Evaluation of Geoinformation Market environment in East Africa

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Evaluation of Geoinformation market environment in East-Africa

By

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Abstract

Although most Geoinformation (GI) is still created and used in the public sector in East Africa (EA), some private companies collect and disseminate GI, often in the form of local added-value information products/services not provided by the public sector. The private sector in East Africa has been kin in picking up the commercialization of GI quickly and becoming actively involved in the opportunities they can identify. Realizing that the value of geoinformation is related to the access to this data (as a basic economic good), it has become a national, regional as well as world-wide economic commodity of ever-increasing importance. Many departments and private companies within community administrations and state authorities in EA are equipped with geoinformation systems. Yet one can observe that the GI market in the region as a whole is presently not sufficiently well developed, organizations are scattered and perform in an ad hoc way with heterogeneous structure. Pricing of geospatial data products and services is not regulated and there are few statistics on GI market growth which may be due to lack of harmonisation in the collection of GI at regional level. This makes assessment of the market very difficult for GI.

The research describes a number of issues from market theory by an eclectic choice with reference to four selected countries; United Kingdom, United States of America, Netherlands and South Africa. Furthermore, the research describes the situation of GI data production, exchange and use among the GI users and providers in EA based on the data collected in the field through interaction with the different stakeholders from the GI community of the three countries.

The data collection results aims at comparing the existing situation in East Africa with the market theory; this allows a comparison between EA to European Union. A further analysis is conducted by the use of strategic planning tools, in particular scenario comparison. Three scenarios are developed to evaluate to what extent government intervention will contribute to the growth of the GI market using a six step strategic planning methodology developed by Morrison. This results in an overview of implications through a phased approach.

It can be concluded that the GI market in EA is heterogeneous and still lacking proper government steering.

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Tukugize

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List of Acronyms

AFREF	African Reference Frame
AARSE	African Association of Remote Sensing of the Environment
AGI	Association for Geographic Information
AFRICOVER	African Inventory & comprehensive Observation of Vegetaion/Cover and Environmental resource
CODI	Committee on the Development of Information
DWD	Directorate of Water development
EAC	East African Community
EIN	Environnent Information Network
EUROGI	European Unbrella Organization for Geographic Information
ECA	Economic Commission for Africa
ESRI	Environmental Systems Research Institute
GI	Geoinformation
GIS	Geographic Information System
GSDI	Global Spatial Data Infrastructure
KARI	Kenya Agricultural Research Institute
KTN	Kenya Technology Network
KISM	Kenya Institute of Surveying and Mapping
ILRI	International Livestock Research Institute
IGGI	Intra-governmental Group on Geographic Information (IGGI)
JICA	Japan International Cooperation Agency
MUIENR	Makerere University Institute of Environment and Natural resources
MWLE	Ministry of Water, Lands and Environment
MTN	Mobile Technology Network
NFA	National Forestry Authority
NEMA	National Environment Management Authority
NSDI	National Spatial data Infrastructure
NMO	National mapping Organizations
NGOs	Non-Governmental Organizations
NEPAD	New partnership for African Development
RUWASA	Rural water and Sanitation Programme
RAFU	Road Agency Formation Unit
RCMRD	Regional Centre for Mapping of Resources for Development
RAVI	Dutch Council for geographic information
SADC	Southern African Development Community
SWOT	Strengths Weaknesses Opportunities and Threats
UNECA	United Nations Economic Commission for Africa
USA	United Status of America
UK	United Kingdom
UBOS	Uganda Bureau of Statistics
WIPO	World intellectual property organization
WEGS	Water, Environment and Geospatial database Services

1. Geoinformation in East Africa

1.1. Introduction

The East Africa (EA) is a community with a regional intergovernmental organization of the Republics of Kenya, Uganda and Tanzania. EA has a population of 82 million people who share a common history, language, culture and infrastructure. In this region, geoinformation (GI) is mainly provided by the public sectors that are mandated by the governments to provide data. However, one can also observe that there are a number of private companies, Non Governmental Organizations (NGOs) and projects engaged in using and producing GI. These are composed of indigenous and international partners from the civil society, universities including the space and aid agencies that currently are a major source of GI training and support. The organizations operate in various levels ranging from local, national and even at regional levels. This implies that cross border GI applications are becoming more and more important in the region. The involvement of organizations in production of GI has been enabled by new facilitating technologies. These make it easier to integrate and exchange data, thus accounting for the developing GI market. However, it is important to note that although their operations are not largely national but to an extent regional, interchange of GI is ad hoc managed with no basic GI infrastructure.

According to (Oxera 1999; FGDC 2000; GINIE 2000), urge that GI has potentially a high economic value. GI does not only provide a common reference point for the description of complex relationships but also is as a medium for providing information in a transparent and clear manner. Thus GI is a valuable foundation for planning, as well as a basis for faster, qualitatively better decision making. This implies that GI not only is location factor but an economic asset for companies in all business areas as well as public administration. (Micus 2003) rightly presents all these aspects "Whoever provides the appropriate GI can position himself successfully in the GI market". He further argues that communities, authorities and companies today have extensive sources of data, but market development shuffles along. Those who know the market are not surprised by this. (Brox and Kuhn 2001) identify the complexity involved in this GI market as the customer doesn't get what he wants – the customer and supplier are not coming together.

1.2. Research problem

Increased use and application of GI is steadily growing in East Africa (RCMRD 2003). This can also be observed from an increased number of organizations getting involved with GI production and use at all levels, local, national and regional. GI users need accurate and diversified products, which are fit for their GIS applications and also need timely response for product requests and services. This implies that in a competitive GI market, GI providers have to reorganize their operations and become more responsive organizations with GI services as efficient as possible.

Yet one can observe that the geospatial data market in the region as a whole is presently not sufficiently well developed, organizations are scattered and perform in an ad hoc way with heterogeneous structure. Pricing of geospatial data products and services is not regulated and depends

on the respective firm to determine the price charges. There are few statistics on GI market growth which may be due to lack of harmonisation in the collection of GI at regional level, and also lack of awareness of the potential usefulness of GI to positively impact many aspects of normal life and multiple sectors of the economy. This makes assessment of the market very difficult for GI.

However, according to (ECA-CODI 1999; EUROGI 1999; Groot 2000; Longhorn 2002), they suggest that if appropriate framework conditions were created, then a constantly increasing level of GI market growth could be achieved. It can be observed that at the European Union level, efforts have been geared at defining structures so as to ensure GI market growth. (Delft 1998) particularly points out that several documents in the Netherlands have been prepared by the government to deal with accessibility of government-held information in general and with several geo-data sets in particular. Furthermore, similarities and differences in data policy have been compared across European countries and further protection of intellectual property rights to databases has been promoted.

Various market opportunities exist in EA which require cross-border GI such as geo-marketing, utility networks management, etc. Public GI related organizations are also beginning to utilize the private sector by outsourcing and in-sourcing thus contributing to the GI market growth. This implies that Partner States provide unique advantages with framework for regional co-operation and integration. Thus cross border standards, policy requirements should readily be available regarding cross-border GI for planning and monitoring purposes.

1.3. Conceptual framework

The theoretical framework of this research considers the GI market as a business environment of interaction among the stakeholders. These include public (government departments), private GI companies, projects and NGOs who produce and use GI.

This research contributes to a better understanding of the economic and institutional aspects involved in production, use and exchange of GI with specific reference to East Africa.

Figure 1 below illustrates the conceptual framework of the study. This consists of input from experiences from the regions business environment, literature and fieldwork done about the GI market. The activity of this GI market involved a business-environment in provision of products and services by stakeholder organizations whose objectives were reached by having a common business understanding and the enabling opportunity availed by Geo-Information and Communications Technology (ICT). Representation is in figure 1 below.

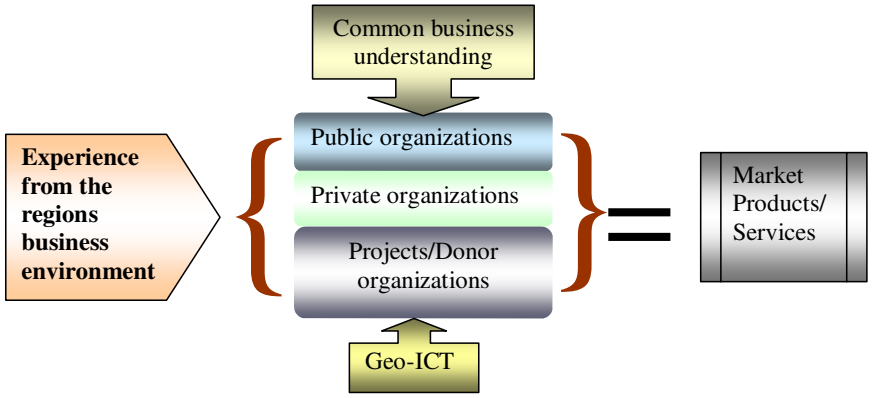

Figure 1 Business environment

1.4. Prior research

The GI market researches done describe the technical services and put emphasis on business aspects as well as the special needs of the GI market. (Micus 2003) approaches the GI market concept by explaining how the geospatial data market can be developed by means of the markets' customers, products, price and rights of use. Micus market studies have argued that geospatial data is factual data and applications are closely interrelated, for only when demand-oriented content is present can a dynamic market for geospatial information with user-oriented applications develop.

A number of organizations are involved in GI market operations for instance; Ordinance Survey of United Kingdom undertakes a variety of activities in the geoinformation market, including data collection, data maintenance, data storage, production and supply of GI products and services. Each element of this production chain provides value to the Great Britain economy. (Oxera 1999). The Dutch Kadaster is fully cost recovery and an explicit legal base has been created to engage in market activities. (EUROGI 1999)

Efforts in Africa through (ECA-CODI 1999) subcommittee on Geo-Information advises governments to develop polices which follow cost-recovery principle including the commercialization of geoinformation products. It further urges that national geo-information bodies and/or providers including governments, the private sector and the other partners contribute and identify sources of funding for geoinformation production.

