

Online Cadastre Portal Services in the Framework of e-Government to Support Real State Industry in Egypt

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SUMMARY

Current cadastre services in Egypt are provided by 'scattered' organizations that are difficult to access simultaneously to provide coherent set of services. These organizations are: the Egyptian Survey Authority, the Real Estate Publicity & Notarization Department, The Real Estate Taxation Department, and the State-owned land Agency. Improving the performance of the real estate market has become inevitable and a major concern for the present government. Several measures were taken to encourage initiatives to strengthen the real estate market, including advanced services for the on-line delivery of cadastre data and functionalities to all stockholders. Such services can be implemented in cooperating with the private sector in its massive efforts to build citizen-centered services to enhance the quality of life of the Egyptian Citizen.

In this paper we propose an Online Cadastre Portal, eCAD Portal, in the framework of the E-Government and the Spatial Data Infrastructure initiatives in Egypt. We recognize, however, the lack of a coherent framework for these initiatives, and therefore we outline a generic framework and build on it in order to introduce the Online Cadastre Portal.

The goal of the eCAD Portal is to provide a single place where agencies can post metadata that describe their resources (cadastre data and land registry functionalities) and where clients can go to discover such resources and request services through brokerage service. The provided services can be simple (a functionality provided by a single source) or complex (chaining of functionalities from several sources). The eCAD Portal includes the necessary Web technologies, which are needed to request, deliver, coordinate and control the execution of identified, tailored, services. A Service Brokers maintain registries containing relevant service metadata to aid the discovery of required services. A Workflow Management Services control and coordinate the execution of service chains, both intra- and inter-enterprise, negotiate and enforce adherence to quality of service specifications while shielding the client from the complexities of the chaining process. Other essential tools to extract and harmonize data sets as well as to invoke GIS functionalities from the participating agencies, are embedded in the under laying layer of protocols provided by the current form for the spatial data infrastructure architecture.

The proposed architecture of eCAD Portal also provides the necessary platform for real estate agencies, to work beyond their boundaries and to operate in a more ‘tight’ coupled mode, forming an integrated ‘virtual’ enterprise to seize business opportunities in such market.

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1. CADASTRE SERVICES IN EGYPT

Three public organizations are involved in the land registration process and the provision of cadastre services in Egypt. Those organizations are the Egyptian Survey Authority (ESA) under the Ministry of Public Works and Irrigation, the Real Estate Publicity and Notarization Department (REPND) under the Ministry of Justice and Real Estate Taxation Department under the Ministry of Finance (RETD).

Cadastre services are requested by citizen, public organizations involved in decision making (such as local authorities, irrigation and agricultural departments, etc.) and business enterprises operating in the real estate market (such as real estate agencies and brokers, layers, banks and financial bodies). These services include the verification of old property, transaction requests, delivery of cadastre information (both legal as well as geometric and survey data and maps), resolve boundary disputes, support land expropriations, etc.

The land registration process is carried out jointly by REPND and ESA; the REPND has the task to verify legal issues and deliver ownership documents (land Title), while ESA carry out field verification of the property, identify legal boundaries and survey the geometry and location of parcels, perform parcel subdivision and make the necessary updates of the cadastre maps. Cadastre documents concerning legal issues, the geometric identification of parcels and the mutation forms that tracking the history of conveyances, etc. are (all or some) kept in both places.

The RETD in principle has a passive role in the land registration process. It receives a copy of the ownership documents for the updating of the tax documents and recording new taxpayers. A copy of these documents is sent to ESA in order to keep consistency of both legal and financial data concerning the land property.

Recently, a new department is established, the State-Owned Land Agency, SOLA, with the task to manage information about the state-owned land (maps, legal documents, responsible authority, disputes on ownership, etc.), to develop scenarios for land use for future investment, and set pricing policy. SOLA uses the services offered by ESA and REPND to verify the ownership status of these lands.

At the moment, the private sector has no role in the land registration process due to the lack of legislation support and the sensitivity about the handling of cadastre and legal issues by non-governmental authorities.

