COMPUTERISED DEVELOPMENT CONTROL AND APPROVAL SYSTEM FOR CITY HALL OF KUALA LUMPUR

Ahris Yaakup, Yazid Abu Bakar, Mohd Nuruddin Abdul Kadir, Susilawati Sulaiman
Department of Urban and Regional Planning
Faculty of Built Environment
Universiti Teknologi Malaysia
Email: b-haris@utm.my

Abstract

Currently, the employment of Information and Communication Technology (ICT) is seen as an evolving approach to better urban governance, especially in realizing sustainable development. Good urban governance is oriented towards efficient and productive use and reorganization of financial, personnel and information resources for the achievement of good metropolitan development, including the enhancement of planning, coordination and management, promotion of administrative reform and advancement of information systems. The advancement of ICT has made it possible to contribute to better local governance, as in the case of City Hall of Kuala Lumpur (CHKL). This paper will discuss the computerised development control and approval system being developed for the Planning and Development Control Department, City Hall of Kuala Lumpur, with emphasize on the GIS architecture developed within the system. The prospects and challenges towards implementation of the system are also discussed.

INTRODUCTION

In establishing conducive of environment and smooth planning for development purposes, the local authorities are currently facing a costly management and maintenance process due to the ever-increasing applications for planning and development. The current manual working procedures turned out to be time consuming and costly. The separate storing of application files and site plans, for example, had caused difficulty in accessing them when needed instantaneously and simultaneously. This contributes to hassles in managing and updating of application information on behalf of the local authorities in the long run. Due to this situation, various studies on developing a development control and planning approval system are being undertaken in attempt to solve, or at least, reduce the problems. This hopefully will facilitate the local authorities in handling the planning application more efficiently, especially in terms of information management.

Currently, the employment of Information and Communication Technology (ICT) is seen as an evolving approach to better urban governance. ICT has made it possible for urban authorities to move towards efficient and productive use and reorganization of financial, personnel and information resources for the achievement of good metropolitan development, through the enhancement of planning, coordination and management, promotion of administrative reform and advancement of information systems. This is due to ICT capabilities which include the followings:

- It improves the storage, manipulation and display of spatially referenced data (including land use, linear services and infrastructure, population, etc.)
- Automated data handling (i.e. payroll administration, valuation, billing and collection; storage tracking and retrieve development application)

- It improves the availability and flow of information in and amongst organizations responsible for urban management, with a view to improve and mainly change anticipation of issues and monitoring implementation
- Predictive and prescriptive models of urban interaction facilitated by ICT can be used to forecast the impact of changing land use and transportation infrastructure on the distribution of population and other activities
- Increased access to information via increased access to computer and the development of web means that a wide range of people can be informed about planning and management issues

The potential use of ICT in urban management, however, must be considered in the light of political and administrative realities (Rakodi, 2002). First, the introduction of ICT involves not only technological problems but is also a complex process of managing change in environments characterized by both uncertainty, on one hand, and entrench institutional procedures and staff motivation on the other. Second, the collection, processing and dissemination of data reflected social relations and are not politically neutral (Hill and McConnachie, 2001). Data generated and inequitable access to it may cause problems in democratic context.

This paper demonstrates and discusses the development of the Computerised Development Control And Approval System for City Hall of Kuala Lumpur (CHKL), Malaysia, with emphasis on the Geographical Information System (GIS) architecture developed within the system.

DEVELOPMENT CONTROL AND APPROVAL IN KUALA LUMPUR

Kuala Lumpur has evolved to become the center of economic growth activities for the Klang Valley and the country. The development of Kuala Lumpur has taken the form of a definite concentration of physical and economic activities in the center with ribbon development taking place along the major arterials leading into the city. Development control is considered very important for Kuala Lumpur Metropolitan, especially in the Commercial Central Area which has the highest concentration of development compared to the rest of the city. To date, the area which consists a mixture of traditional shop houses, office complexes and modern hotel-cum shopping complexes, still receives numerous applications either for new development or redevelopment. The City Hall receives many applications to redevelop the traditional shop houses to be replaced by a more up-beat commercial building (Adom, 1992). Small-scale development often carried out by private developers can be completed in record time but does little to contribute to the aesthetic aspect of the city since it is done in a piecemeal manner. Potential areas being planned for such developments include open spaces, government lands, schools and rivers. Though restrictions are imposed based on development plan and planning standards such as plot ratio, density and plinth area applied by the City Hall, these can still be negotiated by compensating with payment of development charges, provision of car parking and other facilities, surrendering land for road widening or providing building setback. The concern is that the development of the area if not properly and efficiently controlled, will not only adversely affect the form of the planned growth but that the image and identity of Kuala Lumpur will be eventually lost.

Planning legislation in Kuala Lumpur started in the year 1881 (Baharom and Yusof, 2001) whereby an important and critical legislative action was taken after the big fire catastrophe.