(Corbin 2004) considers the GI market to be made up of public sector data providers that are dominant in the market place and as such are a monopoly (no alternative source of data at the current time); e.g. National Cadastres, National Statistics, Mapping Agencies among others. He considers the private sector companies providing data, hardware, software, and services.

Furthermore,(Brox and Kuhn 2001) suggest the design of specific marketplace for GI. To develop a process for defining the required services on a strategic level based on the services and categories described, and to detail the services on a business process level. A generalization of such case studies is expected to lead to a cookbook, similar to that of (GSDI 2000), to be applied by companies, organizations and institutions for the (re)design of GI marketplaces.

1.5. Research objective

The main objective is to evaluate the GI market environment within the East Africa community by focusing at the dynamics shaping the transaction of GI providers; (government departments, private companies, NGOs and projects)

1.6. Research Questions

1. What part of the market theory can be used to describe the GI market?
2. What makes government GI agencies to share authority with private companies in GI production? (Review of international cases Netherlands, United Kingdom, United States of America and South Africa)
3. How is the East-African market similar or different from other GI markets?
4. What is the relationship between government control of GI production and growth of the GI market in the East-African region?

1.7. Research methodology

The research was done in four main phases; Conceptual formulation, Literature review, Fieldwork, Evaluation and Analysis. Figure 2 below gives a summary of what was achieved in each of the phases.

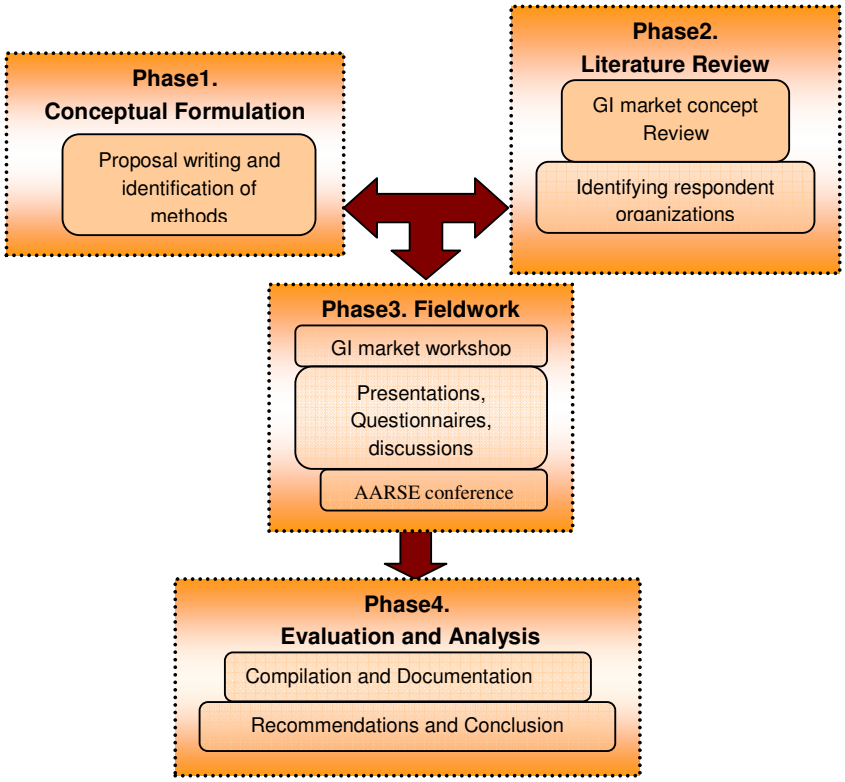

Figure 2 Research Methodology

1.7.1. Phase One

This phase involved the process of proposal writing, which included the formulation of a researchable concept, identification of the research problem, formulation of objectives and questions as basis of research. Finally, the identification of the methodology to achieve the research's main objective was designed.

1.7.2. Phase Two

Phase two entailed details of Literature review. This involved research of various reports (annual reports, customer statistics, and annual budgets), books, conference proceedings, journals, news articles, reports, and web references to establish details about GI market. Search method uses specific key words from the research questions as considerations to search authentic references and sources like the search engines and specified libraries. Literature review was pre-evaluated as input to the first three research questions and successive findings and conclusion. Key respondents were identified and contacted. Their responses provided an overview and contribution by institutions to the development and growth of the GI market.

1.7.3. Phase Three

This phase detailed the fieldwork activities considered in the research. This includes collection of primary and secondary data by use of tools like, questionnaires, interviews and workshop. Graphs and Tables were tools used to summarise and visualise the information drawn from the analysis in order to draw conclusions to any stimulants of cross-border economic activities and the comparison of the EA GI market to the cases in the identified reviewed cases in phase two.

1.7.4. Phase Four

Phase four comprised of the evaluation and analysis of conclusion drawn from the three phases. It uses the Market concepts identified in phase two to explain the results. It further uses scenarios to detail the dynamics shaping the GI market environment by analysis of relevant entities. The final complement of findings provides comparative description to help GI managers to see how these scenarios differ along given dimensions and of what relevance this would be to the growth of the GI market in EA.

1.8. Operational Plan

				2004					2005	
No	**Activity**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
1	Initial research proposal									
2	Detailed research proposal									
3	Literature review									
4	Discussion with respondents									
5	Design of questionnaires									
6	Proposal Defence									
7	Fieldwork preparation									
8	Fieldwork									
9	Fieldwork analysis									
10	Final analysis									
11	Guideline development									
12	Compilation									
13	First thesis presentation									
14	Mid term presentation									
15	Second draft and conclusion									
16	Corrections									
17	Final Draft submission									
18	Presentation preparation									
19	Defence									

Figure 3 Operational Plan

1.9. Outline of thesis structure

Chapter 1: Geoinformation in East Africa

The details in this chapter provide the overview of the research. It introduces the background to the study, presents the research problem, conceptual framework, prior research done, points out the main research objective and outlines the research questions and the methodology followed to answer these questions. It ends with an overview of the structure of the thesis.

Chapter 2: Review of Geoinformation market

The concepts of market theory based on various studies are used to describe which part of economic theory is applied to GI market. Furthermore, it analyzes the GI market by review of international cases. It discusses market and none-market failures inherent in these reviewed cases. It highlights lessons learnt and finally concludes the chapter.

Chapter 3: Status of GI market in East Africa (field study)

This chapter details the activities and the results of data collected. The outcome of fieldwork activities is based on the level of preparation and what was determined as the expected outcome. A systematic methodology for collection of primary and secondary data is outlined and field results are presented.

Chapter 4: Assessment of the GI market in East Africa

This chapter discusses the EA GI market with regards to the field results in order to depict the situation in EA. It further evaluates field results by comparing to market theory. Differences and similarities between EA and EU GI markets are illustrated and lessons learnt are drawn.

Chapter 5: Using scenarios to assess the GI market environment

The method of scenarios as described by (Wilson and Morrison 1996) is introduced and further analysis of the GI market environment is done by this approach. Scenarios are used as a strategy to formulate clearly the extremes that a situation can develop to if a decision is considered to follow a given direction Decisions considered shape the GI market environment and this is essential to clarify what possible implication this would be to a GI manager.

Chapter 6: Evaluation of scenario method

This chapter focuses at determining the validity of the scenario method (Wilson and Morrison's approach). By reviewing each step undertaken, specific insights are elaborated as compared to the SWOT method described by (Groenendijk 2001)

Chapter 7: Conclusion and Recommendations

Finally, a summary of the findings is outlined and recommendations for further research are done.

2. Review of Geoinformation market

2.1. Introduction

This chapter seeks to answer the research questions 1 and 2 as a number of characteristics of a GI market are described based on market theory. One could say an eclectic choice is made based on various studies on GI market to describe which part of economic theory is applied to GI as a product. It further conducts an analysis of the GI Market by considering the review of international cases as an input into the conclusion to question 2. Further analysis identifies the prevailing non-market and market failures in the GI market since the nature of competition varies in different sub markets. The chapter concludes with the lessons learnt biased towards identifying dynamics shaping GI sharing among the considered cases.

2.2. Characteristics of the geoinformation market

2.2.1. Geoinformation market

Various reports have emphasized that GI has potentially a high economic value (Von Rimscha 1996; Oxera 1999; FGDC 2000; Micus 2001; Longhorn 2002; Corbin 2004). (Fornefeld, Oefinger et al. 2000) considers GI as a location factor and an economic asset for companies in all business areas, including service providers, engineering agencies and public administration. He further argues that whoever provides the appropriate GI, can be positioned successfully in the market.

(Chorley 1987) defines “Geoinformation” as information which can be related to specific locations on the Earth covering an enormous range, including the distribution of natural resources, the incidence of pollutants, descriptions of infrastructure such as buildings, utility and transport services, patterns of land use and the health, wealth, employment, housing and voting habits of people. (Oxera 1999) defines geoinformation as all information that has a spatial context encompassing a growing number of datasets, many of which are combined to provide information requirements for the end user.

Abel (1997) considers GI and its market as being complex. Compared to non-spatial markets there are many data formats, semantics, software systems, providers, and users with extremely different requirements. (Micus 2001) approaches GI market concept by explaining how the Geospatial data market can be developed by means of the market, customers, products, price and rights of use. (Micus 2001) defines basic geospatial data market as all the products and services concerning status maps and basic data mapping such as the cadastre maps, the real property register, the topographic mapping as well as aerial photographs. (Oxera 1999) considers the market for GI in Great Britain as being complex with the dominate role of Ordinance Survey undertaking a variety of activities in the GI market to include data collection, maintenance, storage, production and supply of GI products and services.