2. CHALLENGES FACING CADASTRE SERVICES AND IMPROVEMENT ACTIONS

2.1 Challenges

Current cadastre services in Egypt are provided by 'scattered' organizations, ESA, REPD and RETD, which are difficult to access simultaneously to provide coherent set of services. Further, the collaboration between these organizations is always not practiced at a satisfactory level due to business conflicts and the lack of common vision on the economic potentials of cadastre data and services. As a result, the completion of land registers for the entire territories, particular in urban areas, is far from being complete, and the respond to requests for information and services is slow; consequently user's dissatisfaction, long time for registration (from days to years), difficulty to resolve land disputes and guarantee the security of ownerships. Due to such situation, the economic growth in the real estate market is below expectation and international investors are reluctant to invest in such environment.

Further, although several initiatives took place in these organizations to introduce digital technologies to automate and speed up processes and improve the management of documents and data archives, the return on investment on the 'quality' of cadastre services is not that great. This is due to the fact that such initiatives were made in 'isolation' and no common view is formulated for the handling of cadastre and other related data. Consequently, the related data sets in these organizations cannot be easily integrated and shared due to lack of harmonization between them. Further, no effective measures and the supporting digital tools exist for the direct data access and propagation of updates between them in order to keep their data sets up-to-date and in harmony.

The initiative to create the Egyptian Spatial Data Infrastructure NSDI is facing many institutional, financial and technical obstacles and far from being complete. Further, the capability to deliver on-line services, which are urgently needed to increase the economic potentials of the real estate market, does not exist.

The present government is enforcing several measures to strengthen the real estate market aiming to speedup efforts to complete the national land registers, enable advanced services to all stakeholders and consequently encourage international investors. The government has requested these organizations to allow an apparent role for the private sector in the mapping and real estate Industries, with the objective to:

- Increase the share of the private sector in the evolving GIS market in Egypt; leading to more job opportunities in this sector.
- Create advantages for the mapping and real estate industry from the private sector and its flexible approach to changing requirements.
- Cooperate with the private sector in its massive efforts to build citizen-centered services to enhance the quality of life of the Egyptian Citizen. In this connection, an efficient set of services to boost the booming industry of real estate is important to Egypt's economic future.

2.2. Improvement Actions

ESA at the moment is busy with other related organizations, RENPD, RETD and SOLA and the Ministry of Communication and Information Technology, exploring several options to improve cadastre services and respond to such government's policies, as detailed in (7), (8). A summary of these options include:

- The initiation of national programs to complete the entire urban areas with up-to-date large-scale maps and land registers. The execution of these programs, however, requires the participation of all related public and private institutions as the amount and diversity of work involved is beyond the capacity of single organizations. The government will be requested on the other hand to guarantee the allocation of the required funds; not necessarily from the government central budget but to encourage local and international financial bodies to contribute in such programs.
- The speedup of efforts to apply modern GIS and ICT technologies to computerized records (registers, plans, deeds, index map), create databases and the supporting tools for the exchange of digital data. In this context, the formulation of common view for the handling of cadastre in these organizations is essential to support the sharing, harmonization, updating and integration of related data.
- The public organizations, such as ESA, RENPD and RETD, should partnering with private companies in areas outside their expertise, such as ICT services, information management, generation of value-added services based on the exploitation of cadastre data, marketing and partnering for wide distribution of cadastre data and services, the on-line delivery of cadastre services, etc.
- Taking the initiative to formulate the necessary legislation for the participation of the private sector in the land registration process and the provision of licenses for the delivery of cadastre data and services.
- Establish common business vision and explore solutions for all institutional and technical barriers which might hamper the possibilities for full economic exploitation of cadastre-related data available in these organizations and in particular the creation and the fast delivery of value-added, diverse services to support various business activities in the real estate market.
- Speedup efforts to establish the Egyptian Spatial Data Infrastructure NSDI, to support the exchange and harmonization of data sets, the propagation of updates in cadastre data, set regulations for the right-of-use of cadastre data and the protection of privacy. The first phase of NSDI could be directed to serve cadastre services.

In this context, this paper proposes an On-line Cadastre Portal, eCAD Portal, in the framework of the Egyptian E-Government and NSDI initiatives. The primary use of the On-line Cadastre Portal is for discovery, access and chaining of cadastre and land registry services held at government agency offices within Egypt. Such tool will enable advanced services to all stakeholders in the real estate market.

