Ghana's Land Administration Project (LAP) and Land Information Systems (LIS) Implementation: The Issues

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1. INTRODUCTION

There are six land sector agencies involved in Ghana's land administration project (Figure 1). These agencies have technically been operating manually in an environment beset with conflicting and unreliable dada, dubious manipulations of existing data by some recalcitrant staff and tedious retrieval of available information, suggesting the need to establish or develop computer-based land information systems and networks through re-engineering processes and pushing for attitudinal change. It is not the manual systems *per se* that are the cause of the problems (although they have contributed significantly); it is the fact that there are costs, delays and uncertainties as well as rent seeking behaviours in the system. Generally, details of flow-lines of information are seldom documented or monitored. Based on better management of information, substantial improvement within the lands sector can be brought about by analysing and costing existing procedures, abandoning unnecessary practices and making better use of existing resources through the introduction of Information Technology (IT) and LIS (UNCHS (HABITAT), 1990). Essentially, most organisations would be keen to know how LIS could fit into their overall IT strategies.

'Land Administration' as the process whereby land and information about land may be effectively managed, indicating that land administration includes the provision of information on land, identifying those people who have interest in real estate and information about those interests such as the nature and duration of rights in land. It also includes information about the land parcel such as their location, size, improvements, ownership and value. As distinct from 'land administration', 'land management' is the process of managing the use and development of land resources in a sustainable way. Concerned here is with 'land administration', even though a 'cadastre' could actually be a land management tool and is normally a parcel-based land information system containing records of interest in land (for example rights, restrictions and responsibilities associated with such land). The UN Commission notes that effective and sustainable land management is impossible without a cadastre or LIS.
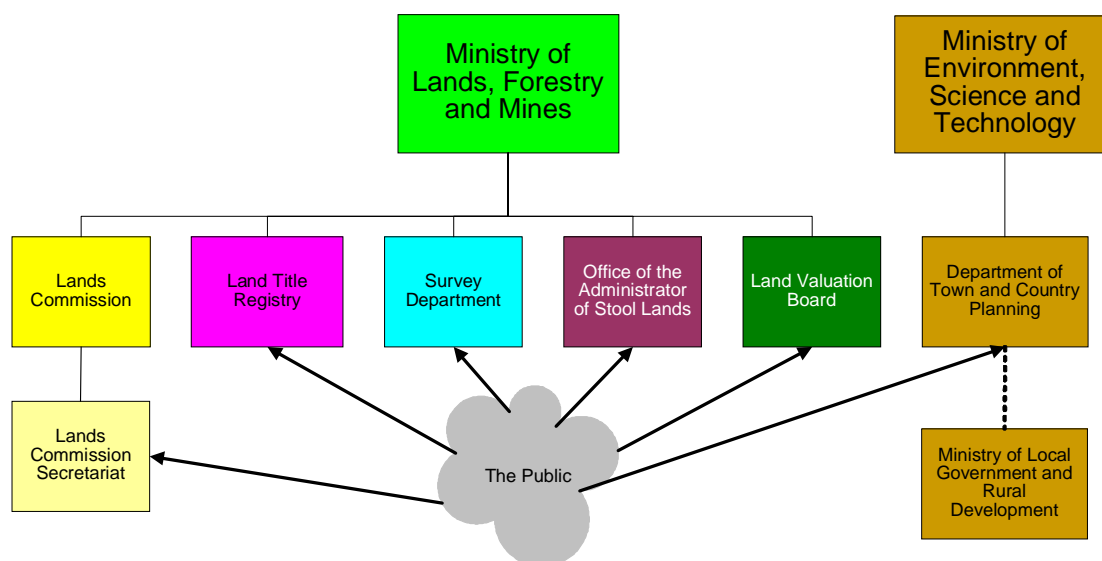
Features:
Six independent agencies, three ministries*:
* Five under the Ministry of Lands, Forestry and Mines;
  Ministry of Environment supervises Town and Country Planning at National/Policy level,   Ministry of Local Government at Local/Implementation level

Figure 1: The six existing land agencies involved in Ghana's Land Administration Project

LIS and GIS have similar meanings in terms of analytical functions and other operations performed on the data. However, the principal focus of LIS is on the land parcel while the architecture of GIS is concerned with mappable features (Meltz, 1989). The two terms will therefore be used interchangeably in this paper.

LIS should also be seen as an *"institutional entity reflecting an organisational structure that integrates technology with a database, expertise and continuing financial support over time"* (Carter, 1989, p. 3). I therefore agree with Campbell (1996) that GIS diffusion is affected not only by the *nature of GIS* itself but also the *structure of an organisation* and the interplay of the two and depend on the extent on how an organisation is prepared to *reinvent* this particular form of technology within its organisational milieu.

The paper examines some aspects of the institutional reform proposals suggested by the Consultant recruited by LAP, addresses topical LIS implementation issues in Ghana's lands sector, looks at the prospects of LIS implementation, itemises some challenges to be faced, and gives some recommendations and conclusions that would enable LAP achieve breakthrough results in LIS implementation.

2. INSTITUTIONAL REFORM PROPOSALS

The land sector agencies are presently bedevilled with poor remuneration, poor conditions of service and inadequate logistics; lack of transparency in work processes, delays and cumbersome manual procedures; poor records management; perceived corruption; mistrust on the part of customary land owners in land administration generally; lack of technical expertise

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in new technology available; and lack of effective collaboration and cooperation between the agencies.

The need to reform the agencies dates back many years but it was not until 1999 that the Government of Ghana fashioned out, for the first time, a National Land Policy (NLP) to give effect to this reform with a view to: *"addressing some ...fundamental problems associated with land management in the country" ; "establishing and developing a land information system (LIS) and network among related land agencies in the country; linking them up with sub-regional and regional networks; and establishing and maintaining a geo-spatial framework database in the Survey Department, requiring all thematic databases to be referenced thereto"* .