However, the "market" philosophy promoted by Dutch Kadaster, Ordinance Survey of Great Britain, appears to depend on whether there is a necessity to finance its own operations or the obligation to be

cost recovering. These assume that the costs of vital resources will be within reach of users. However literature (Masser 1998) has urged that there are instances where charges based on full cost recovery would not find a market and, perhaps, partial cost recovery would have at least generated some income could likely emerge.

2.3. Explanation of Concepts used

Understandings the scope of terms and concepts varies considerably. For the purposes of this research, working definitions for regulation, strategic policy, service-delivery and market have been adopted as follows.

2.3.1. Regulation

Regulation is considered emanating from the statutory powers and public interest requirements of relevant Acts to facilitate market transaction. This includes a set environment of level playing fields for example regulation would be the control, supervision and enforcement roles of the department of Lands and Surveys. This would involve jurisdiction over public and private providers and functions such as licensing, rule setting, compliance monitoring and the determination of penalties.

2.3.2. Strategic Policy;

Involve core government responsibility underling government actions in guiding its management of public affairs. These may include the development or review of legislation or regulatory frameworks, the determination of strategic directions for the pursuit of government objectives and the provision of high level information or advice. This is expected to influence or contribute to listed objectives and decisions about the prioritization and/ or allocation of government resources.

2.3.3. Service Delivery;

This includes primary tasks of a number of organizations in the GI work field. For example Surveys and mapping are information providers whose main task is setting up, maintenance and distribution of geo-data sets and information.

2.3.4. Market theory

2.3.4.1. "Market " concept

From the above, there are four different ways of looking at the concept of a market:

a) *As an environment, i.e. the conditions and constraints under which GI transactions takes place and under which the market players interact*
b) *Individual transactions, i.e. what happens during any economic transaction involving GI*
c) *Marketing, i.e. how economic transactions in GI are best promoted*
d) *Entrepreneurship, i.e. what "cultural" attitude must one has in order to generate economic transactions of GI.*

"Market" in this thesis is evaluated as the environment of interaction which involves organizational and individual transaction. Critically, this environment considers organizational involvement while transactions involve issues like access rights, pricing policies, data sharing and management,

copyright and the behaviour of GI transaction. According to (King 2005) , competitive markets work through an interaction of "supply and demand." These are briefly discussed below.

2.3.4.2. "Demand " concept

Demand is the relationship between price and quantity demanded for a particular good and service in particular circumstances. In Adam smith's classical interpretation, high demand and high scarcity produce high prices, while something with no demand, or something that is in great abundance, will generate low prices. (Masser 1998) illustrates how GI is obtained through expenditure of effort and resources. He argues that GI originally was being provided by government organizations that were mandated to provide the data and services for the general welfare to the people and this was regulated out of the demand to meet the national obligations of government to its citizens.

2.3.4.3. "Supply" concept

Supply is the quantity of a good or service that a producer is willing and able to supply onto the market at a given price in a given time period. Normally as the market price of a commodity rises, producers will expand their supply onto the market. GI is supplied by both government and private organizations, each of these organizations set their prices differently, this may be due to polices inherent to the organization as regards the production process. Examples of pricing policies of GI differ across sectors. For example according to (EU 1999), the UK DTI guidelines favour a market approach where an established market exists for government-held tradable information. Departments and agencies other than trading funds would move to a policy of marginal cost pricing for raw data. The Dutch Cadastre pricing policy is cost recovery, implying that it levies prices with the intension of making profits. Private sector price GI on basis of file size and even to the extent of complexity of request and charge for the estimated average cost of reproduction.

2.3.4.4. Market and Non-market Failures of market theory

Market Failures: In economics, a market failure is a case in which a market fails to efficiently provide or allocate goods and services. This notion is relevant for the GI market since availability of GI is regulated by specific legislation developed to deal with unfair competition from the public sector. Literature (Masser 1998; EUROGI 1999; Brox and Kuhn 2001; Brox and Krek 2002; Martinez and Frank 2003) have identified characteristics of GI market failures; Monopoly by government GI Organizations, characteristics of GI, externalities and transaction costs.

Non-Market failures theory; The literature about non-market failure such as (CIPPREC 2004) suggests government ought to have efficiency dimensions to its actions that apply regardless of the policy course sought. Situations in which the public sector decides to provide GI products/services are concisely related to market failures; failure of competition and redistribution and welfare considerations. (Martinez and Frank 2003) illustrates two alternative interventions by the public sector; the products/services can be publicly produced or privately produced.

2.4. Analysis of the GI market by review of international Cases

Based on the choice of what to look at for the GI Market as outlined in 2.3.4.1, reviewing the GI market environment involves reviewing; access rights, pricing policies, Data sharing and management, copyright, privacy and liability inherent in GI organizations.

The following table lists part of these aspects for four countries (the Netherlands, United Kingdom, United States of America and South Africa based on references (Masser 1998; EU 1999; EUROGI 1999; FGDC 2000; Martinez and Frank 2003)

Table 1. Structural review of country GI market

Characteristics	Market characteristics of countries			
	Netherlands	**United States of America**	**United Kingdom**	**South Africa**
Organizational involvement	Collection, utilization and supply of core GI is most centralized in government agencies. Yet at the same time, growing private sector and privatization. NL follows EU directives (Re-use of Public sector GI)	Most GI is created and used in the public sector. Private companies collect and disseminate GI often in the form of local added-value information.	GI is mainly provided by separate government agencies. The Ordnance Survey of England Scotland and Wales (OSGB), the national mapping agency for Great Britain providing the underpinning reference framework and infrastructure for Great Britain.	Surveys and Mapping is the foremost supplier of geospatial information and services to the public and private sectors. A number of private companies exist providing GI products and services.
Access rights	The Government Information Act compels administrative authorities to disseminate government information and provide information upon request. (Delft 1998; EUROGI 1999) The 'Government and Markets' Directive in 1998 specified that public sector databases could only be made available to third parties on a non-discriminatory basis and at uniform Prices (Delft 1998)	The U.S. Freedom of Information Act and the Open Records Laws of the individual states create a balance between the right of citizens to be informed about government activities and the need to maintain confidentiality of some government records (Delft 1998; Masser 1998; EUROGI 1999; FGDC 2000; EC 2004)	Freedom of Information Act was passed in 2000, however government announced in 2001 that implementation of provisions on the right to access was being delayed until 2005 Legal right of access to some local government information. Aright of access to environmental information held by central and local government and bodies.	Section 15(1) of the Promotion of Access to Information Act 2 of 2000, these products and services are available free of charge and only the direct costs are recovered. Procedures for requesting access to information, grounds which permit or require requests to be refused in certain circumstances and the enforcement mechanisms are available under this Act
Pricing policy	Cost recovery has been the leading principle applicable to data supply by Dutch government bodies to third parties (De Jong). Evidently backed by the Land Registry Act, which states that the Cadaster must be totally cost recovering. While the National mapping agency (TDN) has to recover the costs for 50%.(Kok 2004)	The rate charged for data sets from government agencies is essentially the cost of duplication. (Delft 1998; Masser 1998; EUROGI 1999)	The UK government directs its agencies to recover costs through charges and other income-generating activities. E.g. HM Land Registry and the Meteorological Office are having cost recovery rates in excess of 100%. (Oxera 1999)	Pricing of products and services depends on direct costs such as transfer medium, printing, paper, ink, postage and packaging are recovered otherwise cost are to be free of charge. *(http://w3sli.wcape.gov.za/Surveys/Mapping/MAPPRICE.HTM)*
Data sharing and management	The NCGI operates as a neutral, non-commercial 'electronic marketplace'	FGDC promotes coordinated use, sharing, and	No single led initiative to co-ordinate the provision	NSIF is a national Initiative to co-ordinate the

	for geo-information and as an intermediary between providers and users of the data. The NGII developed by Ravi in cooperation with producers and users provide authentic registers. (EUROGI 1999; Kok 2004)	dissemination of geospatial data on a national basis. Federal agencies place GI on the clearinghouse nodes to make their data sets more accessible to other government agencies as well as to for-profit businesses, non-profit Organizations and citizens. (EUROGI 1999)	and dissemination of GI at the national level. The Association for Geographic Information (AGI) public and private sectors, data producers and users, it represents the GI-community as a whole (public + private). AGI is currently hosting the web-based metadata service GI-gateway. (Bamps and Beusen 2003)	development of infrastructure needed to support the utilization of spatial information in decision making. This has been fostered by the development of SIIB which aims are to achieve co-ordination with respect to the gathering, managing and dissemination of spatial data and information.
Copyright	Information created by the government is in principle copyright protected, although copyright must be claimed explicitly for the protection to be effective. Dutch parliament enacted the European Directive for the Legal Protection of Databases into national legislation. (Kok 2004)	Copyright protection subsists in original works of authorship and the author of the work is the owner of the copyright upon creation of the work. Federal agencies are forbidden from imposing copyright in their works. Copyright is not available for any work of the United States Government (Delft 1998; Masser 1998; EUROGI 1999; EC 2000; FGDC 2000)	Public geoinformation is strongly protected by Crown copyright. It is defined in the above Act as a work made by Her Majesty or by an officer or servant of the Crown in the course of his duties. It covers a wide range of material, including legislation, government codes of practice, OS Survey mapping, government reports, official press releases, government forms and many public records.(Bamps and Beusen 2003)	Amendment Copyright Act of 1992 recognizes an author's moral rights in the South African Copyright Act, and a measure of protection to performers in respect of their performances is also afforded by the Performers Protection Act. *(http://www.bisnetworld.net/bisnet/countries/southafrica18.htm)*
Privacy	The European Directive on Privacy Protection (PbEG L281, 23 November 1995) is of great importance for the use of geo-information. The directive restricts the use of data on natural Persons. (Kok 2004)	Numerous legislative enactments address privacy at both the federal and state levels. The major federal privacy statute is the Privacy Act of 1974.	Data Protection Act 1998 in accordance with the requirements of the EU Directive 95/46/EC. The Office of the Information Commissioner is an independent agency that maintains the register and enforces the Act.	Data Privacy Act and data protection legislation is currently being considered by the South African Law Reform Commission but certain voluntary provisions are set out in the Electronic Communications and Transactions Act. *(http://www.securitysa.com/article.asp?pklArticleID=3317&pklIssueID=457&pklCategoryID=22)*
Liability	This indemnity from liability is explicitly laid down in supply contracts. e.g Statistics Netherlands	Spatial data and spatial data products in the US are typically suitable for the purposes for which they are	**Liabilities** The parties acknowledge that any limits and exclusions of	The Chamber of Mines of South Africa will not be liable for any loss or damage, actions, proceedings, claims, demands,