3. THE E-GOVERNMENT AND THE ROLE OF SPATIAL DATA AND SERVICES

3.1 The E-Government Initiatives

The term E-Government is generally agreed to derive from electronic government. E-Government introduces applications to support various dimensions and ramifications of government and has the following general service areas:

- *The delivery of public services*, where there is an online, Internet based, or electronic aspect to the delivery of the services
- *The conduct of government business* where the activities of those involved in the process of government itself (such as legislators and the legislative process) where some electronic or online aspect is under consideration.

E-Government provides many opportunities to improve the quality of services to the citizen (G2C), to business (G2B, B2B) as well as to government institutions (G2G), as detailed in (9) and many Web- pages about e-government initiatives in many countries.

The evolution of E-Government initiative went through 4 stages of development (the Economist, 2000):

- *The 1st Stage:* Public and private institutions publishing information about themselves (the emerge of Web pages)
- *The 2nd Stage:* Two-way communication, allowing citizen to provide new information about themselves
- *The 3rd Stage:* Multi-purpose citizen portal, providing quantifiable services; the delivery of geo-information and geo-services can be included
- *The 4th Stage:* Portal personalization; portal that integrates complete range of services and based on needs and functions, not on department or agency. The portal will perform the task of ‘brokering’ to locate, request and chain services from various service nodes, according to the specifications set by service requestors. The proposed on-line cadastre portal eCAD in this paper falls in such category.

The E-Government initiative in Egypt takes two-way approach to implement its service; the government information-sharing portal (to provide government information to citizen), and e-government service portal (to perform on-line transactions between government and citizen). The two government portals are integrated into a single governmental portal.

This paper is proposing a supplementary functionality to this initiative, a customized portal for on-line delivery of cadastre services. Such services can be either simple (i.e. services provided by a single organization in the cadastre business) or a complex one (i.e. a service composed by the chaining of several functionalities in various organizations).

Figure (1) shows the various components necessary to realize such portal in the framework of the E-Government and the Spatial Data Infrastructure NSDI initiatives. The portal can be realized in the framework of partnership between the public sector and the massive effort of

the private sector to build citizen-centered services to enhance the quality of life of the Egyptian Citizen. The supporting concepts and technologies are detailed later in this paper.

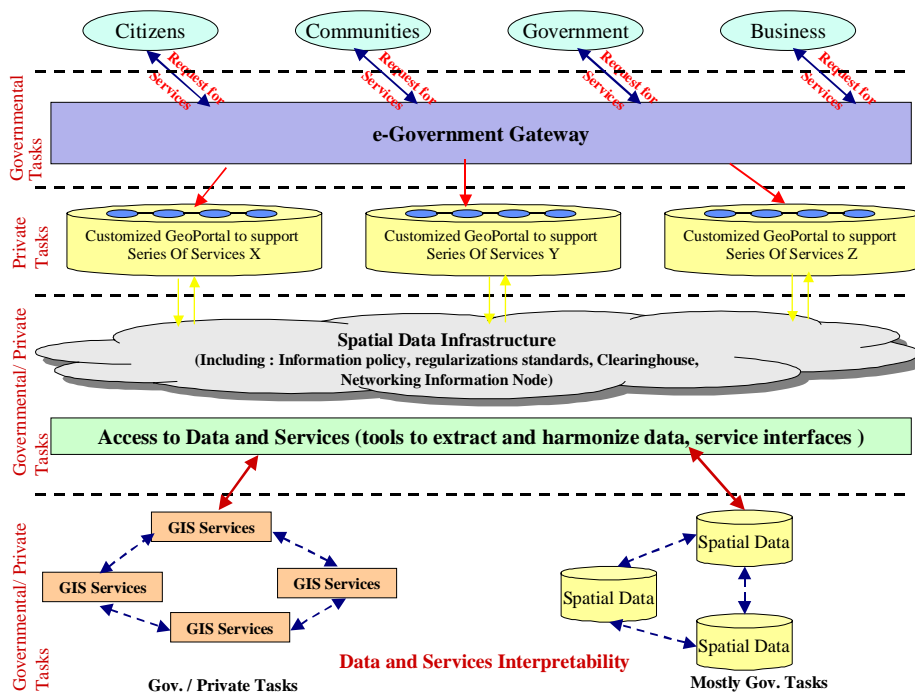


Figure 1: Customized Geo-Portals in framework E-Government

3.2 The Role Of Cadastre Information and Services In The E-Government.

The Cadastre is one of the Base Registers that are essential for the information infrastructure of the society, such as population, building, and Enterprises Corporation registers. Many identifiers of base register objects are generated from real estate identifier. The spatial description of real estates provides the opportunity to integrate real estates and objects inside them with other GISs.

