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IMPROVING MUNICIPAL EFFICIENCY USING GIS: A CASE OF KINGDOM OF BAHRAIN.

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Abstract

Kingdom of Bahrain is implementing e-governance to provide better living standard for the public as part of Bahrain 2030 vision. Municipal affairs is one of the key ministry which provide many services to public such as cleaning & beautification, issuing permits, issuing address and provide helps to needy people. In order to reach investors, public and other government agencies, Municipal affairs need to provide uninterrupted faster service. Currently municipality provide these services in various municipal locations, municipal portal and through e-government portal. Most of the municipal services required location details to provide better service and to process the applications faster. Municipal affairs implemented GIS technique successfully to provide complete e-governance solution for municipal services. Municipal affairs using GIS techniques in their business for more than 15 years and developed up-to-date Bahrain spatial database and implemented many GIS based applications. Municipality using desktop applications for the municipal staff to analyze and collect the spatial data. These application accessed from many locations and data stored centrally. In the last three years, municipal affairs understood the importance GIS in providing e-governance and utilized it optimally. Bahrain Geo-Explorer service helps the public to understand the Bahrain spatially and to know the planning and investment details. Building permit service help the public to provide accurate details about the land and to track their applications. GIS technique also used to automate the business procedures and to standardize the procedure in all municipal locations.

Keywords: *Municipal GIS, Addresses System, GIS Applications,GIS Services,GIS and Business and GIS Bahrain.*

INTRODUCTION

Ministry of Municipalities Affairs and Urban Planning (MMAUP) in the Kingdom of Bahrain is responsible for planning and monitoring the development, cleaning and beautification and issue permits for various activities such as building construction, advertisements, commercial activities etc. MMAUP has five municipalities as Capital, Muharraq, North, Middle and South, with Urban Development and Agricultural Directorates. It is providing services to public from more than 24 locations across the country.

Information Systems Directorate (ISD) is part of MMAUP to coordinate the municipalities and share their information, activities and knowledge. It is providing a centralized facility to store, analyze, maintain, Integrate the data and share the data between different municipalities and ministries. ISD also developing the applications, which are commonly used by all municipalities using various technologies like Oracle RDBMS and GIS. ISD is always playing the key role in identifying and implementing the new technologies and evaluating standard procedure in the municipal services. ISD also collects the required information from other organizations and redistributes the information for all the municipalities after reorganizing and reformatting the information to suit with the municipality needs (Kumar 2012).

Municipal GIS

Most of the municipal services require spatial information to make decision. Earlier municipal staff using CAD drawings and paper maps to analyse any area. Ministry has established steering committee in 1997 to study the scope of GIS in municipal services. Also a technical team created to identify municipal requirements in terms of software, hardware, applications, procedures and data for GIS implementation and this committee submitted the GIS strategic business plan with clear goals and objectives of Municipal GIS (Klosterman 2001). ISD started implementing GIS in Bahrain Municipalities using GIS strategic business plan in mid-1998. The project initiated with the establishment of a project team consisting of municipality staff to manage the GIS implementation. The team was charged with the implementation of the GIS in order to improve their efficiency and increase their revenue.

Currently MMAUP has become major player in the field of GIS in this region and in utilizing GIS technique for municipal service. ISD also developed and implemented many GIS applications to improve the performance of municipality staff.