However, ‘urban planning’ was only introduced in 1921, while legislation that directly regulates town planning activities was later introduced in 1930. Eventually, the sudden need for better planning was realized with the new Kuala Lumpur City Act (Planning) in 1973 (Act 107). It is the first ever legislation meant to control urban planning and development and related activities (Kerajaan Malaysia, 1973). When Town and Country Planning Act (Act 172) was introduced in 1976 (Kerajaan Malaysia, 1976), which incorporates Structure Plan under 20 years strategic plan, it also included Local Plan meant to develop spatial framework for social policies, urban economic activities. Later, a dedicated Act meant only for Kuala Lumpur was passed by the Parliament that incorporates major principles under Act 107 and Act 172.

Process And Procedures

The City Hall of Kuala Lumpur (CHKL) is the largest municipal authority as far as size and functions are concerned. Administration and management of CHKL is undertaken by more than 20 different departments or units including the Master Plan Department, Planning Control Division, Building Control Division, Enforcement Unit, Administrative Division as well as the Secretariat, each having its own head. All these departments are under the supervision of a Director General who is assisted by two Deputy Director Generals. The Mayor appointed by the Prime Minister, heads the entire organization and is an administrator with vast power and authority over decision making as far as development is concerned.

All applications for any development in the city of Kuala Lumpur will have to be submitted to the City Hall for approval. Depending on the type and scale of development, these applications will be processed and considered by either ‘Town Planning Committee I’ or ‘Town Planning Committee II’. Town Planning Committee I chaired by the Mayor looks at proposals for comprehensive and large-scale development, layout plans, change of use of land and increased density, and the application for the use of government land. This committee comprises the Director General of City Hall, Deputy Secretary to the Minister of Federal Territory, and all the directors of the technical divisions. Before an application is reviewed by this committee, it will have to go through all the technical departments for comments and recommendations, based on which decision is derived whether to approve, approve with conditions or reject the proposed development. Then, Development Order will be issued by the Mayor. Meanwhile, Town Planning Committee II looks into the applications for development of shop houses, detach houses, mosques, industrial building, etc. The procedure adopted by Town Planning Committee II is similar to the former committee, except that Development Order will be issued by the Director General.

Requirements

The process of development control and approval involves a technique for the systematic compilation of expert quantitative analysis and qualitative assessment of land use and property development viability, including its effect on the surrounding area, and the presentation of results in a way that enables the importance of the predicted results, and the scope of modifying or mitigating them to be properly evaluated by the relevant decision making body before a planning permission is rendered. Development at the local level such as CHKL obviously involves a lot of policies and implementation decisions, which have to consider the cost and benefit to every level of urban dwellers. To plan and control development in such area requires the technology that is capable of not only assisting in day-to-day routines but should also aid in formulating development strategies able to cope with

the fast changing scene. Given the wide range of activities over the years, the local authority has amassed a huge amount of information of which a substantial portion is geographical in nature such as layout of housing scheme, road and drainage system, composition and distribution of population, distribution of land use and so forth. Unfortunately, these data are often inaccessible even to the local administrators, the main reason being the database management system which is based on manual filing system, making retrieval of information difficult and time consuming (Yaakup *et al*., 1995). While previous systems developed help tremendously in information retrieval and analysis, they do not handle spatial data very well. Thus, jobs assigned to the system are quite limited to routine retrieval.

Development control and approval in CHKL, which involves the process of analyzing the appropriateness of planning applications, requires various data from the relevant agencies (Appendix 1). A planning application will be assessed in terms of current development scenario, land information, planning requirements and planning design (Yaakup *et al*., 2002). An information system is necessary not to only keep and display data pertaining to planning application for the purpose of administrative functions, but also designed to facilitate planning at strategic level. The system developed for development control and approval, thus need to comprise the following features:

i. Capabilities of analyzing development strategies in terms of the role and function of Kuala Lumpur taking into consideration the policies outlined by the government. This can be done using current data on floor space of the development area as well as the whole planning area. By comparing this information and control figure projected by the Kuala Lumpur Structure Plan, the effectiveness of the development policies can be evaluated;

ii. Capabilities of providing information to assess the implication of planning application in terms of the provision of social and community facilities;

iii. Capabilities of identifying potential land available for development. This is useful to both the public and private sectors to determine supply of floor space. Land supply is an economically dynamic process and very much dependent on government policies. Such information therefore forms the basis for strategic planning;

iv. Capabilities of identifying areas receiving development pressure to facilitate development control and monitoring of the areas;

v. Capabilities of facilitating technical evaluation of planning applications by displaying data on land use, plot ratio, transport system, etc. used by other agencies involved in technical aspects;

vi. Capabilities of displaying information on development status, surrounding development, available infrastructures and other planning requirements. This is because information on development and administrative policies formulated by the municipality, which has been translated into spatial entity is important to enable the planners to advice applicants.

The system developed should also allow for integration with other stand-alone databases apart from further enhancement to cope with the fast changing technology.