In October 2003, the Government launched the LAP to translate this policy into concrete action, recognising that as Ghana moved towards increasing use of digital technology and GIS systems, there was the need to design a properly structured computer-based LIS that would record basic cadastral information and better allow user access and integration within different datasets. However, it was believed that the existing agencies had to be placed under one management since they remained fragmented, ineffective and inefficient in their present operations.

To give effect to this proposal a number of suggestions were made for a new Lands Commission with one Chief Executive Officer (CEO) at the famous Swedru Meeting[1], namely that the:
– Government divested itself of direct management of stool lands;
– new Lands Commission was to be market focussed;
– process of re-engineering was to be implemented to reduce transaction cost of land registration;
– law on compulsory land acquisition was to be reformed to reduce the incentive for unnecessary acquisition of land by Government; and
– Town and Country Planning Department (TCPD) remained under the Ministry of Local Government and Rural Development.

It is worthy to note that in 2003 the Government had come out with an Information and Communications Technology for Accelerated Development (ICT4AD) Policy that sought to support the modernisation of the Civil and Public Service through institutional reforms and deployment and exploitation of ICTs to facilitate improvements in operational effectiveness, efficiency and service delivery; and develop GIS applications to monitor and support sustainable environment usage in cases like land and water.

It is against this background that a consultant was recruited to suggest the preferred institutional reform option after consultation with all stakeholders including civil society organisations, the private sector and traditional authorities. Figure 2 indicates the structure of the preferred option. It is not the intention of this paper to delve into too-much detail on this

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[1] The six Agencies met at Swedru in the early part of the project implementation and came out with what is now termed the 'Consensus Option'. This is different from the 'Preferred Option' as suggested by the Consultant for institutional reform.

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structure. The paper will only address some aspects to give the necessary perspective to the objectives set here. It is important to recapitulate, however, that major problems to be overcome in implementing LIS in Ghana's lands sector agencies will be organisational, managerial and human based and this explains why a lot of space has been given to institutional issues in this paper.
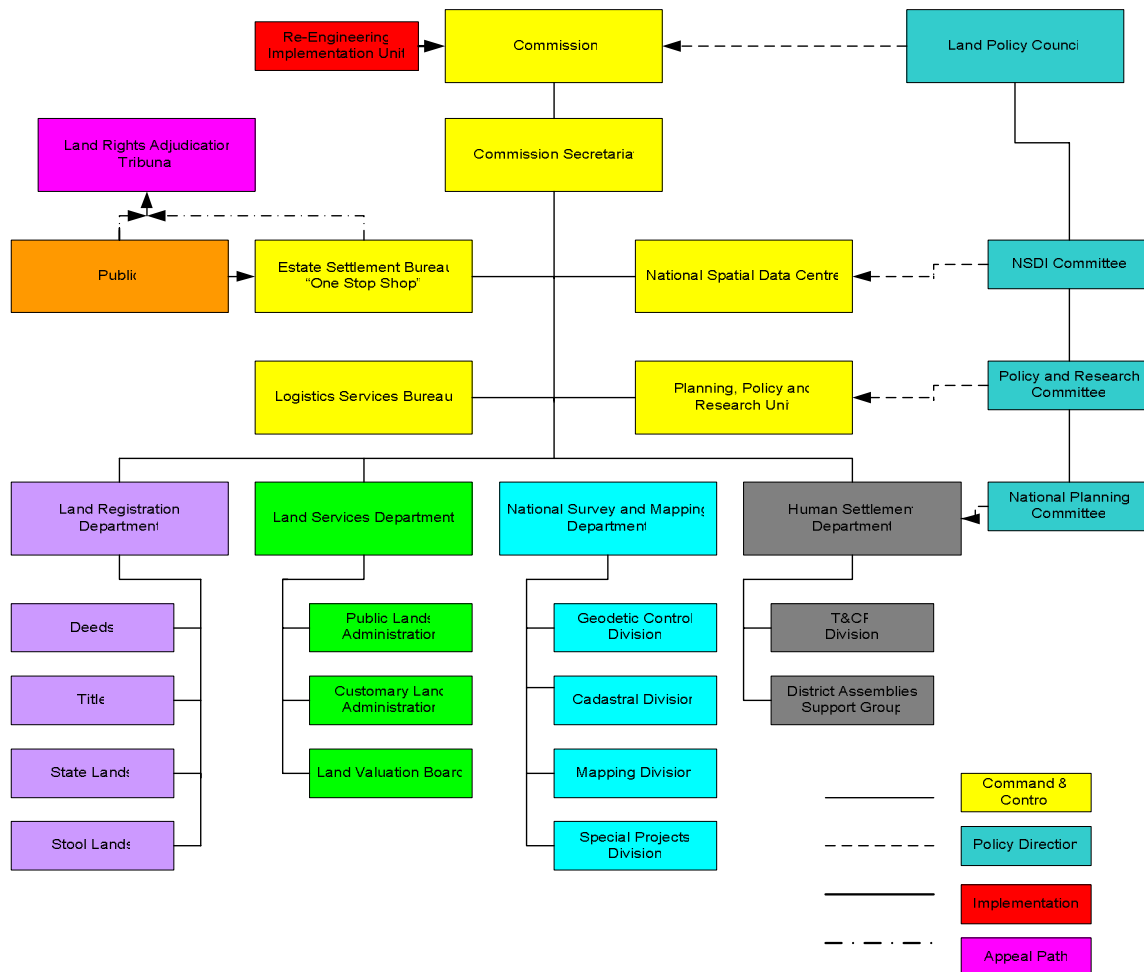
Source: Grant, 2004

Figure 2: The Land Administration Structure proposed by LAP the Consultant

In Figure 2, a number of key features are easily recognisable:
– the Land Policy Council (now the Land Sector Policy Committee (LSPC) of LAP) is expected to provide policy advice on National Land Policy to the new Commission; the Steering Committee functions for the LAP will be conducted by a Committee of the Land Policy Council;
– a One-Stop-Shop (Estate Settlement Bureau (ESB)) is to be adopted where clients could have all requests on land met at a point of call. This is to be interfaced with a Land Rights Adjudication Tribunal where the outcome of all transactions and any Alternative Dispute Resolution or conflict resolution may be provided subject to appeal to the Tribunal;

- National Spatial Data Infrastructure (NSDI) where an integrated national spatial information will be developed;
- Logistic Services Bureau (LSB) where all supporting services, legal, financial, public relations, management services and corporate facilities will be housed;
- an Internal Audit Unit will be attached to the Board of Commissioners for appropriate tasking and auditing within the total agency;
- the existing Land Agencies will be reorganized into four operating departments: Land Registration Department, a Land Services Department, a National Survey and Mapping Department, and a Human Settlement Department (if TCPD is to be part of the One-Stop-Shop); and
- staffing and pay scales of the Commission Secretariat and Operating Departments will be independent of civil service recruitment rules and all conditions of service harmonised.