Municipal Spatial Database

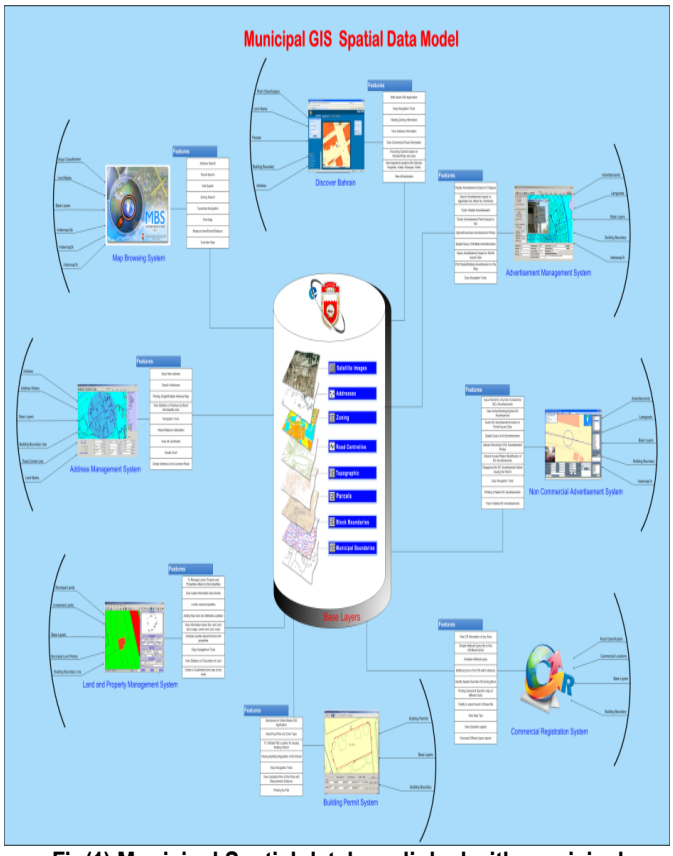
Developing spatial database is an important component of GIS implementation in Municipal GIS. Strategic business plan has grouped the spatial layers as base layers and thematic layers. Base layers required for all municipal services and thematic layers are specific to particular municipal services. Base layers are administrative boundaries, road centerline, addresses, land boundaries, Topo layers and satellite images. These information are created and maintained by different government agencies in different formats such as Survey and Land Registration bureau, Ministry of Works and Central Informatics Centre. ISD has coordinated with other agencies to share the data and formatted the data to common data format (Wiggins and French 2005).

ISD has also developed applications and implemented in all municipalities to collect thematic maps such as addresses, municipal lands, advertisement location, commercial roads, commercial shops, building permit locations, Zoning and land subdivisions. Ministry spatial database has contained more than 100 layers which are updated in different frequency. All the layers are stored in centralized server accessible for municipal staff.

Municipal GIS services

Information Systems Directorate has developed the applications considering the following three area.

- Developing utilities for managing municipal spatial data and GIS users
- Developing applications to carry out municipal services and
- Developing applications for the public to increase awareness about municipal regulations