COMPUTERISED DEVELOPMENT CONTROL AND APPROVAL SYSTEM

The ICT applications in CHKL range from traffic monitoring to development control and preparation of development plans (Unit Multi Media, 2001). Various implementations of ICT projects have demonstrated that ICT is an important tool in CHKL. The application of ICT in day-to-day work indicates the assimilation of good governance principles. Nevertheless, a systematic approach is required to ensure a smooth transformation for the staff of CHKL in moving towards e-government as envisioned by the Malaysian Government.

The Computerised Development Control and Approval System which will be implemented by the Planning and Development Control Department, City Hall of Kuala Lumpur, is one of the ICT applications undertaken to facilitate the procedures to control and monitor the city development. The system being developed integrates several sub systems to execute specific functions. At the same time, the sub systems interact with one another by sharing information sources (Figure 1).

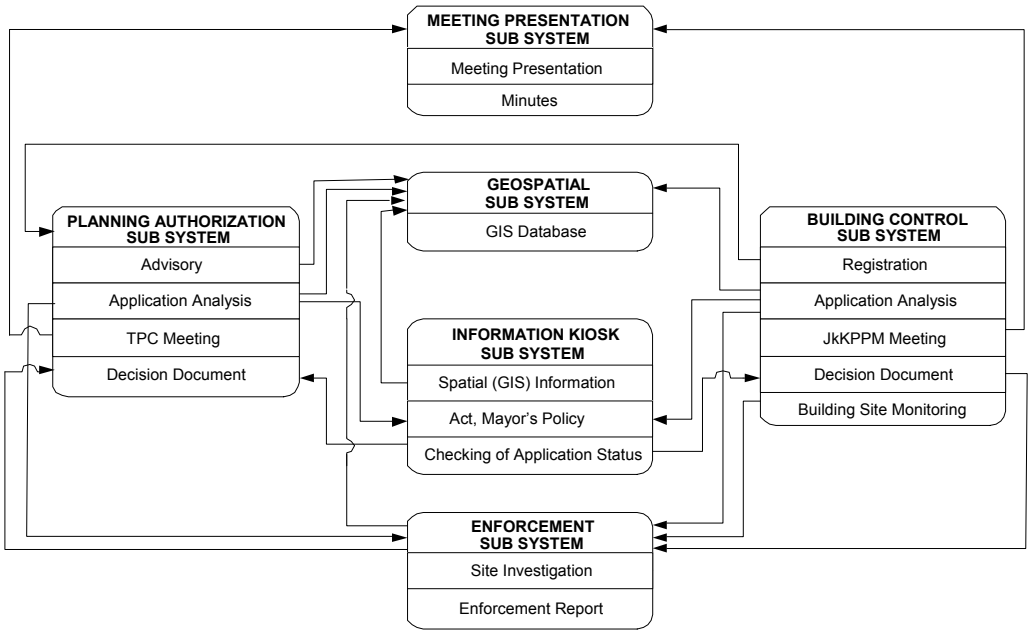

Figure 1: Sub Systems Interaction

In general, the Computerised Development Control and Approval System encompass seven main sub systems, which are:

i. Planning Authorization Sub System
ii. Building Control Sub System
iii. Enforcement Subsystem
iv. Information Kiosk Sub System
v. Meeting Presentation Sub System
vi. Documentation Processing Sub System
vii. Geospatial and Planning Information Sub System

Planning Authorization Sub System

The Planning Authorization Sub System operates to process planning application, beginning from the submission of an application until the Policy Approval or Development Order is issued. To support the processes involved in planning authorization, this sub system was designed to encompass six modules as follows:

- Advisory Module
- Registration Module
- Task distribution and LPP Module
- Agenda Module
- Decision Documents Module
- Monitoring Module

This sub system allows user to observe the related policies and spatial information while evaluating the planning applications and requirements. Apart from saving time and space, it helps to minimize workload and reduce the use of paper. Besides, the data-sharing concept will minimize overlapping of data stored in the database as well as information processing and thus, increase the quality and productivity of work.

Building Control Sub System

The Building Control Sub System is meant as a support for the building approval process. This sub system begins from the submission of application for building plan approval through the process of producing Certificate for Occupation. The features are similar to the Planning Authorization Sub System, which include graphic and interactive interface and enable interaction between sub systems. This sub system will assist the Building Control Division in managing their activities through the five modules developed:

- Registration Module
- Evaluation of Application Module
- Agenda Module
- Decision Acknowledgement Module
- Monitoring Module

Enforcement Sub System

The Enforcement Sub System assists the Planning and Building Control Department in planning and carrying out enforcement actions. These include generating reports on site investigation, issuing warning notices, implementing control activities and reports on certain decision made by the Planning and Building Control Department. This sub system also helps the public to file complaint and receive feedback from the local authority. It also facilitates the management in acquiring investigation reports faster so as to act in a more effective and timely manner. Four modules were developed for this sub system, namely:

- Enforcement Module
- Planner Module
- Building and Sanitary Module
- Monitoring Module

Geospatial and Planning Information Sub System

The Geospatial and Planning Information Sub System is developed to provide a complete spatial database along with the attribute data, which recorded the Development Order Approval, Building Order Approval, and Building Occupation Order. The implementation of this sub system involves of the GIS database development, data collection, data conversion and updating of spatial and attribute data. This sub system also provides support in terms of spatial data for the other sub systems, while at the same time enable other divisions to retrieve the spatial information they need through the interface programs developed. Users can specify the type of information they want to retrieve using the query functions based on 'parcel', 'road', 'section' or 'county' identifications. This sub system will help the management to make decisions more systematically and rationally.