	accepts liability for faults in the data supplied. Liability has been regulated by law in the case of the Cadaster.(Kok 2004)	intended and no more. This principle is enforced primarily through our Liability laws. As a general proposition, one is not allowed to warrant a spatial data product for a purpose for which it is not suitable. If one does and the client is legally harmed by the seller's negligence or incompetence, the seller is liable for the damages suffered. (Delft 1998)	liability in relation to each other under this Contractor License shall be governed by the terms and conditions of other contracts between them. (Bamps and Beusen 2003)	liability, damages, costs, charges and expenses, howsoever arising, as a result of the use of this website or the information therein. All users hereby agree to submit exclusively to the laws of the Republic of South Africa and the jurisdiction of the courts of the Republic of South Africa in respect of any dispute arising out of the use of this website or the information therein.

2.5. Regional GI initiatives

The GI market environment at national level cannot be isolated from regional or even global initiatives. It is thus necessary to review a number of regional GI developments and hereunder follow examples of some of the European Union (EU) and EA GI market related initiatives.

2.5.1. European Union initiatives related to GI

To improve the establishment of and GI market and utilisation of GI in Europe, certain steps have been taken to move from purely national GI initiatives to a more European approach in mapping, statistics, utilities, environment and transport. In 1993, Comite Europeen des Responsables de la Cartograhie Officille (CERCO) created a MOU to develop closer cooperation to provide better EU-wide Cartographic data.

In 1994 European Umbrella Organization for Geographic Information (EUROGI) was formed to bring together national and European organizations for GI. Furthermore, an Infrastructure for Spatial Information in Europe (INSPIRE) has been established to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. This initiative aims at a European legal norm to regulate the European geo-data infrastructure (ESDI) by using national geo-data infrastructures of the EU-Members. Experimental prototype version of the EU Geo-Portal has been setup aiming at better understanding user requirements and at defining the standards-based technical specifications of the future operational system.

European Union Directives; At EU level the (EU 1999) – Directive aims to control of further use and commercial utilisation of the public sector information: This Directive identifies public sector information of fundamental role in the proper function of internal market and free circulation of goods, services and people. Other Directives include: 90/313/EEC on the freedom of access to environment information, 95/46/EC protection of individual with regard to the processing of personal data and on the movement of such data.

2.5.2. East Africa initiatives related to GI

The EA market is not isolated from other initiatives that involve GI; the following below are some of the current GI initiatives considered at regional level.

To address long term objectives such as poverty eradication and economic growth an African level New Partnership for Africa's Development (NEPAD) was established. NEPAD seeks to provide a policy framework to focus on in identifying the way forward for economic and sustainable development on the African continent. For achieve this management of GI was identified to be of paramount importance and thus Committee on Development Information (CODI) was established to specifically target issues related to GI. Below are some of CODI-Geos initiatives;

- To use regional centers (Central Africa, East Africa, North Africa, Southern Africa and Western Africa) and institutions to link up with countries to facilitate regional coordination, communication and dissemination of GI on relevant projects and initiatives.
- All African countries participate towards developing African Reference Frame (AFREF) as part of national as well as regional reference framework.
- Identification of regional datasets which should be derived from fundamental data sets. The envisaged regional datasets have been identified to include, geodetic framework, topography, land cover, settlements, administrative boundaries and transportation.
- That every country develops or adopts mapping standards consistent with international standards.

African Information Society Initiative (AISI); provides support to countries to develop their own national information and communication infrastructure (NICI) policies, plans and strategies. E.g The Uganda Development Gateway (UDG), Tanzanian Development Gateway, Kenya Development Gateway all aim at providing information on sustainable development and poverty reduction through a portal and any other available means of information dissemination, offering a common space for dialogue and exchange of experience, knowledge, ideas, tools, information, data and other resources. It is a knowledge sharing initiative by and for those who have a stake and an interest in development

Regional programmes in the Lake and its Basin; To oversee management of fisheries resources on a sustainable basis, the Lake Victoria Fisheries Organization, the Lake Victoria Fisheries Research Project and Lake Victoria Environmental Management Programme were established with emphasis on a comprehensive approach to the management of the Lake's ecosystem. Apart from the major programmes, a host of other activities relating to the Lake Basin environment and development are being undertaken by other interested international, regional, national and non-governmental organisations. A recent survey commissioned by the East African Community revealed that over two hundred institutions, projects and organisations, including non-governmental organisations, are currently engaged around Lake Victoria.

Intergovernmental organizations: As a result of collaboration at regional level, RCMD was established: The Centre in collaboration with its member States, UN Economic Commission for Africa (UNECA) and Directorate of Surveys and Mapping of South Africa and International Association of Geodesy (IAG) has been at the forefront of promoting the implementation of AFREF project by all African countries. In this regard, the project was endorsed during the Committee on Development Information (CODI) meeting of UNECA, to be implemented by all African countries.

Regional Information Systems; The Famine Early Warning System (FEWS) for Africa is an example of where data, information, and analyses are provided to decision makers so they can evaluate and anticipate the need for famine interventions. is to strengthen the abilities of foreign countries and

regional organizations to manage risk of food insecurity through the provision of timely and analytical early warning and vulnerability information.

External support provided by international organizations; United States Geological Survey, EROS Data Centre and Global Spatial Data Infrastructure. The purpose of these organizations is to promote international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that will allow nations to better address social, economic, and environmental issues of pressing importance.

Treaty on East African Co-operation 1999; Uganda is a member of the East African Community together with Kenya and Tanzania. One of the guiding principles of the EAC is the recognition, promotion and protection of human and people's rights in accordance with the provisions of the African Charter on Human and Peoples' Rights and the harmonization and approximation of laws and policies.

2.6. GI Market failures of the reviewed cases

This section considers the cases (NL, UK, USA and SA) to explain the GI market theory as discussed in section 2.3.4. It particularly generates cases of market failures. Many factors cause the malfunction of the GI market mechanism and these include;

2.6.1. The monopoly of government GI Institutions

In United Kingdom, South Africa and the Netherlands, there is actual monopolistic control or "near" monopolistic control by the National Mapping Organizations in regard to base maps and much of thematic mapping production. Besides the risk that certain types of datasets will simply not be released by some public GI organizations becomes high in this case. The danger here that could be experienced is that further exploitation by commercial developers of these datasets is hampered. In some cases, this is for security or other reasons declared by the government, but not in all cases. It is often difficult to find out exactly why certain datasets are not released - or even to know that they exist.

Market failure can also be caused by the existence of inequality throughout the economy. Wide differences in income and wealth between different GI groups within the economy lead to a wide gap in living standards between affluent households and those experiencing poverty. Society may come to the view that too much inequality is unacceptable or undesirable.

Absence of clearly defined legislative framework like property rights for those agents operating in the market. When intellectual property rights and copyright are not clearly defined, market failure is likely because producers & consumers may not be held to accountable for their operations. Copyright restrictions can be used by the public organizations to restrict the reuse of their GI. In certain situations, if a public organization does not have full rights to the information it is producing, it cannot, in turn, license the material for commercial exploitation.

2.6.2. Economic characteristics of GI

(Martinez and Frank 2003) identifies the underlying characteristics of GI and produce market failures or the competitive markets. Three characteristics are identified.

1) Non-rival in consumption; when a client obtains GI for individual use, one's person consumption does not reduce another person's consumption of the same good. Thus the marginal cost of supplying an additional unit of dataset is zero.

2) Non-excludable in consumption; nobody can be prevented from consumption. This hold if the GI is freely available or almost free at production cost. This has been supported for instance by laws in the U.S. which allows greater access to government information at the all government levels.

3) Non-rejectable; individuals cannot abstain from their consumption even if they want to.

According to (Oxera 1999), the economic value of GI is often underestimated because the knowledge acquired through the use of GI is considered an automatic 'right', which will always be freely available. (Masser 1993) considers alternative economic classifications of GI. He establishes that while GI has many of the characteristics of a resource, a commodity, a capital asset or infrastructure, it does not fit neatly into any of these categories.

(deVries 2004) considers the marginal cost of supplying additional copy of GI to be low close to zero with ICT. He further argues that with such near public goods, markets won't allocate efficiently because the need for consumers to pay and the incentives of suppliers to produce. This implies that it becomes difficult to exclude non-paying consumers of public goods if they were providing through the market.

2.6.3. Externalities

(Hansson 2004) has defined externalities as opportunity cost not fully accounted for in the price and market system. de Vries (2004) defines externalities as effects arising from production and consumption of goods and services for which no appropriate compensation is paid causing market failure if the price mechanism does not take into account the full social costs and benefits of production and consumption. Groot (2001) argues that mal-provision of GI leads to loss of positive externalities, to costly duplication and possibly reduced timeliness in the decision-making processes.
This is the classical case of incomplete market for a geoinformation asset which is associated with market failures because the prevailing price fails to capture all the benefits and costs associated with market transaction.

2.6.4. Transaction costs

(Brox 2001) argues that the GI market wants and needs e-commerce and e-business, thus implying that the marketplace for GI does not require or is not located in a physical space. Such virtual GI markets consist of communication paths where information exchange is easy and transactions can be dine over the Internet. Costs, other than price, incurred in the process of exchanging these GI products and services usually involve transaction costs in the form of information, coordination, bargaining and enforcement of contract. In most cases such costs re negligible compare to the benefits from trade that the GI market make possible.