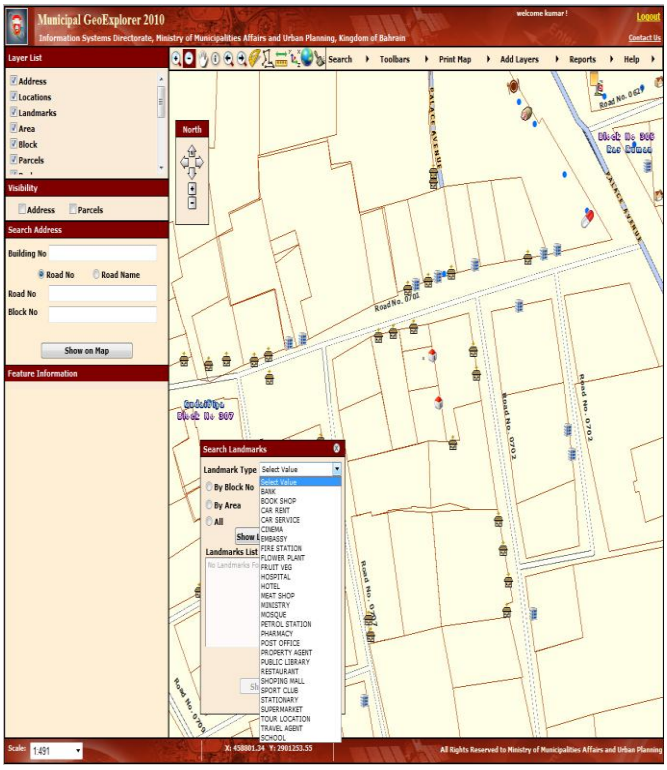


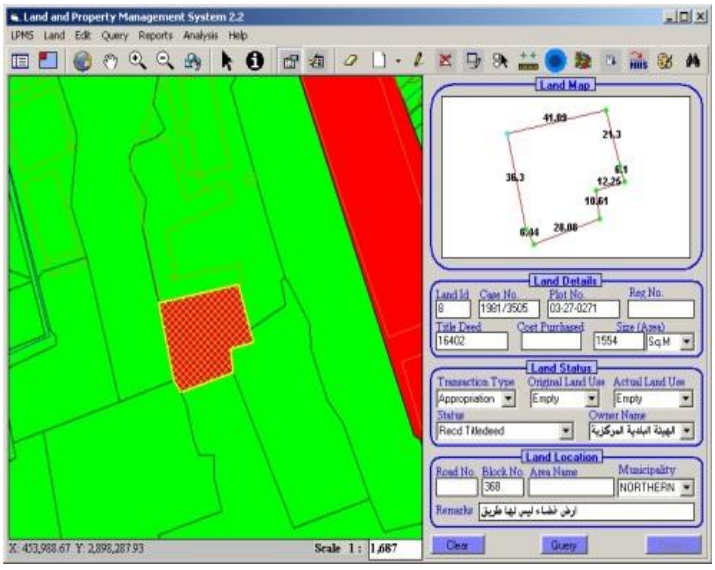
Fig(1) Municipal Spatial database linked with municipal applications

GIS for Municipal staff

The ISD has created spatial database contains more than 100 layers which can utilized by municipal staff to carry out different tasks. Most of the municipal staff require to access these information to make better analysis and also senior management requires these information to make better decision. In order to utilize these information, ministry required to have good GIS software and skills to use the software. Many GIS software has advanced tools and required to have proper training to use the software. Also these software are not tailor-made for municipal requirements. ISD has developed user friendly Municipal Geoexplorer application to access layers in spatial database easily. It is a web based application with many customised tools and analysis functions. Users can browse more than 35 essential layers through this application such as administrative boundary, addresses, road network, parcels, topo, zoning, commercial shops, topo sheets, commercial road, land use 2030, electricity and water network, land marks, sewerage network and satellite images of different periods. User can view any layer at any scale and switch off \ on of layers any time. Also users can make query based on spatial data or attributes of all layers and can create customized maps by one click. Currently more than 600 municipal staff are using this application every day (Harris and Batty, 2007).

Land and Property Management System





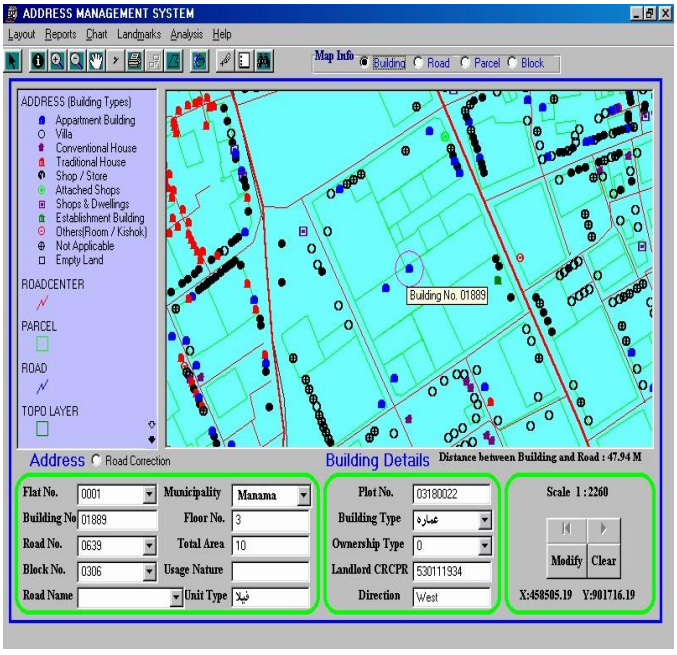
Fig(2)Screen shot of Municipal Geoexplorer
Fig(3) Land and Property Management System