Information Kiosk Sub System

The Information Kiosk Sub System is built for internal users as well as the public to gather information through the Planning and Building Control Department's web site. This kiosk provides detail information on Kuala Lumpur, the Planning and Building Control Department as well as development control and enforcement. Through the system, users can retrieve information related to City Hall of Kuala Lumpur apart from obtain various forms provided. The system also allows the City Hall to announce important issues to the public. In general, this sub system involves the following:

- Function for enforcement plan approval result
- Function for accessing spatial data (GIS web)
- Function for accessing information on planning and building legislation
- Function for accessing application support documents

Meeting Presentation Sub System

The Meeting Presentation Sub System enables the smooth progress of a meeting through facilities for displaying related information on development application including plans, GIS related data and other associated information being discussed such as documents, maps and so forth. Meetings should be able to run smoothly as location plans, site images, perspective diagrams and proposal plans can be illustrated with a clearer image compared to conventional procedures. Furthermore, the information needed can be retrieved promptly.

Documentation Processing Sub System

The Documentation Processing Sub System is designed to store and retrieve all documents in a more systematic manner. This may solve the problems of storing physical files and locating of files. The documents will be transformed from hardcopy to softcopy and stored in the system database. Hence, user can manage the documents more efficiently and simply as and when the document is needed.

GIS FOR DEVELOPMENT CONTROL AND APPROVAL

Geographical Information System (GIS) is seen as the most suitable solution for supporting the handling of spatial information throughout the development control and approval process. The advent of GIS has created a large field of opportunity for the development of new

approaches to the computer processing of geographically referenced data obviously needed in supporting decision-making processes. Some of the important functions include the ability to retrieve information rapidly and efficiently, model different scenarios and evaluate alternative solutions generated by various modeling procedures. Hence, a more effective solution to various spatial-related problems including those associated with planning and development matters can be achieved.

GIS Database Design

The GIS database design was based on the planning and development control process to be implemented. In general, the design of GIS for the purpose of development control and approval is based on the procedures and processes which involve the following stages:

Stages	**Activities**	**Function of GIS**
Initial Discussion	Consultation to owner/ developer regarding potential, planning requirement, policies involved in the area	Data Retrieval: a) Existing development b) Development status c) Development Plan d) Planning policies
Processing of Planning Application	- registration - site visit - gathering data from various departments - identifying planning issues - preparing technical report - analyzing the application	- identify potential land for development - translate policies formulated into spatial context - identify development pressure area
Consideration by Technical Sub Committee	- comment on technical requirement - recommend the technical amendment to applicant	- data retrieval from various agencies - facilitate technical evaluation
Consideration by Town Planning Committee	- formulate and review planning policies - considering planning application	- assist in analyzing the development strategy - provide information to evaluate the planning implication

Based on GIS application for planning and development control, the database was designed and developed to comprise several elements, each with various data layers meant for analysis and conformed to technical requirements for planning application:

- Base map – plot coordinate, topography, map series, locational relationships and spatial entity at land parcel level with assigned ID
- Administrative Boundary – state, city hall, planning zone,
- Built Environment – Residential, commercial, industrial, institutional, educational, religious, recreational
- Transportation - roads, LRT, railways, transport station, airport
- Planning Requirement - development plan, planning policy, land use, plot ratio, development status and land information (parcel no., district, section and status)
- Geosoil – geology, soil
- Hidrography – lake, river, reservoir, drainage

- Relief Element - contour, slope
- Vegetation – natural vegetation, cultivated vegetation
- Meteorology – rainfall, humidity, wind
- Utility – electricity (overhead cable and transmission), telecommunication (cable line, public phone and transmitter), water (pipeline and pump station), sewerage (sewerage line, sewerage tank and treatment plant)
- Community facilities - religious places, civic halls, health centers, education facilities (kindergarten, primary, secondary and tertiary)
- Imagery
- Building - use, condition, height, plinth area, walkway, etc;

GIS for planning and development control will have to be maintained and planning information will have to be updated continuously. Once a decision is made, both the spatial and attribute database should be updated.

The development control and approval system being developed stresses on interaction between the relational database management and geographic data storage. Base on the database design, this system takes an object-based approach to storing spatial data information as an integral part of the database. The spatial index key is assigned and stored as an attribute in every object in the relational database. It becomes important properties as interaction reference between object information (tabular data) and spatial data (shapefile). Each row in the table has a particular feature in its Shapefile, and the table can be queried to return specific subset of features from the table. Therefore, when a user makes a query on the specific modules in any sub system developed, spatial index key is first identified to allow user to use it to perform efficient area retrievals from GIS storage. The interaction of the tables is shown in Figure 2.