Whilst the consultant thought it possible to achieve a complete integration of land administration services along functional lines, which will require the merging of some units and the elimination of others and preferred the inclusion of the Town and Country Planning Department (TCPD) within the MLF, the LAP is pushing for a linkage between the two whilst still resourcing the TCPD under the LAP (see Figure 3).
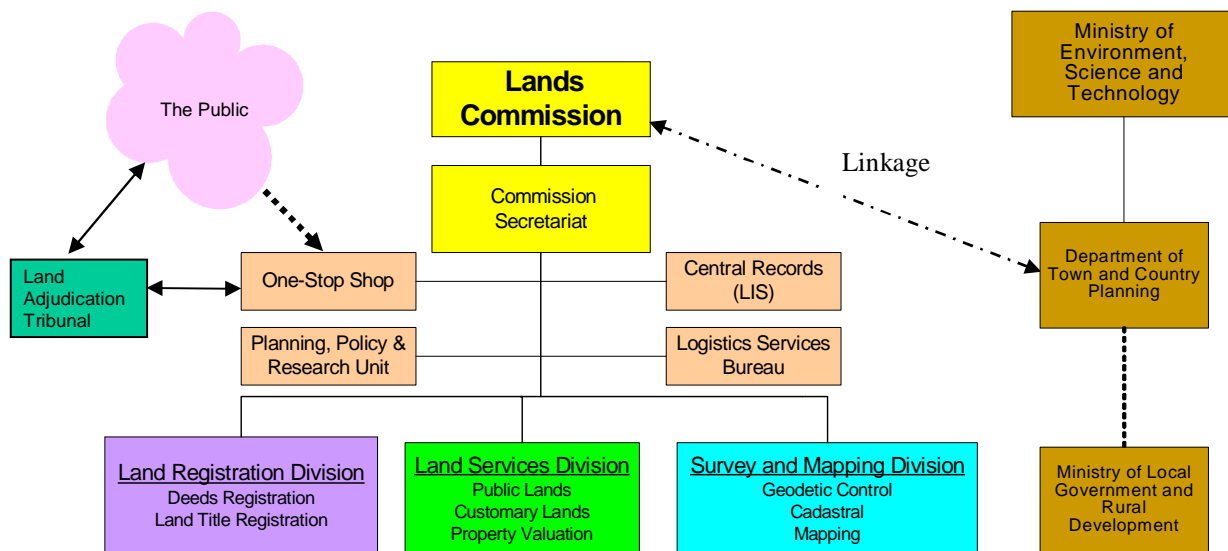

Figure 3: The Land Administration Structure proposed by LAP to Cabinet, December 2005

Again, the NSDI initially proposed by the Consultant to be part of the new Lands Commission structure, has given way to a LIS unit that may be linked to Ghana's NSDI (NAFGIM)[2] that ought to be truly national, representing a whole-of-government approach to gathering, sharing and presenting geo-referenced information; and this is better placed under the National Development Planning Commission or under the Office of the President.

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[2] Investigations at the Environmental Protection Agency indicate that NAFGIM is now more or less defunct and ought to be 'resuscitated'.

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The next part of this paper zeros in into the (Central Records) LIS segment in Figure 3, examining in some detail LIS implementation issues. A two-pronged approach is employed: firstly, a broad discussion on a GIS co-ordinating mechanism for the lands agencies is established and a GIS configuration at that level proposed. Focus is then directed to the agencies to examine the envisaged structure and processes of GIS implementation in the LAP and the role of the agency's future implementation team. Thereafter, the initial implementation requirements of the LCS including the institutional arrangements for the *GIS project* implementation under the project are considered, dwelling also on the role of GIS as a planning support tool. Secondly, approaches and sources to learn best practices in GIS implementation are provided as a checklist.

3. LIS PROJECT IMPLEMENTATION: THE RELEVANT ISSUES

The LAP envisages a holistic approach in the introduction of GIS in land sector agencies. Some co-ordinating mechanism has to be established for these agencies in GIS implementation at the very outset, even before the envisaged one-stop-service. A phased-out incremental approach is advocated. Figure 4 shows a schematic framework for co-ordinating land sector agencies as they currently exist.
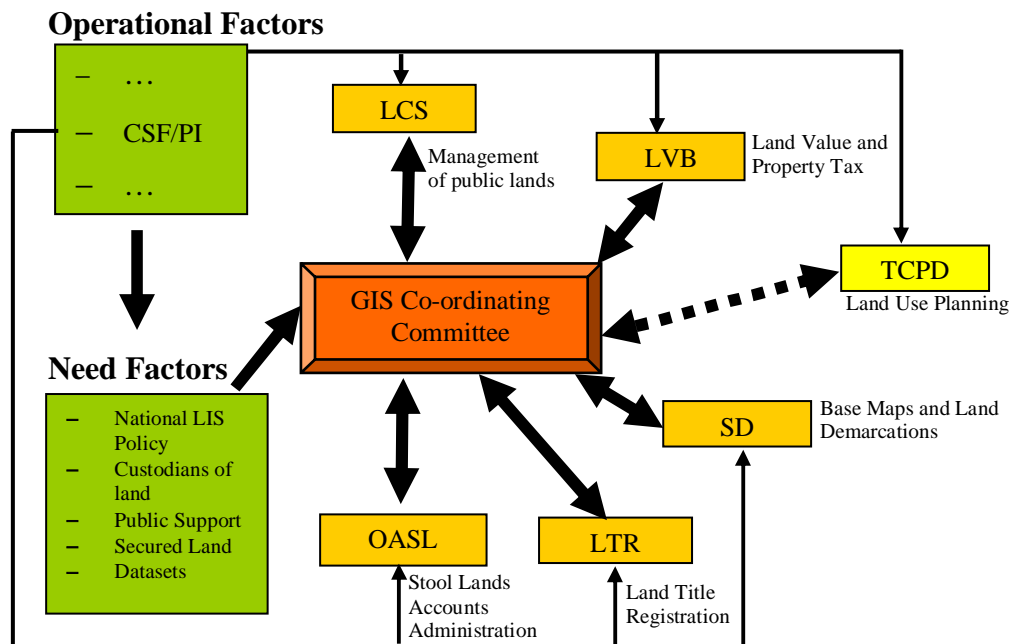

