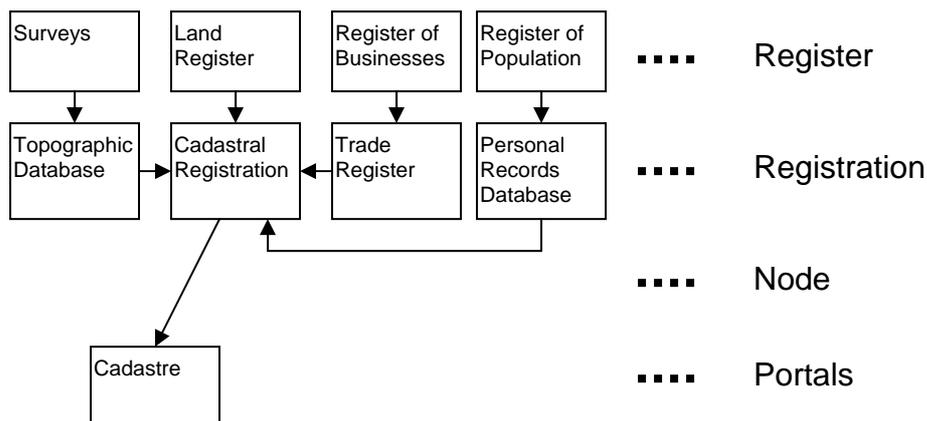**Figure 2**: The future information and communication chain

3.1 Evolution in the Cadastre

Considering our vision outlined above the Netherlands' Cadastre has come a long way and is still actively underway. In the Netherlands we have past the level of the paper and pencil cadastre (although we are still working at some levels with analogue information). Like most other organizations we started with digitizing our analogue processes. Data or input from other sources was not coupled at the level of the registrations automatically. A personal, visual inspection of the data (by for example a notary or government official) provided the link with the cadastral data (see Figure 3).

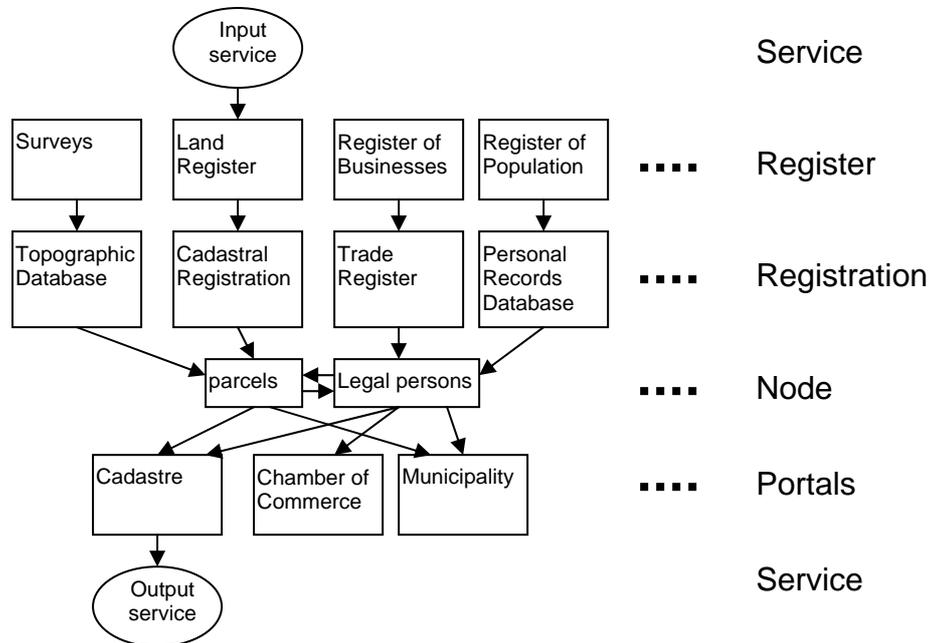**Figure 3**: First step: digitizing the core cadastral process

The next step we took was to link other registrations with our own registration (Figure 4). We established a link with the (national) personal records database 10 years ago. The geographic reference (being the large scale base map of the Netherlands) is automatically included in the cadastral base map since 2001 (when it attained national coverage). At the moment we are working on a connection with the trade register.