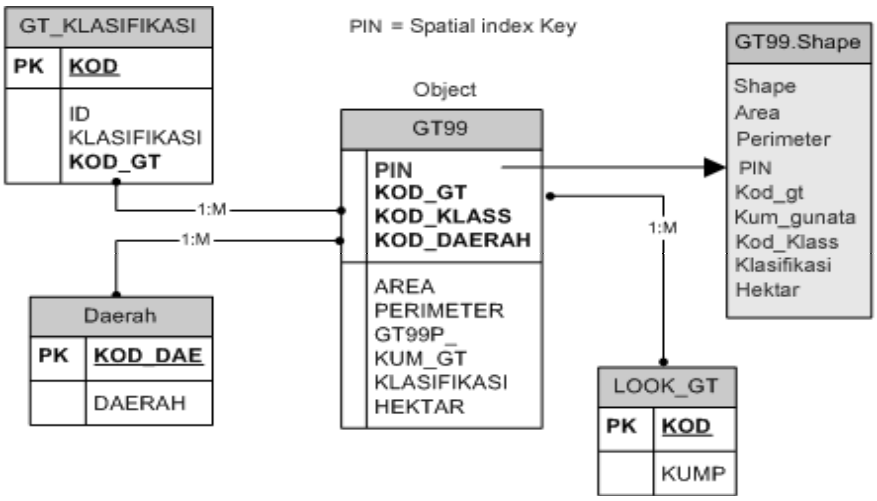

Figure 2: Relationship between Object Information and Spatial Data (Shapefile) using spatial key index

ArcGIS-ArcInfo is used for updating or modify existing feature based on more recent information. This can include modifying or adding spatial features or changing or adding values in a dataset's attribute. To provide access to system user, GIS data has been converted into shapefiles to support GIS functions provided in the overall sub systems.

GIS Functions in Supporting the Other Sub Systems

Basically, the framework for developing the overall sub system is based on Visual Basic programming except for Information Kiosk as well as Geospatial and Planning Information Sub Systems. Visual Basic has provided a powerful set of tools for accessing database by ODBC and to get a user interface up and running as fast as possible. In this case, ArcGIS desktop application is used with Visual Basic for Application (VBA), which is embedded within ArcMap. Through VBA, some modules in the sub systems were made to interact with ArcMap interface following a query operation. Using VBA, developer was able to leverage the application framework that already existed in ArcMap for general data management and map presentation task and extend ArcMap interface with functions like query and searching as well as adding menus and tools according to GIS requirements on this system. Figure 3 shows the way in which geographic data management can help in the development control and approval process through integration of application using software tool approaches.

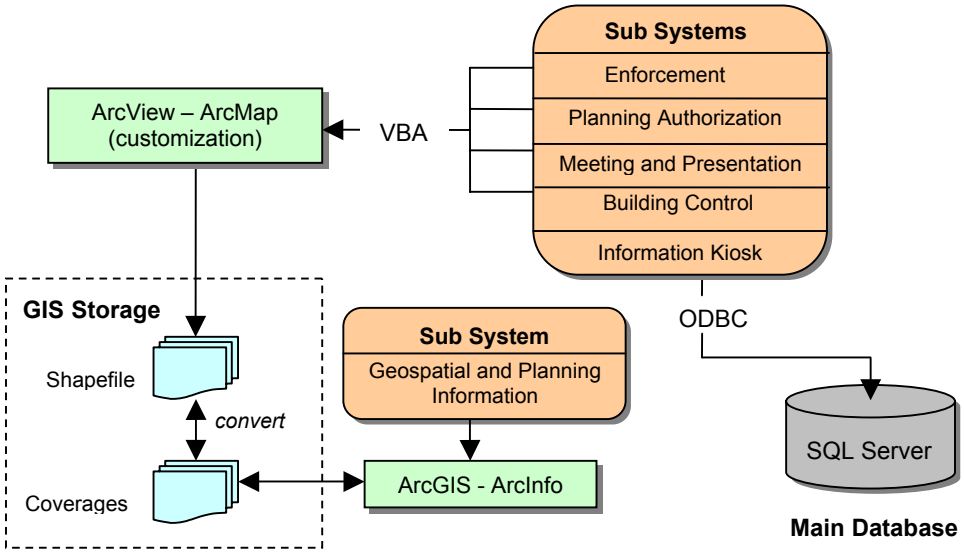

Figure 3: Extending GIS function on sub systems using software tools

The Geospatial and Planning Information Sub System plays the role as reference centre or spatial data bank for the other sub systems. This sub system allows spatial data sharing between sub systems via the functions provided for retrieving and data manipulation. In general, the GIS modules developed support the other sub systems as follows (Figure 4):

a) Planning Authorization Sub System
In this sub system, the GIS functions provided support for user in making data entry as well as data analysis and manipulation, conducting queries and generating report for Planning Evaluation Report (LPP), generating Site Investigation Report and other planning approval processes.