(Walter, Georgiadou et al. 2003) identify transaction costs associated during the land registration process of a parcel and they included estates agents' commission, conveyance and bond registration fees, and transfer and stamp duties, but excluding the cost of lands itself and the cost of any improvements. The existence of unpriced but non zero transactions costs means that some trades not occur and the failure to undertake these trades could be defined as GI market failure.

(Krek and Frank 1999) notes that cost associated with acquiring information about the GI product or service that is a subject of trade and choosing, organizing, negotiating, and entering into contracts is called transaction cost. The exchange of a geoinformation product or service is a transaction and involves transaction cost. Searching for information about the geoinformation product, its characteristics, estimating its quality and usability, defining and measuring the rights transferred with the trade- all raise the transaction cost to the potential buyer.

2.6.5. Imperfect competition

In economic theory, imperfect competition is the competitive situation in any market where the conditions necessary for perfect competition are not satisfied. Perfect competition is characterized by, producer or consumer having the power to influence prices in the market, large number of small producers and consumers on a given market none of the producers or consumers can influence the price on their own goods and services.

2.7. Government intervention (None-market failure)

According to (NetTel 2004), Government intervention may seek to correct for the distortions created by market failure and to improve the efficiency in the way that markets operate.

- Taxes to correct for externalities
- Taxation of monopoly profits
- Regulation of oligopolies/cartel behaviour
- Direct provision of public goods (defence)
- Policies to introduce competition into markets (de-regulation)
- Price controls for the recently privatised utilities

Recognize that the basic functions of government are responding to market failure and responding to the need for improved service delivery. A review of government intervention if GI market failures shows that governments must focus on the provision of pure public goods. Pure public goods include: property rights, land and protection of those in crisis.

2.8. Lessons learnt

The lessons learnt are biased towards identifying the contributing factors of the reviewed international cases towards what makes government Geoinformation agencies to share authority with geospatial related private companies.

- Several areas of law influence the sharing of geographic information within countries and across national boundaries. For instance the general principle of open and unrestricted access to government information concerning copyright has been beneficial in terms of supporting the development of the GI industry in the USA. The example from USA concludes that having low cost government based data sets and a public policy (state policy) which stipulates fee access of information to all, do make it possible to create a new and exciting, growing, niche industry not only providing jobs for many people but highly contributing to the growths of the GI industry.
- Growing number of projects and non governmental organizations with GI an important component. For example at the EU, initiatives through “INSPIRE” aims at establishing the European Spatial Data Infrastructure (ESDI) by making available GI for decision making.

EUROGI is raising awareness of SDI, RAVI in the Netherlands acts as an advisory body for the Dutch government in matters of GI. RAVI comprises all public services and local authorities and aim to improve the spatial information infrastructure by means of cooperation and agreement. There is a growing number of applications and services utilizing spatial data to provide business solutions in government agencies, business enterprises and the communities such as emergency management, disaster risk management, natural resource management, land administration, environmental monitoring, health, geo-marketing, routing, tourism and finance. Data policy, institutional framework, technology and standards are emerging as the four major pillars of a spatial data infrastructure.

- Certain national policies encourage involvement of public private partnerships and competition. For instance Ordnance survey of GB encourages licensed partners add value to Ordnance Survey datasets.
- A concerted institutional effort of organizations to coordinate and manage GI activities contributes to sharing authority among organizations. For instance, whilst there is no single central government led initiative to co-ordinate the provision and dissemination of GI at the national level in UK, Ordnance Survey of Great Britain (OSGB), Ordnance Survey of Northern Ireland (OSNI) and the Association for Geographic Information (AGI) considerably coordinate participation of the private and public sector in the development of a national GI framework, and innovative solutions within the GI industry. They intend in the long run standardization of data, structures, identifiers and formats.
- Cooperation enhanced by technological improvements. With the developments which have took place in the field of data collection, data processing and equipment (GPS, laser-scanning, digital imaging and image processing) mainly being driven by technology, these have resulted merging of companies and partnerships between companies. For example cooperation Partners of Leica integrate software into some hardware surveying equipment, combining tools like Total Management Systems for Real Estate" with GIS done by SAP and ESRI. It seems that flexible cooperation can bring more benefit to partner GI organizations than delivering services in isolation.

2.9. Conclusion

This chapter addressed the characteristics of the GI Market by examining the status of the GI market internationally with specific reference to four cases; The Netherlands, The USA, United Kingdom and South Africa. Specific issues mentioned included the definition of GI market which included access rights, pricing policies, data sharing and management, copyright and the behaviour of GI transaction. Market failures include monopoly by government agencies, transaction costs and economic characteristics of GI. The description of the specific issues was done in order to extract specific lessons for what is it that makes government Geoinformation agencies to share authority with private companies and latter to be used to draw comparison to characteristics of East-Africa GI market.

3. Status of GI market in East Africa (field study)

3.1. Introduction

The previous chapter used part of the economic theory of the market to assess the GI market. It further conducted analysis of GI market environment by reviewing international cases. Finally it highlighted the market failures inherent. This chapter attempts to answer the question on the characteristics of EA GI market by describing the current situation of GI data production, exchange and use among the GI users and providers in East-Africa. It is based on the data collected in the field through interaction with the different stakeholders within the GI community from the three countries.

3.2. Area of field study

The field study was conducted in the East African region which comprises of the Republics of Kenya, Uganda and Tanzania. The three countries cover an area of 1.8 million square kilometres and have a population of 82 million who share a common history and infrastructure. These provide the Partner States with a unique framework for regional co-operation and integration.

The EAC development strategy 2001-2005 (EAC 2005) emphasizes economic co-operation and development with a strong focus on the social dimension. Regional co-operation and integration is broad-based covering trade, investments and industrial development; monetary and fiscal affairs; infrastructure and services; human resources, science and technology; agriculture and food security; environment and natural resources management; tourism and wildlife management; and health, social and cultural activities. Other areas of co-operation include free movement of factors of production; and co-operation in political matters, including defense, security, and foreign-affairs, legal and judicial affairs. The role of the private sector and civil society is considered as central and crucial to the regional integration and development in a veritable partnership with the public sector.

3.3. Data Collection strategy

The strategy aimed at defining how data were collected. A combination of methods is used. Each of these is discussed hereafter.

3.3.1. Pre-field preparation

During the preparation phase, some issues that needed to be considered before embarking on primary data collection were identified. It helped find major answers to questions like; what are the specific issues to be addressed; what kind of information is needed on these issues; who is the source of the information? The strategy set to interview people in the Netherlands. This set the objective of how data both secondary and primary would be collected and finally which organizations would be contacted. Below is a summary of the information obtained from pre-field interviews.

- There exist a number of private companies which provide a range of consultancy services to government. These are the private sector, academia institutions, public (government departments and municipalities. For example, InfoBridge in Tanzania coordinates with Local municipalities to collect information on property tax collection, RUWASA coordinates with InfoBridge in adding value to information on sanitation.
- It was also observed that government is involved in service provision where GI maybe used e.g. road construction, housing construction etc.
- Organizations working with GIS find difficulties in working with GI software and this renders them ineffective because it's claimed that the software just doesn't work and yet lots of investments have been made towards its purchase.
- There is reluctance to work with GI in the public sector. Public activities have the tendency to relate and depend on donor funds. The effect of this may have led to an inactive culture among the civil servants.
- Enterprise drive is observed to lack in the public organizations. Besides, willingness to share geoinformation among private companies is minimal due to fear of loss of control. It was observed that there was need to create awareness among GI providers and users in order to increase knowledge associated with the economic value of GI.
- Governments are not supporting growth of the private sector. For example, in Tanzania, the private companies find it difficult to take a loan from the bank. This is due to high interest (27%) of the principle amount. This is a challenge faced by private enterprises who find it expensive to find loans in order to establish GI firms.
- Potential customers through Public Private Partners (PPP) do exist. Areas with GI market potential include municipalities, tourism, water and electricity management, property tax collection and road plans. The main challenge is for private companies to work towards marketing their services/products creating awareness on the potential of GI.
- Regional initiatives, it was also observed that the GI trend is moving towards working with South African companies (currently taking aerial Photography and processing line and orthophotomaps from photographs, in partnership with Swede survey AB of Sweden and Kwena Air of South Africa).

Based on the initial interviews during the pre-field preparation, it was noted that it would be relevant to use interviews and questionnaires. A one day's workshop as a way to generate data was organized and conducted. A key contact person with a private organization Geo-Communications Ltd in Uganda was contacted to coordinate the preparation of this one day workshop. With the help of the background information, questionnaires were designed, the organization and planning of the one-day workshop was also done. The target group of the would-be respondents from 20 different organizations were identified and contacted.

3.3.2. Interviews during AARSE conference

Attending the AARSE conference October 2004, provided a unique opportunity to administer interviews and questionnaires to key resource full persons/experts working with Geoinformation.

3.3.3. Tools used for data collection

The tools to collect data were;

- Questionnaires were issued based on stratification of respondents. Two main categories of stratification done according to the sectors (private sector, public sector and NGOs) and the country. The purpose was to relate the location of the organization to their responses.
- Workshop- included presentations and Delphi method of discussion with the participants. Identification of participants was done with the help of the coordinator.
- Interviews targeted GI managers from the identified organizations.