Most of documentation for land administration in many countries, including Egypt, however, is still in paper form which makes it difficult to search and access to the land administration data in these documents. Modern GIS and ICT technologies offer the opportunity to computerized records (registers, plans, deeds, index map) as well as the integration of new medias (maps, pictures, balances). Further, the Internet and Web technologies found its way in the cadastre business and several initiatives took place in many countries to improve the delivery of cadastre services over the Internet, as reviewed in (10), such as:

- Land Register On-line for the delivery of data and cadaster service on the Internet.
- Electronic Discharges and Lodgment.
- Provide National Land Information Service Electronically.
- Electronic conveyance via electronic official seal and signature implemented to replace the paper documents and bridging the process of registration and conveyance.
- Provide a 'black box' for personal documents to serve the e-government initiatives.

4. ON-LINE CADASTRE PORTAL, eCAD, PORTAL

4.1 The eCAD Architecture

The goal of the proposed eCAD Portal, as shown in Figure (1), is to provide a single place where agencies in the cadastre business can post metadata that describe their resources (data and services) and where they clients can go to discover and request services from these resources through brokerage service. The Portal is a means for agencies (private and public) to share existing resources through web services. The Portal also includes the necessary services, which are needed to coordinate and control the execution of identified services. Several technologies are needed to perform these tasks such as Web services providing GIS functionalities, workflow management services, service brokers, etc., as shown in figure (2).

Service brokers maintain registries containing relevant service metadata to aid the discovery of required services. Workflow management services control and coordinate the execution of service chains, both intra- and inter-enterprise, negotiate and enforce adherence to quality of service specifications (service level agreements) while shielding the client from the complexities of the chaining process. The service broker and WFMS are thus central components of the proposed eCAD Portal. Other essential tools to extract and harmonize data sets as well as to invoke a service from the participating agencies, are embedded in the underlying layer of protocols for networking distributed databases and service nodes and achieving interoperability amongst them. The current form for the spatial data infrastructure architecture can realize such layer.

The functionalities required to realize such portal, as shown in figures (1) and (2), are:

- Data brokering functionality to analyze requests and locate spatial data and cadastre data and services, and delivery of services.
- Services to create and search data and service registers.
- Chaining functionality to chain services from various organizations.
- Web services to access wide range of GIS functionalities.
- An integrated framework for data and service interoperability.
- Spatial data infrastructure functionalities to support access to spatial data and geo-services.

In the following, some of these functionalities are described in details.