Figure 4: Proposed GIS co-ordinating mechanisms for the Agencies

Before Figure 4 is discussed, it is important to mention that a GIS organisational model for the agencies would have to be based on the fact that the LAP is gunning for the merging of the land agencies as one body. It has, however, been noted by experts that the very nature of corporate working (through the adoption of the enterprise model) was problematic and that since its adoption may warrant major structural changes in organisations involving huge financial outlays, the corporate/enterprise model had never been actually used even by local authorities where they were expected to be adopted widely (Campbell and Masser, 1995; Local Government Management Board (1993); Reeve and Petch, 1999).

The proposition that, in the initial stage of implementation, each agency should be re-engineered and strengthened as individual bodies since re-engineering will involve creating centres of information about land administration, land values and taxes *et cetera* involving the coordination of organisational and technological change ought to be taken seriously. The issue then would be ensuring proper networking arrangements between the existing agencies (after re-engineering) under the GIS Coordinating Committee that will operate as a Land Information and Management Advisory Board, with links to Ghana's SDI, NAGIM. GIS has a critical role to play in this and whilst there is need for organisational reform, the 'big bang' approach cannot be a viable option, technically. After the merger of the agencies the above 'departmental approach' may metamorphosize into a 'GIS enterprise model' but only after care consideration based on empirical evidence.

Referring back to Figure 4, each agency will have to use appropriate suite of methodologies (for example Critical Success Factors (CSF)/Performance Indicators (PI)) and others where appropriate (constituting operational factors)) to determine its needs in relation to the overall national need (need factors, that look at national GIS goals, land as a resource, the role of custodians of such lands, the public as stakeholders and issues relating to datasets) whilst being co-ordinated by the GIS Coordinating Committee. The Committee is expected to oversee data integration and ensure increased capacity for data sharing, instilling the concept of information as a corporate resource into all the land agencies. Each individual organisation's long term plan must relate directly to the long-term plans of the central government (LAP) it serves (Huxhold, 1991). For GIS implementation, there should be clear lines of responsibility for each participating agency and adequate incentives that allow work to be done constructively to achieve the GIS project objectives.

What should the LIS configuration for Ghana's land sector under the above co-ordinating mechanism be like? It is suggested that it comprises three basic sections namely a 'land database', a 'spatial analysis and modelling' component and a 'user products' element. The land database may be divided into three sections namely cartographic data files (maps), attribute data file (descriptive data) and manual registers (see Figure 5 below).

Ideally, spatial analysis and modelling may have four sections. It would utilise software with capabilities for vector and raster operations where appropriate. It is important that standards exist to ensure effective and efficient data sharing among agencies. Applications must conform to existing practices and procedures simplified with the aid of expert systems and numerical models where appropriate (Lai and Wong, 1996). A Data Base Management System (DBMS) would be used for querying operations and interpretation of data. It is expected that some manual systems such as 'index' filing would run concurrently with computer-aided information systems.

Roles of the various departments must be spelt out early. For example cadastral boundaries and topological base maps must be the responsibility of the SD whilst land use maps must lie within the purview of the TCPD working closely with SD as with all other agencies. The end result will be map generation and generalisation (spatial data queries and analysis), interpolation maps (land resource appraisals), querying procedures and interpretation of the