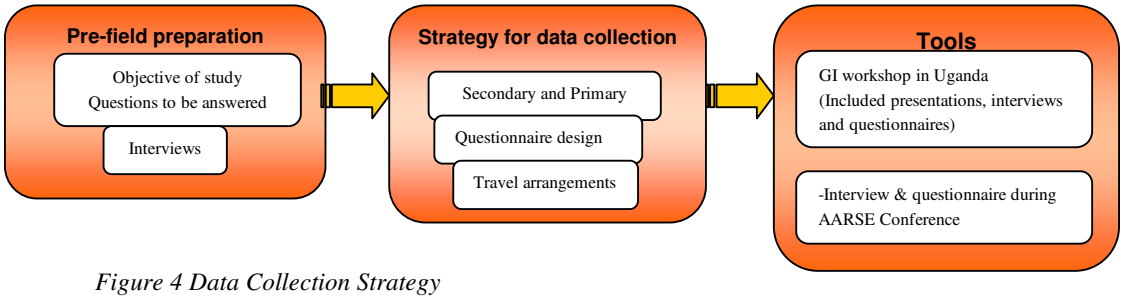

Figure 4 Data Collection Strategy

3.4. Data collection

3.4.1. Primary data collection

Primary data was gathered specifically for the purposes of determining the current concerns of the partner agencies and the kind (quality and quantity) information they already have. It was used to supplement and enrich the secondary data that was collected from the field.

3.4.1.1. Questionnaire Design

Two types of questionnaires were designed to target both the private and public organizations. The main purpose of the questionnaires was to assess the status of GI production, use and exchange among the sector; public and private organizations in EA. The results in turn are used to determine the requirements for the growth of the GI market.

Each questionnaire was subdivided into small subsections including, organizational status, accessibility and pricing of GI, customer's requirement, data sharing and management, awareness of National Spatial Data Infrastructure, accessing the level of GI industry. The questions were composed in such a way that the expected answers could be easily derived. The types of questions were mainly "multiple choice" to ease completion. Other question types included short explanation and filling tabular information (See appendix 3 and 4 for sample questionnaires).

3.4.1.2. Distribution of Questionnaire

A package was prepared consisting of the questionnaires, an invitation letter briefly explaining the intent of the workshop and workshop schedule. (See Annex 1 and 2 for invitation letters) These were sent digitally to the identified coordinator who emailed and delivered them manually to the identified key respondents from the target organizations. Some of the questionnaires were distributed during workshop, while others were distributed after the workshop.

In Nairobi, key respondents were identified by reviewing the list of participants registered for the workshop. With the help of the workshop organizers, target persons were identified and interviews were arranged. Table 2 summarizes both interview and questionnaire details. The purpose of questionnaire was explained to the respondents, and responses to the questionnaires were voluntarily done.

3.4.1.3. GI Market Workshop in Uganda

The one-day workshop entitled "Assessing the status of GI Data production, use and exchange among GI related organization" was held in Kampala. This aimed at bringing together representatives of all the stakeholders from government, private sector, non-governmental organizations and community-based organizations to explore the main issues relating to GI market in Uganda. Other objectives of the workshop included:

- To outline the Role of the GI private and public organizations, Projects and NGOs to the development of the spatial data market in Uganda and East Africa as a region so as to understand GI industry operational needs.
- To bring together experiences and knowledge on the issues of geoinformation management policy in order to identify opportunities and blockages for better exploitation of Geoinformation in the renewable business.
- To explore and evaluate regional and national focus of niche market developments.

The workshop began at 8:30am on October 08, 2004 with 14 participants registered from 13 organizations. Three presentations were given, the first on Role of Public organizations to the growth of the GI market, the second considered the role played by private companies to the growth of the GI market and the third role of SDI to market growth (See Annex 5 for summary of workshop details).

3.4.1.4. Interviews

Managers of various GI organisations were selected at random and interviewed. These provided an opportunity to obtain background information as well as clarification on a number of issues in the questionnaires. Interviews were mainly conducted face-to-face. By asking additional questions, this enhanced the likelihood of obtaining useful responses from the interviewee.

A total of 20 persons were interviewed from 18 organizations. Key issues discussed during interviews were; dynamics involved in daily business provision, challenges faced, where opportunities are, customer orientation, organizations' role in GI industry development in respective countries, problems experienced with exchanging or obtaining information, type of projects and the levels of collaboration, integration of GI and its impact on business processes. The interviews confirmed the status of private and public sectors dealing with GI.

3.4.2. Secondary data collection

Secondary data provided background information in the form of reports, legislations and evidences that were used to substantiate conclusions to make them as objective as possible. A summary of the types of secondary data collected is outlined below. (Annex 6 is a complete list of document details).

- Policy documents
- Questionnaires
- Pamphlets, bulletins
- Business plans

- Statistical Reports
- Legislative Acts
- Summary of transaction

3.5. Results of conducted survey

A total of 60 questionnaires were distributed and 49 were received. Table 2 below shows a summary of interviews and number of questionnaires conducted in East Africa.

Table 2: Summary of responses

Country	No of Interviews		No of Questionnaires	
	Private GI	Public GI	Private GI	Public GI
Uganda	3	5	4	17
Kenya	4	5	6	18
Tanzania	1	2	1	3
Total	**20**		**49**	

The return rate provides a fairly reasonable overview based on stratification of organizations, countries, and public and private sector differences from the GI community. It also represents a wide range of influence or interest amongst different developers, providers and users of GI or geospatial datasets.

3.5.1. Summary of surveys conducted in Uganda

3.5.1.1. Summary of Workshop Results

The workshop organization involved three presentations and discussion sessions. The presentations aimed at using the speakers to generate data to specific questions while the discussion was reached through a plenary session using the Delphi method. The method involved encouraging each group participant to express concerns about the stated questions: such as: What role should the government play to stimulate market growths for the use of GI in Uganda? And what issues/activities could non-governmental organizations/individuals etc focus on for market growths of GI production/use"? Summary of results agreed to by all participants include.

- Whether the Department of Surveys and Mapping should take the lead to bring up-to-date the current products in the market by producing a national base map upon which other organizations can add value. This department should carry out regular quality control checks to ensure that all products on the market are of good quality.
- Need for surveys and mapping to improve their performance by developing ways of ploughing back what they earn from the market transaction for instance the sale of maps. This needs to be arranged with government in order to retain or even allocate appropriate budget approvals.
- Whether to create a National GI council to promote the relevancy of GI among government institutions and the citizens at large. The importance of GI could be included in the education curriculum.
- How to create a nation-wide awareness programme on the usefulness of GI at all levels of the government.

- Need to train personnel to increase awareness of the need and applicability of GI in institutional settings. Thus creating a wider GI market base which could be exploited by software and hardware vendors since it includes the use of these facilities.
- The need of Surveys and Mapping to update their products, this will encourage other organizations to buy data from them and reduce the number of organizations involved in data collection.
- Government has a role to play through establishing polices and defined legal framework which would help contribute to the growth of the GI industry. This would provide structure and means of data exchange, and use among organizations and thus establishing the value which geoinformation could be given.
- The need for Ugandans to develop a working attitude and get rid off the donor dependency syndrome. And also develop strategy to fight against corruption among various officials in all government sectors.
- How to stimulate collaboration amongst the various institutions to avoid duplication. Since more NGOs have up-to-date geo-data, mechanisms should be developed to share information with public GI organizations.

3.5.1.2. Summary of questionnaire results in Uganda

Summary results from GI Public Organizations

a) *Organizational status, accessibility and pricing of Geoinformation*

Seven categories of organizations were assessed in various areas regarding their functioning and major GI activities. Figure 5 shows a summary of these organizations.

From the various responses, figure 6 shows that pricing policy of GI products/services considerably varied among organization. Responses indicated at times more than one pricing policy within an organization. These included a combination of pricing according to production cost, cost recovery and negotiation. However, 4 of the organizations indicated that they aimed towards cost recovery programs even when they are still charging their products according to production cost. There seems to be ambiguity between cost recovery and production cost.

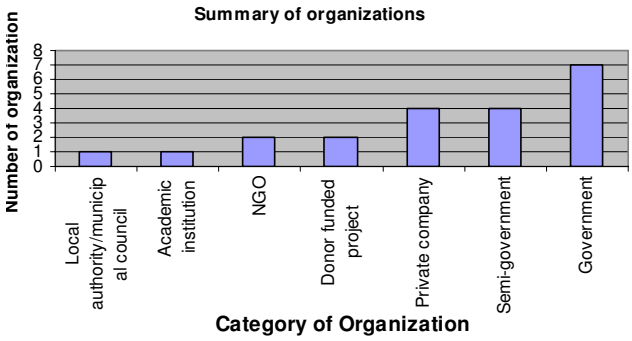

Figure 5. Category of organizations in Uganda

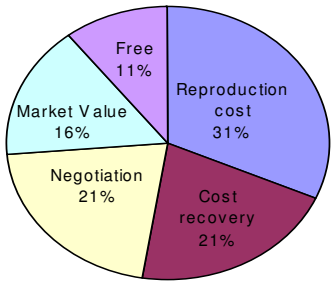

Figure 6 Pricing methods in organizations

From figure 6, it can be seen that price negotiation is practiced among 4 out of 17 organizations. Responses indicated that price differentiation highly was dependent on who the customer is and the situation. An example indicated that for donor clients, these were charged highly since they are presumed to have funds allocated for information collection. There normally exists conspiracy

between corresponding colleagues from different organizations with the potential of providing the needed data. Negotiation would be geared towards charging the data in accordance to or even close to the amount allocated in the budget for data collection.

Other respondents indicated that the process of price setting is determined according to the cost of labour and the material used. An image or map's cost would range from a minimum price of 100,000/= and above. An example price for maps according to the size of paper shows that for an A1 costs 50,000/=, an A2 costs 25, 000/=, an A3 costs 12500/=, and A4 costs 5000/=. Prices also depend on users' financial ability, negotiation skills and the amount of time as input of work (standard or customized, amount of digital data) needed. However most problems experienced were related to how to value the digital products. Pricing of digital products entirely depends on one's ability to negotiate.