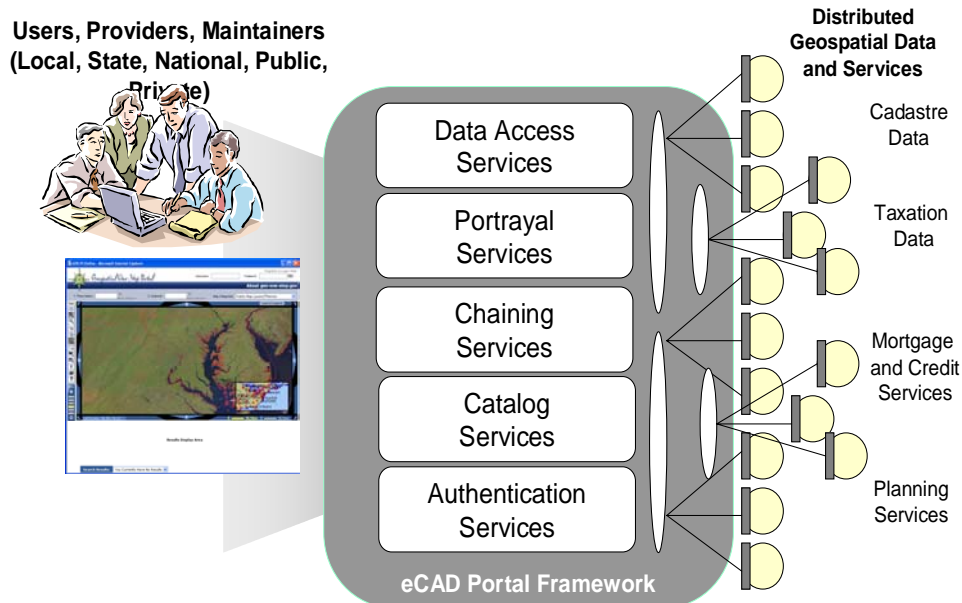


Figure 2: eCAD architecture overview

4.2 State-of-Art for Web Services

Web services are a new breed of Web application. They are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web. Web services perform functions, which can be anything from simple requests or complicated business processes. In other words, web services are interoperable building blocks for constructing applications. Further, responses to requests can be immediate (synchronous web service) or delayed depending on complexity of processes (asynchronous web services). Web services and consumers of Web services are typically businesses, making Web services predominantly business-to-business (B-to-B) transactions. An enterprise can be the provider of Web services and also the consumer of other Web services.

The Web Services Description Language (WSDL), an XML language, is used to define Web services (as a set of operations, messages and binding protocols) and describe how to access them in a specific format. More details can be found in (2), (5).

4.3 Chaining Service

The proposed eCAD architecture, figure (2) supports Business Process Management (BPM) technologies to facilitate adaptive enterprise functionality. The Workflow Chaining Service (WfCS) executes workflow processes and correlates and coordinates synchronous interactions into collaborative and transactional business flows. It is an infrastructure service for modeling, connecting, deploying and managing and executing business processes. The Workflow Manager:

- Allows composite web services to be defined
- Integrates asynchronous services
- Coordinates multi-step business processes
- Publishes business processes as Web Services
- Invokes automated processing flows

For each process, the WfCS takes a BPM script (written by Business Process Execution Language BPEL, a language enables task-sharing for distributed computing) that describes the workflow or processing chain to be executed, a WSDL document that describes the interface that the process will present to clients, and the WSDL documents that describe the service instances that the process may invoke during its execution. From this information, the process is made available as a Web Service (or called Service Chaining) that can take place across the Web in such a way that any cooperating entity (a participating agency or service node) can perform one or more steps in the process the same way. Farther, the programmer might describe a business protocol that formalize what pieces of information is needed for such step (for the generation of a product for instant) and what exceptions may have to be handled (such as technical constraints, data heterogeneity, business constraints). Further details can be found in (1), (2), (4), (5).

As described in ISO 19119, there are many possible approaches to composing chains of processing services into aggregate or compound service components. General patterns can be used to describe these approaches based on, for example, the visibility of the services to the user (or client application) as well as the difference in how control of the services is managed. Using these criteria, Figure (3) shows several patterns.