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attribute data (DBMS), and prototyping and simulation studies (expert systems and models) where appropriate.
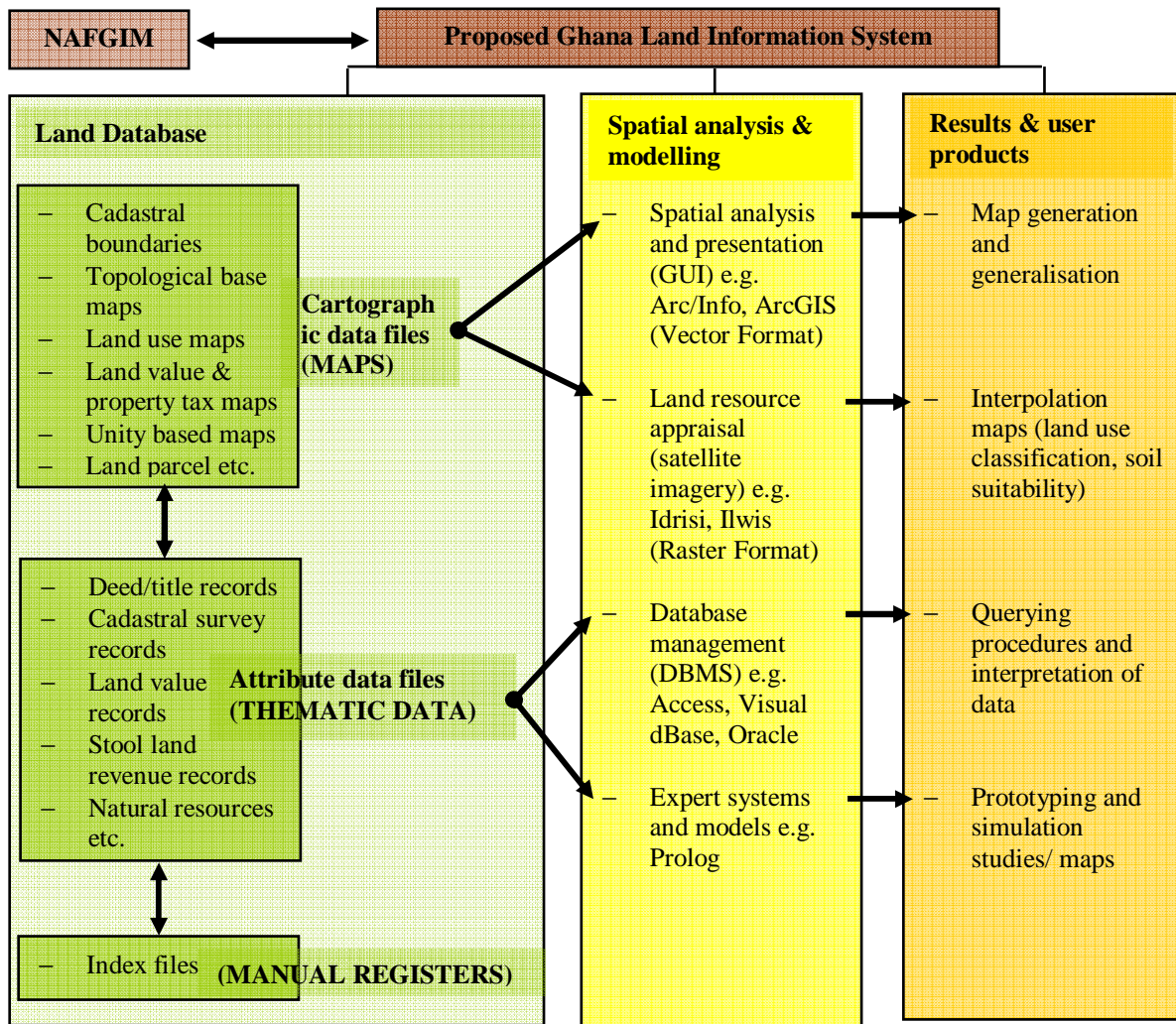
Source: after Chidley et al. (1993)
Figure 5: Proposed GIS configuration for Ghana's land sector

The first requirement is the automation of the agencies GIS *non-spatial database*. "*It is costly to collect, store and shift through large quantities of unnecessary data. Hence, the most cost effective approach is to collect only the data required for the specific tasks...*" Yaakup *et al,* 1995, p. 731). Non-graphical data in the agencies have resided in files and are quite well indexed but most of this will still have to be converted into digital format. It may be necessary to start with a simple database like *Microsoft Access* and scale this up to *Oracle* in the future. The building of *spatial databases* using ArcGIS, for instance, with a *customised interface* can then follow at which stage accurate master addresses or proper owner data sets would have been obtained.

The next part of the paper dwells specifically on how implementation may occur within those agencies.

There is to be a GIS Project Team at the Head Office (headed by a qualified but high-ranking officer (co-ordinator)), which is expected to play an internal co-ordinating role and be the source of technical information for all sections of the agencies. The team will encourage user participation, develop local expertise, demonstrate the effectiveness of GIS technology through research and innovation and liaise with NAFGIM on GIS standardisation and networking issues. The GIS Departments at the regional levels will help transfer GIS technology to the regions directly and supervise the district offices. Both regional and district levels will be responsible for GIS implementation and therefore are to be seen operational units. At the district level, *"NGOs by their nature of their field presence, can potentially serve as vehicles to support the transfer of GIS technology to the district administration"* (Sahay and Walsham, 1996, p. 392).

It is to be noted in Figure 5 that this proposed GIS structure must be integrated into the present agencies systems, headed by the respect Heads of Agencies, as far as is practicable. What is to be addressed are the roles of these Heads of the Departments after merger. Would it be practical to make them GIS 'experts/godfathers' (Reeve and Petch, 1999) and GIS 'Project Co-ordinators' as well? Another issue are the roles of the new Regional bosses as the administrative heads of the regions. Do they become hybrid GIS managers (Reeve and Petch, 1999)? In other words, do they all necessarily have to be retrained to become the GIS experts at the highest level in the head office and the regions in the long run? Even though this is highly recommended, the principal actors and users of the GIS project must themselves decide on this. In this respect, it must be acknowledged that GIS is to be implemented in a context in which there are going to be differing opinions and priorities that have to be harmonised. There is a need, therefore, to devise mechanisms that aim at maximising synergy between the different actors and users or implementers of the GIS project (Sahay and Walsham, 1996).

As a corollary, another critical issue is supervision of work in the GIS units. Who supervises work at the agencies and what is to be the specific role of the GIS Coordinating Committee? An allusion was earlier made to some of these roles. However, it is important to state that each agency, that is now administratively independent, is to have separate GIS teams whose role it is to mainly develop *"an appropriate set of methods for collecting, analysing, storing and sharing information and subject these to technical and [spatial] analysis"* (Fox, 1991, p. 65). The Committee's role will then be catalytic only, focusing on pushing for renovations of existing buildings to house the GIS units, ensuring training and appointment of well-trained staff, scouting and purchasing and installing equipment knowledgeably and seeking management support, among others. It is expected to *"either include, or allow for participation of local interest such as private enterprises, community groups and non-governmental associations concerned with spatial information for [land administration] purposes"* (Fox, 1991, p. 65). The Committee must ensure that there is standardisation of data through constant contact with NAFGIM if revitalized.