Accessibility policies varied among the respondent organizations. Free access policy was practised by 5 of the organizations, while negotiation and memorandum of understanding were others as summarized in figure 7 below.

What was easy to sell? Figure 8 shows the response to this question. 9 of the 17 respondents indicated that it was easier to sell hardcopy products. These were mainly in form of maps. 6 of the respondents indicated that digital information was easy for them to sell but the pricing of these digital products depended on one's negotiation skills.

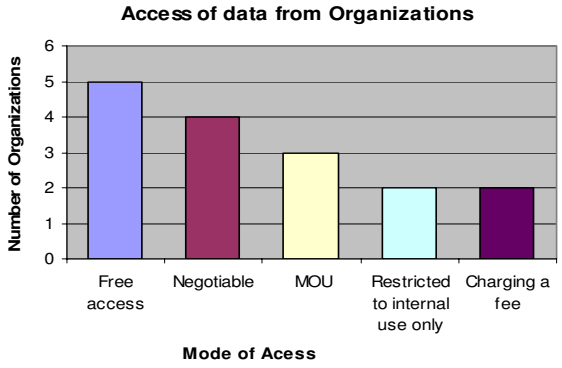

Figure 7 Access to GI

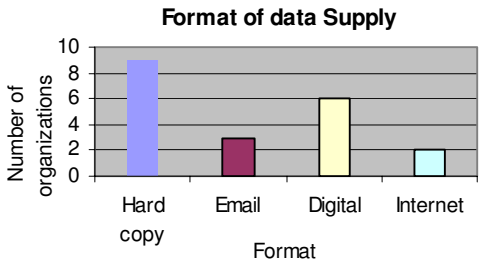

Figure 8 Format of data supply

b) *Corresponding to Customers and advertising*

Respondents from all the 17 organizations indicated that combinations of methods were being used by their clients to access GI from their organizations. However, office visits was the most predominate method. All the 17 responded that their customers were mainly visiting the offices for products and services. Summary of other facilities used by clients is illustrated in the Table 3 below.

Table 3 Access to information

Category of Access	No of Responses
Office visits	17
Telephone	7
Email	6
Website	1
Internet	1

Table 4 Advertising medium

Advertising medium	No of organizations
Public media	4
Focused group discussions	2
Internal adverts	4
Conferences & seminars	5
Internet	1
Billboards	None
None	2

Table 4 illustrates which advertising mediums are employed by organizations. These vary and seminars and conferences as indicated in table 4 seem most effective means of advertising used among organizations. Yet conferences and seminars do not provide opportunities of elaborate coverage as compared to using news papers and news bulletins.

6 of the organizations indicated that they were in partnership with other organizations for GI service provision or for development of provision of new products. Examples of such collaboration on land cover include NEMA under EIN with department of lands and surveys, physical planning, MUIENR, KARI Kawanda, Forestry ministry of Agriculture.

Aspects of provision of overlapping activities was indicated by 4 organizations for instance Uganda Bureau of Statistics(UBS) deals with administrative boundaries while other organizations like RAFU-Transport, DWD-Hydrography, AFRICOVER- vegetation too were partially producing the same data as UBS. (See list of abbreviations for acronyms)

Respondents were asked if they followed two types of policies: copyright and pricing policies. Figure 9 show that 9 of the respondents that they had a copyright policy while 5 didn't apply copyright to there geo-data. 4 of the respondents indicated that they use a pricing list for products /services while 6 of the respondents indicated that they had no particular pricing policy. Figure 9 gives a graphical representation of these results.

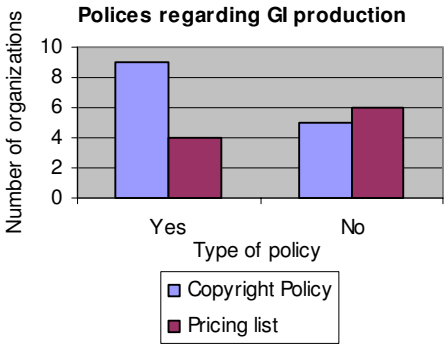

Figure 9 GI policies

c) *Data sharing and management*

60% of respondent's indicated that their organizations were involved in data sharing while 40% indicated that they did not share data for fear of losing the originality. However, it can be observed that this may be a major barrier to exchanging GI among GI service providers in Uganda. Furthermore, respondents indicated that they collected their own data sets and that data integration from other organizations was not commonly practised. However critically, the danger of this is the possibility of having heterogeneous GI datasets characterized by different standards, projections systems on the market.

80% of the organizations responded that update of GI was normally done whenever funds were available.

Summary results from GI Private Organizations.

The assessment among the private GI organizations aimed to show the dynamics shaping the private sector in Uganda. Table 2 shows overall summary of interviews and questionnaire but 4 private GI companies responded to the questionnaires in Uganda. Below is the summary of responses from this interaction.

a) Access of GI from other organizations:

This included the assessment on cooperation among the private/public GI organizations, how access and copyright policies by public organizations shape private GI activities. Below is the summary of findings beginning with polices.

Access rights: All the 4 respondents indicated that access to public GI wasn't a problem. The only prerequisite was for the client to meet the terms of access. For instance, if a cost was attached to the GI, the client has to pay the needed cost. However instances of extra pay to quicken the process of acquiring the needed GI were experienced in some situations. Also situations where the departmental heads did not allow certain type of datasets to be accessed was reported by 3 out of the 4 respondents. The powers of discretion to disclose or withhold GI are given to departmental heads.

Copyright polices: Uganda is a member of WIPO and thus Uganda adheres to the International Copyright Law. Exchange and reuse of GI among organizations is reached mainly by agreement as illustrated by all the 4 respondents. The given condition is mainly for the part to acknowledge the source of data as a prerequisite for reuse

Respondents expressed varied views as to which policy is bad for their business and why. Below is a summary of their views:

- ⇔ Free access policy of government information; 3 of the respondents indicated that although most public organizations in Uganda are required by low to provide free access to information, Presently, instances of legislation providing for a right of access to information in Uganda are sector-specific – this is, for instance, in relation to environmental management. Respondents also indicated that some laws such as Official Secrets Act makes it an offence to "obtain, collect, record, publish or communicate" in whatever manner to any person what is deemed to be official secrets inhibit access to information on the part of public in Uganda. The Public Service Standing Orders debar officers disclosing information that comes into their official use otherwise than to an "authorised person" and further bestow upon only an officer at the rank of the Permanent Secretary in department or institution the authority to release such information on application. In effect, public and civil servants are warned not to disclose information they come across in their employment under guises of "classified" documents or "official secrets". Further, the discretion given to certain officials makes access to information a privilege than a right. GI is too affected by such laws and thus may result to certain datasets not being commercially exploited by the public sector.
- ⇔ Two of the respondents indicated that certain public organization have high bureaucratic procedures when accessing information, this literally makes it cumbersome to find GI from those organizations.
- ⇔ "Copyright policies in Uganda were not clear leave alone enforced". This was a response indicated by 2 respondents. Agreements such as MOU were considered to be easily respected rather than copyrighted data in Uganda. An example was given of the surveys and mapping which copyrights its maps but still instances of duplication through digitizing was highly practised.

b) Data Sharing and GIS use

All 4 respondents indicated that other public organizations were using the same data or part of their data. Private companies mainly acquire basic GI from public organizations to which they add value in

order to meet the intended objective. However all the four respondents indicated that they were not involved in data sharing since they were commercial oriented.

Esri's Arc view was the main software used among these private companies. Geographically related information from other organizations was received in the form of both hard and digital copies. Communication and interaction with data providers was mainly through electronic mails and memoranda of understanding.

The respondent's views were asked as to which problems they experience when exchanging geospatial data with other providers. Figure 10 summarizes the results as perceived by the respondents and apparently, one can observe that the problem of having out dated and inaccurate GI were the most predominate.

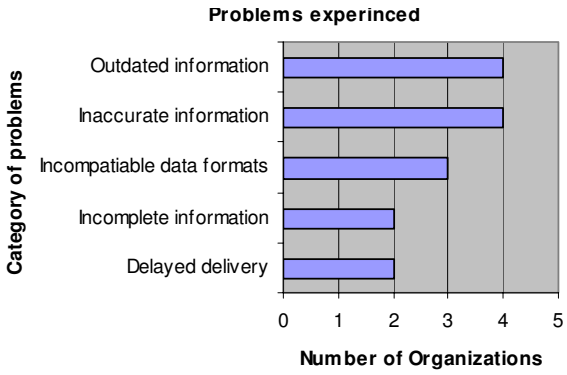

Figure 10 Problems Experienced

c) Network Use and Marketing of GI products/services

All the 4 private organizations indicated that they were linked to internet. Their websites mainly supported; advertising, administration, internal and external communication of the organizations.

The production of GI products/services depends mainly on customer requirements as indicated by all the 4 respondents. Transaction from the market activities determined activities while price setting depends on negotiation skills and how much the customer is willing to pay for the product/service.

During the period 2000-2003, all the four respondents indicated that Government was their most frequent customer. Most of the activities/contracts with the government were obtained with the help of friends and colleagues to champion bid winning. The annual earnings of these private companies vary; Table 5 shows annual earnings as indicated by the respondents earned from market transactions

Table 5. Annual income.

Income in dollars	Amount in Dollars
Organization A	210,000
Organization B	150,000
Organization C	310,000
Organization D	100,000

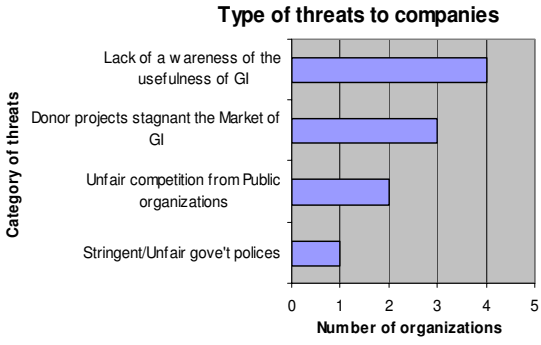

Figure 11 Threats to companies

Figure 11, shows a summary of most threats faced by private GI organizations as perceived by the respondents. It is clearly observed that the lack of awareness on the usefulness of GI prominently was ranked the highest threat expressed by all organizations.