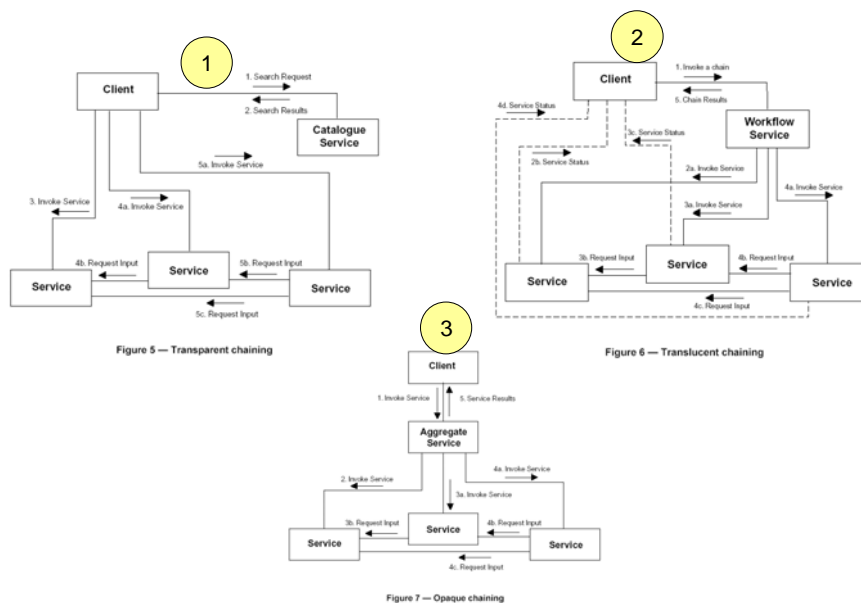


Figure 3: Service Chaining Cases (from ISO 19119, OGC Topic 12)

These chaining patterns include:

- User defined (transparent) chaining: the client application manages the workflow and control of the chain is exclusively with the user of the client application
- Workflow-managed (translucent) chaining: in which the client application invokes a Workflow Management service that controls the chain and the user is aware of the individual services; a workflow service controls the chain execution, perhaps with oversight by the human user of the client application
- Aggregate service (opaque): in which the client application invokes a service that carries out the chain, with the user having no awareness of the individual services; the aggregate service exclusively performs the control function with no visibility by the client application.

5. CASE STUDY TO IMPLEMENT THE eCAD PORTAL FOR ON_LINE CADASTRE SERVICES IN EGYPT

5.1 Case Study Objective

Today's dynamic business environment in the real estate market in Egypt and the present government measures to strengthen such market, forces key organizations operating in the real estate business to work beyond their boundaries and to operate in a more tightly coupled mode, forming integrated 'virtual' enterprises (VE), to seize business opportunities. Such an enterprise is of a 'temporal' setup, networking these organizations (which are legally autonomous) to join functions to achieve a 'particular' objective. Serving the various stakeholders in the real estate market with advanced services to satisfy their requests for the on-line delivery of spatial data and GIS and cadastre functionalities, motivates such business option. More about virtual enterprise can be found in (3), (4), (6), (7).

A case study was conducted at ITC, the Netherlands, in the framework of the cooperation program between ITC and ESA, the TMS/ESA Project. As reviewed in (8), to develop a prototype to address both business and technical issues, which are relevant to achieve these business goals.

5.2 The Case Study Business Perspective

In this case study, many institutional arrangements have been addressed in order to structure and manage a virtual enterprise, the 'Virtual Land Agency', networking ESA, REPND, RETD, SOLA and other private institutions in such a way that third parties see it as an identifiable and complete organization (one enterprise), as shown in figure (4). The provision of on-line services to all stakeholders in the real estate market will be the key task of such enterprise. Such services can be simple one (i.e. provided by one of the organizations involved in the cadastre business) or complex one (i.e. require the chaining of several functionalities in these organizations). The provision of spatial data and GIS and cadastre functionalities, are included. The objectives are: better customer satisfaction, reduced time-to-market and

adaptation to changes in the surrounding environment. By taking this approach, more tightly integration and communication is achieved through a common vision on the economic potentials of cadastre data and resolving business conflicts, measures to achieve interoperability of data, services and ICT resources, the necessary arrangements to establish clear responsibilities for each of the participating institutions, and the creation a ‘healthy working relationships’.

These arrangements were considered in this case study in the framework of the required public private partnership PPP in the real estate industry in Egypt. Further details are reviewed in (7).

5.2 The Case Study Technical Perspective

This case study addressed the requirements and components to implement a customized portal for on-line delivery of cadastre services, in the framework of the E-Government and the Spatial Data Infrastructure NSDI initiatives, as shown figure (4). The proposed architecture of such portal, on the other hand, will materialize the key functionalities that are necessary for the successful implementation of the ‘Virtual land Agency’.