b) Building Control Sub System
GIS functions support the building control sub system in the displaying of site location and plan proposal for assessment whether they comply with other requirements of building approval. The GIS functions developed has made it easier for user to refer and search the required spatial information base on location, owner information and land use.

c) Enforcement Sub System
The GIS functions developed enable the enforcement officers to monitor land use and building faults by providing site location, site information, planning approval reports and building plan reports.

d) Information Kiosk Sub System
The Information Kiosk Sub System provided the GIS functions through web-based technology for public user to view and retrieve spatial information related to land use and building development using query operation base on lot number, street name, building type and area.

e) Meeting Presentation Sub System
In this sub system, GIS functions support user to display information and query on planning application as well as related policies and development plans such as the Local Plan, Structure Plan, Micro Plan and Layout Plan that has been approved. This will assist decision makers to come up with more rational decisions.

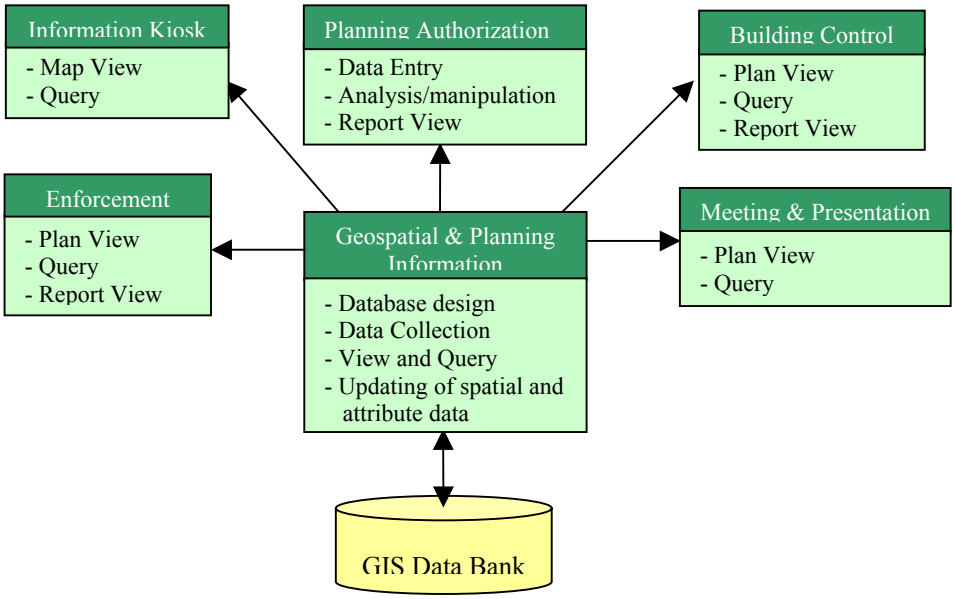

Figure 4: GIS functions in other sub systems

Web Based GIS in Information Kiosk Sub System

State of the art Web-based GIS are built on integration of multi-related technologies that include Object-Oriented Language, GIS package and language, HTML, CGI, ASP and the theories about Public Participation GIS (Chang, 1997). The implementation of Web-based GIS is more towards inviting public participation apart from providing information in the form of maps and data for public access, and paving the path for data sharing with agencies having the same interest. The implementation concept base on global data sharing permits users to acquire and implement activities of interest the same way as implementation of application through the local area network.

The Information Kiosk Sub System provides the GIS functions for public users to retrieve spatial as well as attribute data. These functions operate by linking features in the GIS database to the attribute data in the external database. A layer will be chosen through

matching related information found in the SQL server database provided. In this case, the attribute data refers to the same table in the main database that is used by all sub systems in the Development Control and Approval System. Basically, the GIS architecture in this sub system is as illustrated in Figure 5.