Figure 4: Second step: linking up to other registrations

Currently we are also working on connecting our registers through nodes (Figure 5). This is partly driven by a government program aimed at creating an e-Government environment in which citizens and businesses are served effectively and efficiently. Connections between the registrations are made at the level of nodes (e.g. one for the cadastre and one for address and building information). In the medium term the data will still be duplicated from the other registrations. In the long term the nodes will provide the ID's to link up (real-time) to the information needed. At the same time we entered a new area by providing a service for the electronic entry of deeds. At the output side we are currently operating a service that directly

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feeds into the systems of our clients (e.g. notaries and real-estate agents). We are entering the era of chain integration.
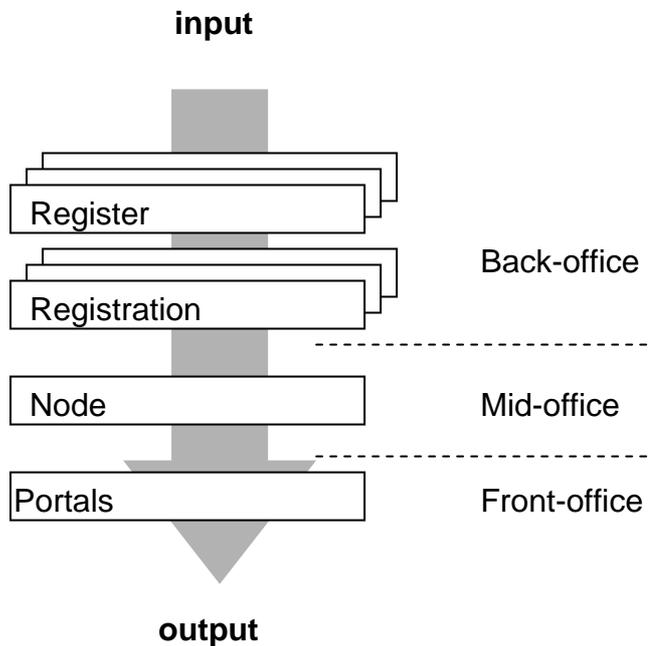

Figure 5: Creating services and interoperability

In the long run it is the Netherlands' government vision that also the nodes will become obsolete and a central node will connect all information or even that information is fully interoperable. It will also be possible to view or download most original (legal) documents from the registrations (although for most purposes this will not be required). The end-user will communicate through services.
Reconsidering our original view on the future flow of information (Figure 2) we think that this will happen, but that in practice the speed in which the full realization is brought about is heavily dependent on the organizational arrangements between organizations and in the value-chains

Once this vision comes true there will be many changes in public organizations. Looking at the developments from the perspective of the structure of public organizations there will be major changes (see Figure 6). The back office (which the cadastres and NMCA's have since long been) will remain. The mid-office will gain importance in the short to medium term to achieve the coupling of information and communication services. It will be the basis for the harmonization of processes. In the long run the mid-office will disappear and will be replaced by a coordination function within the e-Government. During the last decades each government organization has created its own front office. The function of the front office will

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certainly remain, but it will be focused more on improving services and less on organizational relations. The development of the user's focus, business processes and ICT allow that the back-, mid- and front offices are decoupled (i.e. are not necessarily part of the same organization).

input

```
                    Register                Back-office
                    Registration
            - - - - - - - - - - - - - - - -
                    Node                    Mid-office
            - - - - - - - - - - - - - - - -
                    Portals                 Front-office
```

output

Figure 6: Impact on the structure of the organization.

4. IMPACT ON THE CADASTRAL ORGANIZATION

End-users increasingly require a personalized handling of their actions through whichever entry point they have. The cadastral organization will face fragmentation at the customer side. This requires that the cadastral organization is able to adapt to or at least service a myriad of different customer groups or services.

There is probably direct contact with the end-users for the core processes related to legal security, land markets, planning and spatial information. But many end-users will remain unknown. We even envisage that once e-Government is in place up to 95% of our users (but significantly less than 95% of our traffic) will not access our information directly but through services provided by third parties. The cadastre will be less visible to the end-user as an organization. There will however still be a large need for a cadastre in the sense that the 'label' cadastre guarantees legal security and up to date spatial information. These added values of the cadastral services will be the customers' unique buying reasons, so we have to invest in services with 'Cadastre inside'.

These developments require a flexible and reliable front office organization. Flexibility is required because of the fragmented user-groups, the need to respond quickly, and the cooperation with related parties (see Figure 2). Reliability is essential because the added

value of a cadastre is largely based on correctness, up to datedness and non-partisanship of the information. In practice many services will be developed with partners in the information and communication chains, so cooperation will be one of the core competences.