Municipalities possess more than 400 lands and also utilizing government lands for various projects. It was difficult for senior management and municipal staff to track these lands and their information since they were scattered between municipalities and directorates. ISD has developed a fully integrated desktop application for managing the lands, projects & properties utilized by Municipalities. It maintains the latest information about the land with greatest level of accuracy, thus making the system an efficient decision making tool for senior management. The process of renting, leasing and selling these lands/Projects/Properties generates good amount of income for the municipality. Through LPMS, one can see all the land details along with the dimensions

and their title deeds in just one click. Also it has facility to create reports based on spatial and non-spatial information and can create customized land maps with all details (Kumar 2012).

Address management system

Municipalities are responsible for issuing address and address plates to public. Earlier, customers used to submit their land details and municipal staff had to search the parcel in hardcopy maps to find out possible address for that plot. This process took long duration and also made possible for human errors. ISD has developed GIS based address management system where user can view block boundary, road, addresses, land parcels and topo easily. Currently municipal staff enter the parcel number on the system and it will assign the road and block to the address automatically. Also it guides municipal staff about possible address range on that road and user has to just enter the point. System also updates the address layer in centralized server with all necessary information which can be viewed in other applications immediately. This application helped to standardize the business processes also (Huxhold 2011).



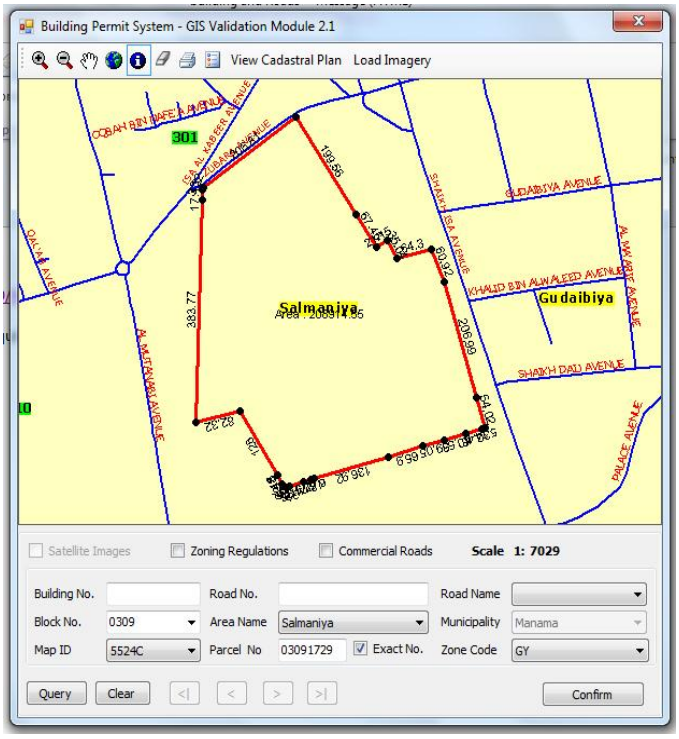
Fig(4) Address Management System

Building permit system

In Bahrain, customers apply for new construction had to deal with more than 10 entities including municipalities. It involves Municipality, Water Distribution Directorate, Electricity Distribution Directorate, Telecommunication, Sewerage, Roads directorate and Civil defence. In some cases, No Objection Certificate (NOC) from ministry of health and Ministry of commerce also required. The number of entities involved in issuing building permits made the process lengthy and time consuming (Healey 2010).