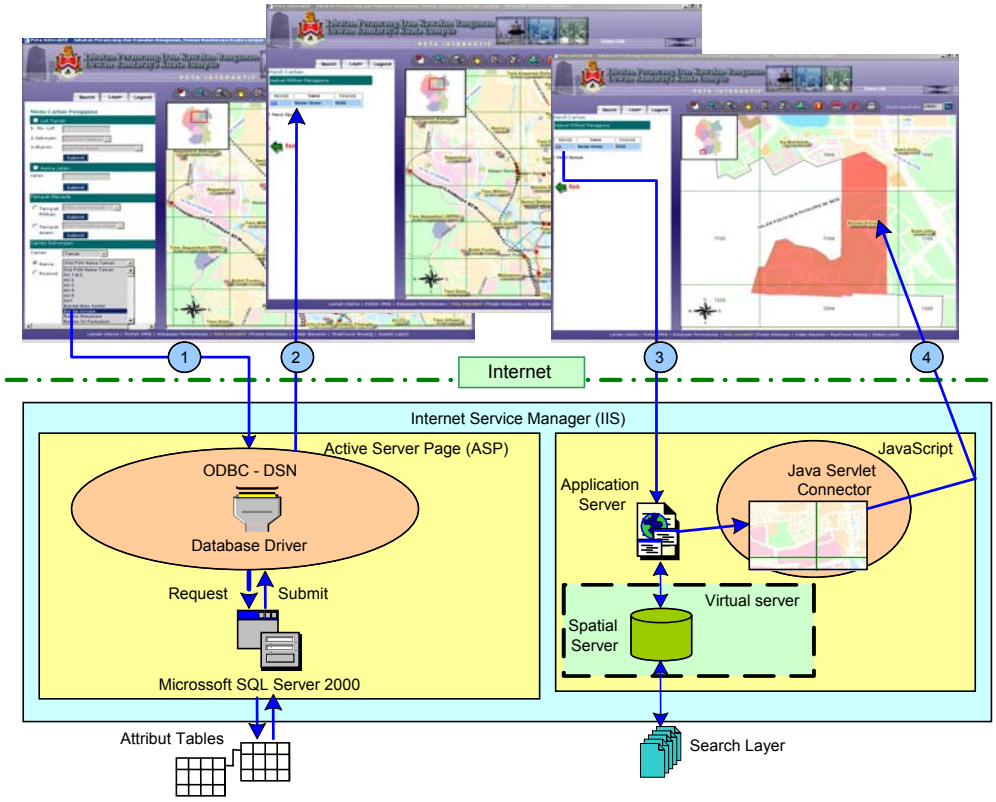

Figure 5: Web GIS Architecture within the Information Kiosk Sub System

ArcIMS is used in developing the GIS web-base application as it is an Internet Map Server software which provides the components required for web development such as authoring, designing, publishing and administering Internet mapping application. It allows web clients, map server, data server and Web Server to communicate between one another. Through ArcIMS, developers are able to build the web-based GIS faster and manage MapService over the internet.

Within the application, two types of search operation can be performed, which are *relational database search* and *feature search*. The *relational database search* stresses on Active Server Pages framework for creating the application for attribute data search. Web Server acts as the main part to retrieve the requested data by using Internet Services Manager (IIS). To make the database accessible to ASP, an Open Database Connectivity (ODBC) connection to the SQL Server driver was set up. A query form in ASP was developed to allow users to select data from the database satisfying several criteria in variety of condition like county (mukim) or a section in CHKL area. After the user has set the selection criteria such as parcel, road, building or area, the selection criteria is forwarded to a second ASP page, which formed an SQL query from the selection criteria and sent it to the database via the ODBC connection. The data returned by the ODBC connection was then displayed on the result page in tabular format.

Once the user clicks on an item in the result page, the application performs a *feature search* to provide a map of the corresponding feature. The *feature search* is performed through the application connector used is the Java Servlet Connector. Java Servlet operates together with the Web Server to enable the HTTP to be submitted together with the user query to the ArcIMS application server. In this stage, Spatial Server acts as the main part in the client data request and submission processes as the Spatial Server is the controller to the flow of data from and to the data storage. However, the Spatial Server could not be accessed directly from the application server but rather through the Virtual Server. The Virtual Server can comprise one or more Spatial Server depending on the goal and use of the system. Thus, access can be made through MapService preparation on the Virtual server. In the web system developed, the application of Image Server (Virtual Server) for the MapService used enables the process of 'image rendering' onto the Spatial Server to be done. Subsequently, maps will be generated on the server and returned to client in the JPG format.

Various stages of users will be allowed to access the web page via web browsers such as Microsoft Internet Explorer 4.0 or the latest version. The GIS web page allows user to view and use the information displayed for further processing. The web page was developed with the aim to facilitate users to acquire information in digital form. The web page acts as a source of reference in making evaluation for planning and development purposes especially where public participation is concerned.

PROSPECTS AND CHALLENGES

Since the early 1980's, there have been major breakthroughs in the cost, speed and data storage capacity of computer hardware and software. With computer costs still dropping, with the emerge of powerful portable machines, and with the possibility of massively increased network bandwidths, enabling a larger and larger segment of Kuala Lumpur city dwellers to connect up, the prospects for new types of computer use in problem solving and policy domains have never been more promising (Yaakup, Johar and Dahlan, 1997). The application of the computerised development control and approval system will inevitably influence the existing structure and practice of urban planning and management in CHKL.

The implementation of the computerised system provides a good prospect for e-submission of planning application. However, one of the most important requirements is that the system developed should cover all the necessary work process involved in development control and approval. Furthermore, selection of crucial procedures to be computerised will cut cost and time consumed apart from minimizing the process of bureaucracy, while defining of workflow will avoid overlapping of information processing. Other requirements include continuing process of amendment and updating of information, specifying compatible formats allowed for submission of application while ensuring that the system is capable of catering multi-data transfer, legal devices to ensure that all parties are secured of their rights as well as security measures for protecting access of information by unauthorised parties. Establishment of an e-submission monitoring committee should also be considered to help evaluate and validate the integrity and reliability of information submitted. For the time being, stress should be made on the need for submission of digital copy of information regarding each application. In the long run, efforts need to be made to develop the manpower within the organisation as well as educate the public and private entities involved on the requirements for e-submission.