Table 1 shows examples of GIS strategic planning and choices using a bar chart that may engage the attention of the Committee. Arrows suggest that activities are to be sustained for a lengthy time period. After installing equipment, for instance, they ought to be upgraded periodically over a long period. The comprehensive long-term plan of LAP of 15 years and above will ensure that analyses and constant appraisal of the needs of the agencies will be

consistent with the individual goals of the agencies and thus prevent unrealised expectations and disappointments (Huxhold, 1991). Appointment of well-trained staff, for instance, can begin shortly before feasibility study is completed and before GIS application starts. The acquisition and installation of GIS must be approached with a strategic plan and choices made under a stable management environment to ensure sustainability (de Man, 1996; Madziya *et al.,* 1989; Geertman and Stillwell, 2002).
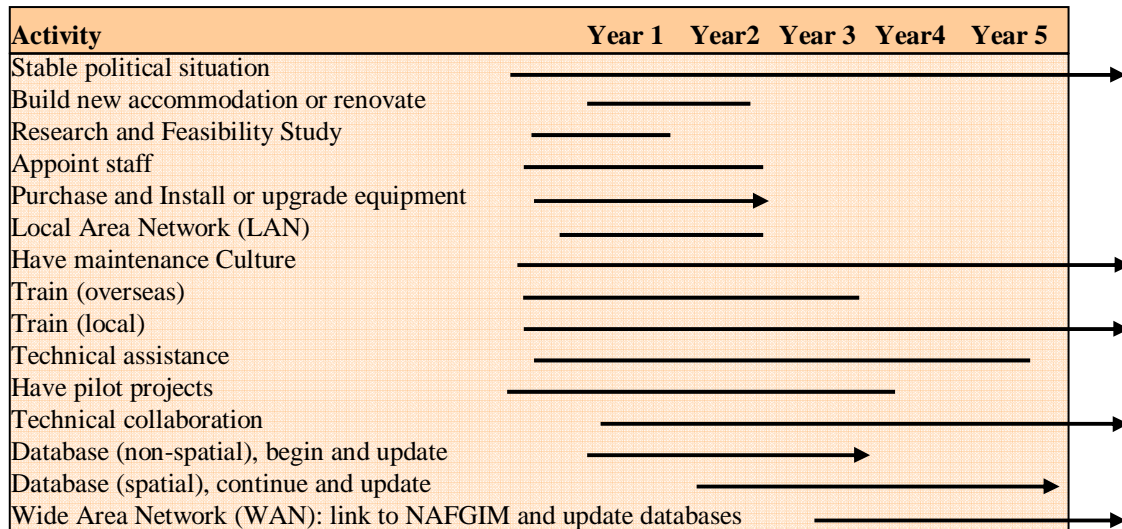
Activity	Year 1	Year2	Year 3	Year4	Year 5
Stable political situation					
Build new accommodation or renovate					
Research and Feasibility Study					
Appoint staff					
Purchase and Install or upgrade equipment					
Local Area Network (LAN)					
Have maintenance Culture					
Train (overseas)					
Train (local)					
Technical assistance					
Have pilot projects					
Technical collaboration					
Database (non-spatial), begin and update					
Database (spatial), continue and update					
Wide Area Network (WAN): link to NAFGIM and update databases					

Table 1: Example of some national GIS strategic choices using a bar chart

Activity	Acceptable Conditions/Requirements
Stable political situation ………………………...	stable democratic institutions and support
Build new accommodation or renovate …………	create optimal working environment
Research and feasibility study …………………...	use indigenous expertise (strongly human-centred research activities); gaining institutional & financial support
Appoint staff ……………………………………..	GIS manager, analyst, systems administrator, programmer, database administrator, cartographers, drafters, and digitizers
Purchase and install equipment …………………	functional equipment, ensure standardisation for all sections
Local Area Network (LAN) ……………………...	have efficient information system
Have maintenance culture ………………………	maintenance schedule
Train (overseas) …………………………………	study and research (R&D)
Train (in-country) ………………………………...	not having to rely on outside technical assistance when minor problems occur; appropriate mind set for immediate gratification and replication
Have pilot projects ………………………………	
Technical assistance ……………………………..	catalytic donor support, training and using indigenous expertise
Technical collaboration …………………………	long term interaction with other African GIS laboratories
Database (non-spatial) …………………………..	begin with 'keying in' attribute data in a DBMS; data must be accurate and up-to-date
Database (spatial) ………………………………...	digital base maps that can be used by other land agencies that have GIS
Wide Area Network (WAN): NAFGIM …………	share data through a good networking mechanism via NAFGIM

Table 2: Conditions and requirements associated with GIS strategic choices

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It is hoped that the first three years of GIS implementation will be devoted to training of core staff abroad, providing a LAN to all agencies whilst training in-house. Collaboration with other (African) GIS laboratories is recommended and a maintenance culture should be cultivated and sustained throughout the project's life span.

Table 2 above shows the conditions and requirements associated with the choices as indicated in Table 1. In the appointment of staff, whilst is may be necessary to get appropriate job descriptions like the 'systems administrator' in the initial stages, because the agencies would want to develop their own applications in future, 'computer specialists' may later to be seen as 'experienced advisors or facilitators' rather than as experts leading the process (Reeve and Petch, 1999).

The next part of this paper relates the agencies to the national strategic plans and choices elaborated above. Some guided steps are provided to determine the readiness of the agencies for GIS use (Wiley, 1997).

The development of GIS must be tailored to suit specific organisations as objectives and circumstances vary and each approach would therefore require a different plan and treatment. A sequence of six steps has been found as useful guide in the case of the Agencies. Each step provides a specific activity, or a set of activities and their outputs provide information for subsequent steps. Constraints to the introduction to GIS may be social, economic, environmental or institutional or even legal and the design of any interventions must be explicit. Interventions must recognise the capacity of government, the agencies and staff to implement them and the resources available must be specified early (Fox, 1991).