Municipality has made many changes in the process of issuing building permits in terms of regulations and technology. MMAUP has initiated One Stop Shop (OSS) project with objective of reducing process duration by bringing representatives from the five municipalities and all the other entities involved in building permit under one roof. This helped the customer to avoid visiting different organisation and be able to complete the process at single point. However, OSS not solved the purpose since the business procedure was not modified and issuing building permit took almost the same duration as before. ISD has reengineered the process and developed the application using GIS and oracle technology to address all the customers and municipal staff problems and to improve the service. GIS team understood that the up-to-date and accurate parcel and building regulation data are key elements which can change the process dramatically. Memorandum of understanding has been signed between municipality and SLRB to share the data online and the GIS team developed a utility to convert the parcels in DGN format to ArcSDE format with parcel number and type as attributes. Also, the zoning regulation maps were updated and prepared as single thematic layer for entire Bahrain. Using these data, ISD has developed web based application to collect the building permit requests and also desktop module for municipal staff to track and manage the building permits (Huxhold 2011).

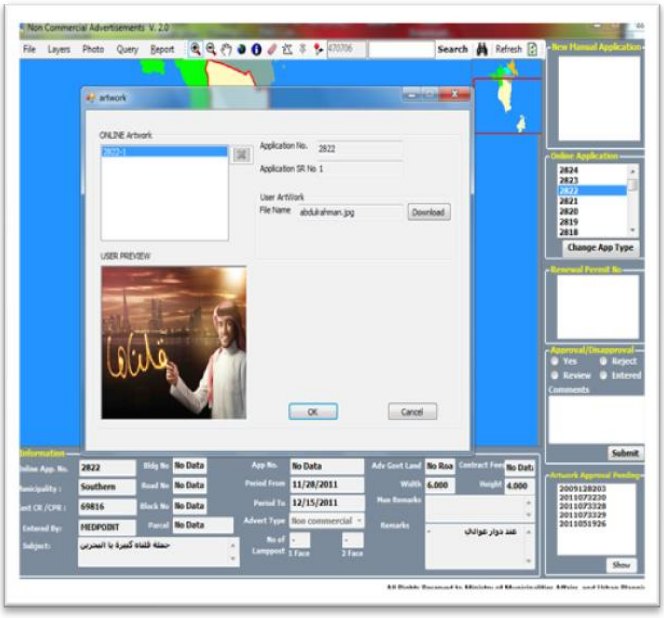
Currently municipality receives the building permit applications only through online and provided facility to attach the necessary documents. While applying, the customer can choose the parcel from the map or can enter the parcel number directly. The system defines the zoning regulation from zone layer and also forward the application to concerned municipal staff based on the location of the parcel from the map. This makes the application to reach the concerned staff immediately and also with exact building regulation type details. Any investor can also visit the municipal website and can view the zoning regulation of the parcels by entering their parcel number which saves the investor time and can design the building appropriately. Also it provide accurate data for municipal staff and easy to follow up and to link with other application in municipal services. Also it helps to automate the business process such as the applications located in civil aviation restricted area only will be forwarded to civil aviation instead of all the application (Grimshaw 2008).



Fig(5) Desktop Module of Building Permit System

All the Advertisements in Bahrain are tracked effectively by municipality through Advertisement Management System (ADMS). This application allows municipality to store all advertisement location with their dimensions and drawings. ISD also created all permanent advertisement locations such as approved lamp post for

advertisements, prism and unipoles as separate spatial layer which helps municipal staff to make better decision. Also the system calculates the advertisement fees automatically using commercial road layer and parcel information. This application allows municipal staff to query about any advertisements based on location, permit number and type and facility to prepare the location map of advertisement immediately. It has separate module to manage non-commercial advertisement and online module for companies to view approved and vacant advertisement locations (Huxhold 2011).



Fig(6) Advertisement System

C0NCLUSION

GIS is an advanced technology and its potential limited only by your skill and imagination in using it. MMAUP has understood the potential of GIS and integrated it in to municipal business successfully. It is essential to implement necessary software with suitable hardware, develop GIS skilled staff, proper procedures and up-to-date data for successful GIS implementation. GIS helps to municipalities to achieve business standardization in all municipalities. It helps to validate the data and maintain high quality information which reduce the process duration and improved municipal staff efficiency. It also helped to automate the business process and to make system based decision.

MMAUP also used GIS to provide better service to public by providing them proper information and by processing the permit applications in short duration.

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