Effective use of ICT such as the system being developed, however, requires the personal commitment of individuals at all levels of the local authority with respect to overall leadership, general awareness and technical capabilities. Successful utilization depends on clear leadership and a commitment from senior staffs aware of the potential opened up for urban planning and management. Training and education is another essential component to ensure the smooth transfer of knowledge. Sophisticated system requires trained and experienced technicians to operate and maintain the system, and, more importantly, sophisticated planners, analysts and managers to determine what type of information should be collected and to interpret and use the information that the system produces.

The implementation of the system, therefore, involves far more than hardware and software decisions. Effective implementation rests on a thorough and systematic evaluation encompassing planning, operational, organizational, institutional, personnel, financial and technical aspects. More research and attention need to be directed toward the organizational and institutional issues.

CONCLUSION

The quality of urban planning and management can be upgraded when available and valid data are handled in an advanced manner with the aid of computers. With the continuous development of ICT, there is a major opportunity for local authorities to use it to manage the allocation of scarce resources in a rapidly changing environment.

Implementation of the computerised development control and approval system is seen as an important tool in facilitating and accelerating the process of development control and approval in CHKL. Furthermore, many benefits were derived from the GIS applications and new work processes developed including better decision making from shared data, time savings from less manual data gathering, elimination of redundant data entry and maintenance, faster as well as more accurate information for citizens and other agencies apart from reducing the increasing costs of redundant data maintenance activities. The system will be able to support planning and decision-making because it offers relatively quick response on analytical questions and monitoring issues.

However, an important issue not to be overlooked in the implementation of the system is the overall information management strategies, which takes into account the availability of data, computing capabilities and management requirements. Without well-developed strategies, it is likely that major problems will arise in relation to its utilization. There will be mismatches between information needs and data availability as well as between data collection and information processing. Success or failure in the adoption very much depends on a variety of human, organizational and technical factors.

Acknowledgement

The authors would like to thank the City Hall of Kuala Lumpur and Universiti Teknologi Malaysia for allowing and granting permission to present this paper.

References

Adom, R. (1992). *Peraturan mengemukakan permohonan perancangan ke Unit Pengekalan dan Seni Bandar*, Department of Planning and Building Control, City Hall of Kuala Lumpur.

Baharom, A. and Yusof, I.M. (2001). GIS application in development control process: local government in Malaysia. Paper presented at *Middle State Division of the Association of American Annual Meeting*, Brookville, New York.

Keng-Pin Chang (1997). *The desining of a web-based geographic information system for community participation*. Master Thesis, Department of Geography, University at Buffalo, The State University of New York.

Hill, T.R. and McConnachie, D. (2001). The role of Geograhical Information Systems in developing planning in South Africa, *Third World Planning Review*, 23(3): 289-300.

Kerajaan Malaysia (1973). *Akta (Perancangan) Bandaraya Kuala Lumpur, 1973, Akta 107*, Jabatan Percetakan Negara, Kuala Lumpur.

Kerajaan Malaysia (1976). *Akta Perancang Bandar dan Desa 1976, Akta 176*, Jabatan Percetakan Negara, Kuala Lumpur.

Rakodi, C. (2002). Politics and performance: the implication of emerging governance for urban management approaches and information systems. Proceedings of the *Sixth GISDECO: Governance and the Use of GIS in Developing Country*, ITC Enschede, The Netherlands, 15-18 May 2002.

Unit Multi Media (2001). *Sistem-sistem Teknologi Maklumat dan Komunikasi (ICT) di Dewan Bandaraya Kuala Lumpur,* Jabatan Pengurusan Organisasi, Dewan Bandaraya Kuala Lumpur.

Yaakup, A., Johar, F., Sulaiman, S., Hassan, R. and Ibrahim, A.R. (2002). GIS and Development Control System for Local Authorities in Malaysia. Proceedings of the *Sixth GISDECO: Governance and the Use of GIS in Developing Country*, ITC Enschede, The Netherlands, 15-18 May 2002.

Yaakup, A., Johar, F. and Dahlan, N.A. (1997). GIS and decision support systems for local authorities in Malaysia*,* in H. Timmermans (ed) *Decision Support System in Urban Planning*, E & FN SPON, London, pp. 212-228.

Yaakup, A., Ibrahim, M. and Johar, F. (1995). Incorporating GIS into sustainable urban and regional planning: The Malaysian case. Paper presented at the *GeoInformatic'95 Hong Kong: International Symposium on Remote Sensing, Geographical Information Systems and Global Positioning Systems in Sustainable Development and Environmental Monitoring*, Hong Kong.

Appendix 1: Development Approval Stages