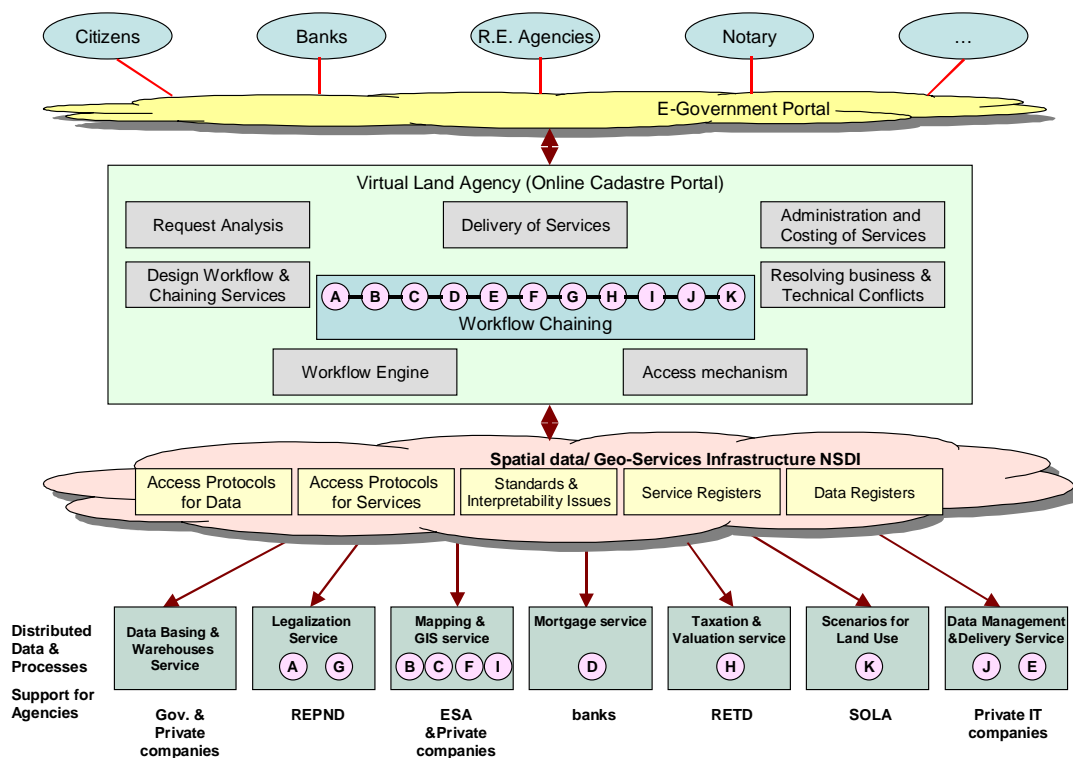


Figure 4: Key Functionalities in the On-Line Cadastre Portal

The operational model of such an enterprise is based on the concept of unbundling of the functionalities of current stand-alone systems in these organizations to make them available as independently developed, yet interoperable autonomous services that many of them can run (or at least invoked) as Web services. Such functionalities can be:

- The Egyptian Survey Authority (ESA) performs field survey operations, map making and GIS operations, the management and provision of spatial data for topographic features and cadastre parcels, the storage of mutation forms for all parcels, the provision of information about ownership and the type of land use, the provision of information about mortgages on land, etc.
- The Registration Estate Department (REPND) performs operations for the legalization of ownership and transactions, the management and provision of ownership information and legal documents, the generation statistics on the dynamics of the real estate market, the provision of information about mortgages on land, etc.
- The real Estate Taxation Department (RETD) performs operations for the field collection of information about 'taxable' real estate objects, management and provision of information about property tax and taxpayers, develop models for the valuation and taxation of properties in the various regions in the country, generate statistics about revenues from real estate tax, etc.
- The State Owned Land Agency (SOLA) performs operations for the collection of information about the status of the state-owned land, resolve ownership disputes, develop land use scenarios, set models for the evaluation and valuation of land, set pricing policies, etc.
- Banks provides 'real estate mortgaging' services.
- Several institutions from the private sector are playing a role in the real estate market, according to their competent and expertise, such survey and mapping companies (map making and GIS operations), IT companies (establishment systems for information management, databases, computers, networks), companies experience in management and control (planning and management of operations, quality control), real estate brokers and layers (provide information about marketing and valuation of land parcels), banks and financial bodies (provide mortgages and credit services), etc.