Step one: The agencies must have proper organisational structures. They are expected to have layouts of office space and capacity to ensure the suitable placement of equipment and easy physical circulation of staff. The present structures in some agencies appear to create congestion. A long-term approach of creating suitable accommodation should be included in strategic planning of the agencies, including determining the agencies institutional constraints on GIS use. LAP is expected to address these. The agencies should, however, each have revised organisational charts detailing hierarchy of responsibilities and clearly defined roles. It is worthy to note that it was not until 1998 that an attempt was made under the prompting of the Civil Service Performance Improvement Project (CSPIP) for any of such agencies to have such charts.

Step two: The agencies must ensure that there are data standards for their operations. Standards may consist of GIS guidelines on both spatial and non-spatial data usage. Standards include the quality, reliability, classification, accuracy and resolution of graphical and attribute data. The agencies are expected to have good basic standards that can facilitate the integration of other agencies' data resources, ensuring accurate data sets and maps.

Step three: The appropriate staff (with requisite training) must be available (Fox, 1991; Edralin 1991). Computer specialists would be needed to provide network support (support advisors) (Reeve and Petch, 1999). Drafters and cartographers must be involved from the very beginning as they would be expected to conduct updates and ensure maintenance to the

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database. The transfer of trained staff should be done with some circumspection as unplanned transfer of key project staff would create implementation difficulties (Sahay and Walsham, 1996).

Step four: The agencies must have appropriate funding. Investments in GIS require the need for availability of adequate funds for maintenance, upgrades and updates of equipment and software. Future budgets must start with current budgets and the agencies must find out what it is spending now on information management and project into the future (Wiley, 1997). The public and other users must pay for services provided to recover partial expenses of the GIS development.

Step five: The agencies must create and have a maintenance culture. It is pertinent to note that 'the Ghanaian has no maintenance culture' and therefore programmes to ensure that all equipment remain functional at all times is critical to GIS operations. An Estate Manager with knowledge in facility management, a Database Administrator and a Systems Administrator responsible for maintaining the system in a continuous operational mode, among others, must be employed.

Step six: The agencies must ensure data sharing. Since this would be the agencies first attempt at seeking data integration with other agencies, they must embrace the policies on data standards and sharing; and the role of NAFGIM as a 'SDI and Clearing House unit' in Ghana is crucial in this respect.

The above six steps and the detailed procedures, are by no means exhaustive, and should not be followed rigidly or sequentially as they are not to be seen as linear. They could be varied and adapted to make the best of every situation at any one point in time. What is important is to understand the purpose of each step or detailed procedure and modify or change them to suit specific circumstances. It is not being projected here that without these requirements, GIS cannot be initiated as these are only guides for effective implementation of GIS in the agencies at the micro-level.

With GIS, as with any planning support systems, the agencies must list their GIS tasks and identify staff and users who will operate the system, set out the resources needed and estimate the time needed to accomplish various tasks and activities. They must also have on their drawing boards, which tasks are to be completed before others are commenced, draw up work plans for their projects as a whole, draw individual personal work plans and allocate money and equipment appropriately. In much more detail, they must arrange administrative matters and logistics well in advance such as checking and arranging security clearances for staff and equipment in the use of maps and computers. They must budget for staff, equipment and transport costs, provide and co-ordinate technical support in consultation with LAP and make provisions for contingencies and iteration of steps in the GIS planning process (FAO, 1993).

The GIS projects must be made to evolve and systems development must take place in an incremental manner (Sahay and Walsham, 1996). On this score, it may not be too appropriate to begin with a critical path analysis as changes are expected to occur frequently. Based on the concept of a preceding activity, a critical path analysis is a task which has to be completed before another can be started (FAO, 1993). However, a detailed work plan (e.g. a planning

table or bar chart) as indicated above, when followed but underpinned with modifications and innovations as changes would allow, can be an invaluable tool to GIS implementation success in the agencies.

What issues are to guide the agencies in implementing GIS? The next part of this paper will be devoted to actual experiences of GIS implementation findings and their sources to help learn useful lessons. This operates as a checklist for GIS implementation (see Table 3 below). It has become imperative to learn from best practice and experience in GIS development so as not to be seen to be reinventing the wheel.

Lessons reported about institutions or individuals in GIS implementation

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Madziya et al. (1989):
− political support is critical;
− public organisations need low-risk GIS solutions; and
− acquisition must be approached with a strategic plan.

Rourk (1989):
− institution process flows to be altered or replaced by the GIS must be well understood;
− employees must be involved in the development; and
− lines of communication among developers, users and management must be established.

 Levinsohn (1989):
− all agencies affected should be involved early in the process;
− full range of key decision makers, line managers and technical staff should be involved throughout;
− executive commitment is highly important; and
− consensus building is required as opposed to implementation by directive.

Fox (1991):
− failure to adopt a new technology because of constraints has consequences and foreseen consequences can become constraints;
− culture of government organs strongly influence the adoption of information technology;
− establishment and operation of these systems require a large number of specialist with broad experience and knowledge; and
− organisations are affected by their structure and order.

Sahay and Walsham (1996):
− balance between technical and social;
− transitions to GIS are made in a gradual rather than an abrupt manner;
− actors must work together as a team for the progress of the project; and
− develop mechanism that maximises synergy between actors.

Campbell (1994):
Four factors that enhances successful GIS implementation:
− simple applications fundamental to the work of potential users;

- user directed implementation involving all stakeholders;
- awareness of the limitations of the organization; and
- high degree of organisational stability or the organisation's ability to cope with change.

Lai and Wong, (1996):
There must be:
- simultaneous adjustments between users practices and technological evolution;
- changes in operating procedures, service provision and power relations in organisations;
- integration of local (indigenous) knowledge and established (exogenous) knowledge;
- standardisation of development visions to gain common ground among major participants;
- progress toward achieving systems that are easy to use; and
- long-term development that requires continual funding and elaborate support infrastructure.

Speer, (1997):
- the presence (or absence) of 'project champions' will likely dictate the success (or failure) of the project.

Reeve and Petch, (1999):
- GIS project leaders need to be sensitive to the nuances of the organisation in which they work; and
- People are the key to GIS success.