For the design of business processes and its underlying ICT information is increasingly coupled to objects. Information does not have to be stored centrally. Theoretically information on all objects (data) can be stored at the source. For practical reasons (e.g. response times, availability) we foresee that centralized databases will be in place for a long time, at least for foundation datasets such as the cadastral registration and geographic core databases. For additional data at the local level (e.g. detailed information on a historic site or a source of pollution) data at the source is a viable alternative. We thus still foresee a need for an organization at the centre of the information and communication services. In this context the cadastre can play a central role as the backbone for the public (and also private) land- and spatial information.

To maintain a position in the servicing of users and the maintenance of the core cadastral and spatial information infrastructure the cadastral organization has to be innovative. It should be able to react to users' demands (at the front end) and steadily improve the flow and quality of information at the basis. Innovation will increasingly involve partnerships.

5. CADASTRE 2014 REVISITED

Revisiting the conclusions of Cadastre 2014 the following can be said (in italics we repeat the original conclusions from the report):

Cadastre 2014 an institution that inventories and registers all types of rights and restrictions that have an impact within a defined contour of the surface according to the four principles of traditional cadastral systems; namely the booking principle, the consent principle, the principle of publicity, and the principle of speciality. The Cadastre 2014 institution makes sure that the limits of impact of rights and restrictions to land are fixed and registered according to the public and private laws in effect in the respective countries, and that everyone can get reliable information about the legal situation of a piece of land.
From a functional point of view we are still working towards this objective. What is less obvious is whether Cadastre 2014 will be an institution by its own right. The cadastre (or NMCA in general) has good possibilities to achieve these goals because of its relation to land and spatial information, but if the government is well organized electronically it may as well be a part of larger e-Government institution. For the end-user the certification of the information will be an important issue.

Cadastre 2014 is making substantial use of the increase of information technology. Procedures are being adapted to the new possibilities to encourage maximum efficiency yet maintain maximum security. Benchmarking and selecting the best new practices will be a challenging task in the domain of modern cadastral systems.
This has already been largely achieved. The information technology certainly offers maximum accessibility. Maximum security also requires that all institutional and legal

procedures are effectively in place and operational. Additionally the aspect of communication will be an intrinsic element of the services. Guidance through procedures, finding solutions or services or basic customer contact are largely based on truly interactive IT-services.

The Cadastre 2014 institution shall be a co-operative between the public and private sectors. The involvement of the public sector ensures that the system has continuity. The public sector shall concentrate on supervision. Efficiency and flexibility will be brought into the system by the private sector, which is responsible for carrying out the operational work. This division of work also guarantees that public and private interests in land are kept in balance.
Considering the architecture based on services the ultimate service rendered will be a mix between public and private services. Before this can be in place fully, the public sector has to harmonize its information and communication flow. Government has to take care that at least the foundation data are well maintained. Based on these premises private and public services will be able to cooperate.

The Cadastre 2014 institution will have an economical structure that enables it tot recover the investment and maintenance costs.
On the whole the services will operate on a cost-recovery base. The creation of the foundation data on the object level will require prior investments by the public sector. It is however also the public sector (and in the end society at large) which will benefit the most. Cost recovery will however not be based on the cadastral data itself, but on value added services such as, for example, a monitor of transactions in the real-estate sector or certification of legal validity of the data.

6. CONCLUDING REMARKS

The roles of Cadastre 2014 will be implemented. The coupling via location is first step in its realization and will serve many purposes in society. To provide the full functionality of Cadastre 2014 also a coupling of objects is required. This requires big investments at the outset and a temporary focus on centralization and standardization. The advent of e-Government has a large impact on the evolution of the cadastre or NMCA as an organization. Cadastre 2014 is not necessarily a visible institution (even less an organization) in society. For the end-users services centered on life-events or processes are the entry points to the information and communication channels. Our opportunity is the design of services that provide security at the legal and spatial level. Furthermore, one still needs a number of central actors to bring about change and warrant service levels at the basis.
The cadastres (or NMCA's) have a good starting position to play a central role. They can be pivotal (and visible) to processes closely linked to legal security and spatial processes in general. For a large number of spatially or land related services the NMCA's can provide the backbone of the information and communication. In 2014 the roles will be largely implemented, but there will exist a large range of differently organized and publicly visible NMCA's.

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BIOGRAPHICAL NOTES

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