An infrastructure (a framework), with institutional and technical arrangements will be required to support the networking and chaining of these functionalities and services to create customized solutions for the required services. Integration is not limited to data exchange capabilities, but also concerns the rest of the enterprise by connecting all necessary functions and heterogeneous functional entities. The infrastructure will manage information, processes, control workflows within- and across the boundaries of the participating organizations. To implement such an infrastructure, a special services based on concepts reviewed in Section 3 in this paper, will be developed to provide the option of combining and chaining of services (a kind of broker/mediator), also to manage inter-organizational workflows and manage the quality of services in such wider network of services, operating under different rules and constraints. Such broker will also serve as the mechanism supporting the searching for

products by users, the selection of partners and the creation and control of workflows. Further details about the supporting technologies can be found in (1), (2), (3), (4), (5), (6).

This broker, as shown in Figure (5), is composed of several functionalities such as:

- User Interface: a browser (with a graphic interface) to provide access to different services; cadastre data and functionalities (simple or complex) in the registered agencies.
- Services to create Data and Service Catalogs, and metadata query.
- A pool of specially designed (tailored) cadastre services, chaining several functionalities that are available at registered data and service providers.
- The broker's framework, within which an organized collection of open standard specifications can be implemented to create spatial data and vendor neutral "plug and play" portal infrastructures. This allows links and the possibility to invoke governmental- and commercial-off-shelf services, which provides a pool of Web services to perform GIS operations such as access maps, features, display and overlay maps, integrate data sets, visualize maps, terrain analysis, secure data download and allow 'immediate' manipulation of spatial data, etc.

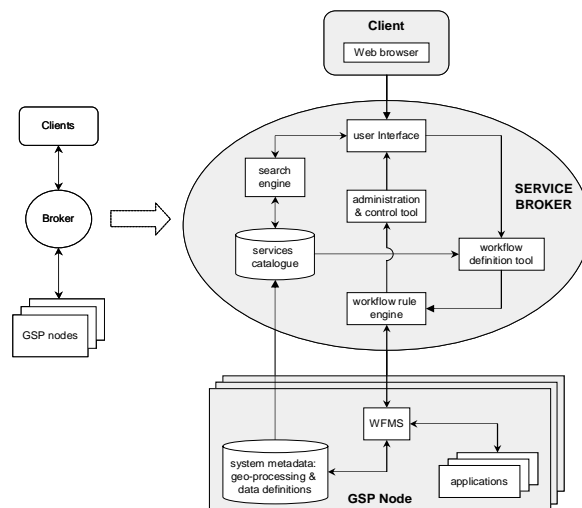


Figure 5: The e-CAD Broker Architecture

- Workflow Management capabilities with:
 - Search Engine: searches for business processes in the Workflow Service Catalogue
 - Workflow Service Catalog: support various enterprises to advertise their data and services
 - Workflow Definition Tools: creates definitions of the various processes
 - Workflow Rule Engine: executes the workflow and chain services across the boundaries of the various enterprises
 - Administration and Control Tool: keeps track of workflow progress

Further, this broker will operate in the framework of the NSDI initiatives, making use of all tools offered to resolve various business constraints as well as data and processes interoperability issues amongst the participating nodes, as detailed in (6).

Several examples were tested, based on Web and workflow management technologies at ITC, as reviewed in (6), (7). At the moment, the management of ESA is considering options for real implementation of such services.

6. CONCLUDING REMARKS

Improving the performance of the real state market in Egypt has become inevitable and a major concern for the present government. Several measures were taken to create the conditions for the exploitation of the large economic potentials of the GIS and cadastre services.

The proposed Online Cadastre Portal, in the framework of the E-Government and NSDI initiatives, enables advanced services for the delivery of on-line spatial data and GIS and cadastre functionalities to all stakeholders. The Portal includes the necessary services, which are needed to share resources through Web services, access and download data, chain various functionalities in several agencies to compose a service, coordinate and control the execution of identified, tailored, services. Several technologies are needed to perform these tasks such as Web services providing GI

S functionalities, workflow management services, service brokers, etc.

The proposed architecture, allows wide range of applications to access and invoke geo-processes supplied by multiple-vendors, to secure data download and allow 'immediate' manipulation of spatial data.

The proposed architecture for the portal also provide the capability to industrial and service sectors to work beyond their boundaries and operate in a more tightly coupled mode, forming integrated 'virtual' enterprises, to seize business opportunity in the real estate market.

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