Nebert (2001): On the concept of SDI
- ensure key government, commercial and value-added data/related service providers are represented as key stakeholders in the development and implementation of national SDI;
- collaboration of government data suppliers on coordinated, supportive policies that relate to spatial data access and distribution including availability of free data, pricing, copyright and use/integration of electronic commerce;
- an access infrastructure and policy that is non-threatening to stakeholder mandates;
- sustainable long term business models;
- early and clear indication of the role of the private sector;
- early marketing and promotion of the entire SDI programme;
- awareness and adoption of international standards;
- organisations must prioritise their data;
- organisations to collect metadata a little at a time; and
- organisations must publish their metadata using OpenGIS Consortium Catalogue Services Specification.

Geertman and Stillwell, (2002)
- characteristics of the policy context (e.g. democracy or dictatorship) influence the preferred technology and the way it is used.

Dunn, (2002)

- appropriate uses of GIS were those that consider first the political, social and institutional context before providing technical evaluation; and
- those projects that are most likely to fail are those in which technocratic 'quick fix' approaches are adopted.

Karikari, Stillwell and Carver (2003a)

- *the successful initiation* [and implementation] of GIS pilot projects by Ghanaian experts will depend on a *strong financial base* and a *strong management support* (with GIS champion(s) playing vital roles);
- *strong management support* and *strong financial base* would indicate *the readiness for GIS use [and implementation];*
- *the readiness for GIS [implementation]* would depend on the political and economic situation of the country with *donor countries playing catalytic roles*; and
- any *successful GIS prototype or pilot* must be well *documented* to ensure *continuous funding* (from within**)** and therefore ensure *sustainability*.

Karikari, Stillwell and Carver (2003b)

- if NAFGIM is it to ensure the full realisation of the potential of geospatial information technologies, then it must resuscitated and made to develop a strong business case and have an aggressive campaign to sell the concept of SDI in Ghana.

Table 3: Typical examples of GIS implementation findings to help learn useful lessons

4. RECOMMENDATIONS

Ghana's Land Sector Agencies must:

- determine that envisaged LIS pilots are administratively workable with the view to involving the ultimate end users (the public and custodians of land); have a phased approach, starting with research or adaptive work (involving these pilot projects) that is scaled up subsequently as experience demands, before a full-scale application is embarked upon;
- involve requisite staff from the outset;
- ensure that prospects are reasonable that adequate funding will be available from *within* (current budget) and if needed from *without* (LAP financial assistance);
- improve their performance through more stable appointment policies;
- reassess the staff strength with the view to rationalising their structures and promoting competent professional staff on the basis of merit;
- clarify their obligations and prerogatives with the objective of ensuring accountability of management;
- give a sustained effort at building up their information systems and analytical capacity through human resource development and research;
- evolve strategies aimed at removing or reducing corruption to improve their image;
- improve conditions of service and pay levels;

- retrain professional staff to cope adequately with work processes through a focused and continuous training programme (including study tours/conferences) in IT, GIS and land related courses;
- create sinking funds or revolving funds from the very outset to be replenished periodically, purely for maintenance of equipment and back-ups;
- have an internal independent audit teams;
- ensure that charges on services provided are determined by the interplay of the forces of supply and demand as far as practicable;
- improve financial performance by removing or reducing waste, raising operating efficiency, exercising better control of inventories and improving billing and collection of ground rents among others;
- set milestones, pausing and ascertaining reasons for successes chalked and problems encountered; and have these well documented during and after each pilot's implementation stage;
- recognise that appropriate staff with training in IT and GIS will be *sine qua non* in their work processes and in the successful implementation of the LAP;
- recognise that once trained, such professionals need to be motivated to stay in LC through incentives and good remuneration;
- recognise that cultural change is needed if LAP is to be successful;
- consider making data analysis on land data part of the agency's mission;
- acknowledge that Ghanaians lack a maintenance culture and recognise that the 'triad' in IT are *hardware, software and expertise*; and that maintenance of equipment and upgrading of software and back-ups must be planned from the very outset and carried out promptly following well-planned maintenance schedules;
- watch attitudes; and
- concentrate on the Big Picture (LAP).

It is recommended that LAP itself be repositioned:
- LAP should restrict itself to facilitating and monitoring the project. (It should ensure project management/control, monitoring and evaluation only);
- components of LAP, with the exception of Component 4 (dealing with monitoring and evaluation and project management), must be headed by Agency Team Leaders based as much as possible on current mandates. Agency Team Leaders must be empowered;
- implementation must occur at 'Implementation Agency' level where all pilots, including GIS ones, must be done: There is the need, in this regard, to develop a deep sense of ownership by making use of the LAPs Regional Co-ordinators as far as practicable; and
- LAP must resource and strengthen the Agencies and relevant stakeholders by providing sustained logistical support, material and human resources development. Procurement must be decentralised to these agencies as far as practicable).

5. CONCLUSION

The underlying concern in this paper is that land must be better managed in Ghana, and this involves a better land-information management, the monitoring and modelling of such phenomenon as land use change and encroachments. In this context, it is observed that the successful implementation of GIS to support land administration in the lands sector in Ghana will be confronted with a series of challenges: the need to provide frameworks within which GIS can evolve as a tool in an orderly way in the Land Sector Agencies; the need to find ways to democratise GIS in land administration and management systems and structures within Ghana; the need to generate designs that are innovative and practical so they will meet specific land sector needs; and the need to provide support infrastructure and services that will enable GIS to operate effectively and efficiently in the lands sector in relation to other sectors. Each of the agencies will have to be re-engineered, at the very outset, to improve efficiency and effectiveness in the delivery of services that are provided to the user. This calls for the urgent need to identify weaknesses, bottlenecks, inefficiencies, duplication, threats and opportunities in respective agencies. On this note, the agencies must recognise that major problems to be overcome in improving land information practices will be organisational, managerial and human based. It is the way in which the responsibility for land data is to be allocated and distributed between institutions, how records are to be kept and administered and on the skill and education of the people who are expected to run these systems that would determine their success and failure, and not the technology employed (Karikari et al. 2005, p. 358).

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