Respondents were asked to give their personal view of the anticipated potential market areas for their organizations. Below is a summary of most frequent answers:

⇔ Among the government Units. Especially in GIS consultancy and training opportunities.

- ⇔ Cadastres and land registration: the land market in Uganda is thriving in the cadastre where the private (licensed) surveyors are very instrumental in providing surveying services. This also involves providing land titles to their clients.
- ⇔ Utility management
- ⇔ At the districts under local government arrangement

Various reasons were given as to what was considered as advantages over other organization providing the same or almost similar GI products/services. These are bulleted below

- ⇔ Modern equipment
- ⇔ Well trained personnel
- ⇔ Good marketing methods
- ⇔ Cheap and affordable datasets,
- ⇔ Good friends who bring business,
- ⇔ Good negotiation with government institutions
- ⇔ Quality of high data and recommendable services
- ⇔ Experience of how government does business.

Accessing the level of GI industry in Uganda

Four major areas were considered to access the level of the GI industry by use of questionnaires administered to both the private and public organizations. Below is the summary of finding.

I. Awareness of National Spatial Data Infrastructure (NSDI)

75 % of respondents from public organizations indicated that they had never heard of any NSDI initiatives within Uganda. While all the 4 respondents from the private GI companies indicated that they were not aware of any NSDI development in Uganda. These responses show that the level of organizational involved in NSDI initiatives is only limited to a few organizations and individuals. The concept of NSDI among individuals and organizations is not yet well understood this could account for the few statistics and records of any NSDI developments.

II. Contributing to smooth running of GIS activities

Various views were expressed as contributing to the smooth running of GIS activities within and among GI organizations. In most cases, the reasons given provided an overlap between the private and public organization among these included; Ease use of software, availability of tools, training and technical support, expertise of staff, adequate training in GIS

III. Problems/Obstacles as perceived by respondents in GI provision

- ⇔ GIS Technical support in Uganda is lacking
- ⇔ Constant break down of equipment leading to delay in project to receive assistance from UK, USA
- ⇔ Lack of awareness on the use of GI
- ⇔ Services very costly for using GI
- ⇔ Lack of financing for funding of updates
- ⇔ Lack of awareness of GIS among the clients and general public,
- ⇔ Public decision makers need to be taught the usefulness of GIS
- ⇔ Understanding from the top management
- ⇔ Lack of advanced training in public organizations
- ⇔ Lack of basic data layers e.g. DEM at useful resolution

IV. Contribution of East-African integration to the growth of the GI industry

Furthermore, assessing the GI industry at the regional level was done on how the East-African integration would contribute to the growths of the GI industry in the region. A summary of responses is below.

- ⇔ Support by cooperative use of resources such as base stations
- ⇔ Encourage development and free movement of skilled labour, technological transfer and improved quality of services as a result of competition at regional level
- ⇔ Market of GIS products and services will increase
- ⇔ Competition among GI providers will improve delivery of products and services
- ⇔ Will enable area revise it's maps
- ⇔ Widen training opportunities
- ⇔ Technological transfer and skilled labour development
- ⇔ Areas of creating awareness of eccentric things like data standards, copyright policy, and wider market for data since there are trans-border projects, opportunities of bidding and participating in regional bids.

3.5.1.3. Summary results of Interview in Uganda

The interviews represent a mixture of ideas and opinions of what the perception of GI are, what could be and the expected benefits. In summary the following points were observed.

- There are many isolated and ad-hoc GI projects that are being undertaken. These are entirely dependent on experts who work with limited guidance within some organizations. This has resulted lots of duplication, copyright and intellectual property rights, pricing policies varying from individuals and organizations at large.
- The operations of GI activities are not regulated in Uganda. Whilst organizations have regulations, their enforcement is not practised resulting to high costs associated with buying GI data for mission specific projects have lead to duplication of basic framework data
- GIS development in Public organizations is usually outsourced to private sector companies. The emergency and use of ICT in Uganda is mainly privately driven. Thus creating the link between government departments and private companies which are mainly deal with consultancy services. Besides, many GI donor funded projects contribute to the growth of the GI market in Uganda. These are characterised with the use of geo-ICT. Such projects include Surveying on international boundaries, Mapping under NEMA and AFRICOVER project.
- Mismatch of information is experienced when combining organizations' datasets. This could be attributed to the lack of standardization within the country.
- The driving factor for the development of NSDI is the availability of a funding donor. Various donor organizations have expressed interest in establishing NSDI but often times with drawn and thus this seems to contribute to the continued fragmentation of the GI market in Uganda.
- The issue of who should own NSDI and where (which ministry) it should reside, is apparently an issue in Uganda. Unlike most countries where the National Mapping Organizations have taken the lead in the establishing of NSDI, that is not the case in Uganda, most officials in Lands and Surveys, a department mandated to regulate mapping activities in Uganda is not aware of NSDI developments.
- The friends and colleagues from selected organizations who get involved in NSDI developments do not provide the feed back loop to their organizations of any NSDI initiatives. NSDI provides

an excuse/vehicle to raise funds, to organize seminars and conferences in which varied interests of attendance is normally attached.

3.5.2. Summary of surveys results conducted in Kenya

3.5.2.1. Summary of questionnaire results from GI Public Organization

a) Organizational status, accessibility and pricing of Geoinformation

Figure 12 gives a summary of the categories of organizations contacted while in Kenya.
Figure13 shows a summary of variations of access policy practised by organizations contacted. From figure 13, it can be seen that free access policy practised among 7 organizations.

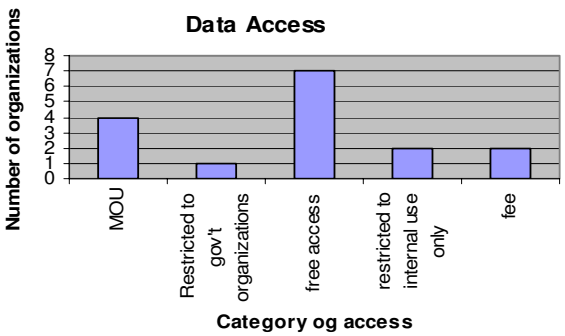

Figure 12 Data access

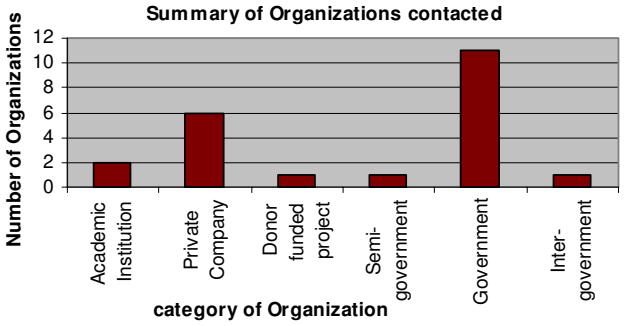

Figure 13 Organizations in Kenya

Pricing policies vary among the organizations indicated by respondents; 11 of the respondents indicated that pricing of products was done according to production cost. 4 of the organizations indicated that they have adopted a cost recovery strategy. However an observation as regards the use of term cost recovery indicated that the term cost recovery was ambiguously being used. Figure 14 is a summery representation of various pricing policies indicated by respondents.

Table 6 gives a summary of GI formats that was mainly used by clients when acquiring their GI from the public organizations. From the responses, products sold were mainly hardcopy illustrated by 14 organizations, followed by digital and very few products were being sold over the internet. Internet may not be a good market place for the sale of products.

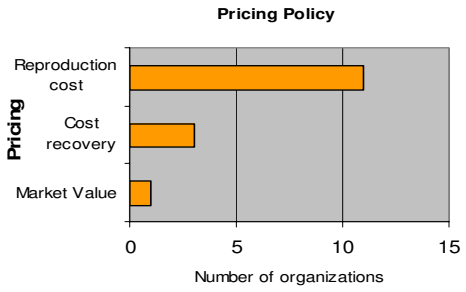

Figure 14 Pricing policy

Table 6 Format of data access

Format	No of Organizations
Hard copy	14
Email	4
Digital	5
Internet	2

b) Corresponding to Customers and advertising

Respondents from all the 18 organizations indicated using a combination of methods as medium of advertising. Figure 15 below gives a summary of respondents' major used medium to advertise and apparently, internal adverts, conferences and seminars provide the most effectives way.

As regards to clients access to GI, office visits was the most predominate method. All the 18 responded that their customers were mainly visiting the offices for products and services. Use of telephone was mainly for inquiry on the type of data availability by customers. Table 7 shows that summary of other facilities used by clients when accessing data from public organizations in Kenya.

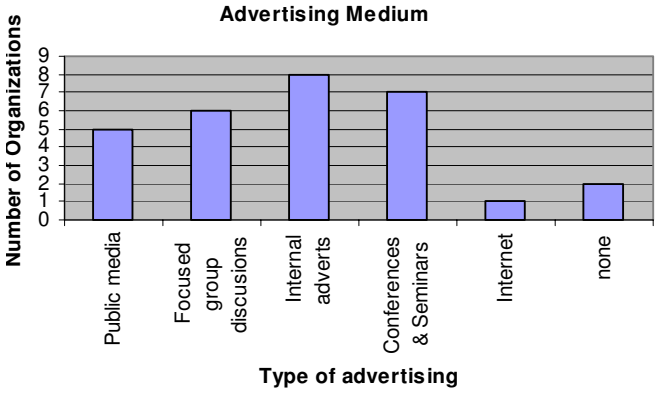

Figure 15 Advertising medium

Table 7 Access to products/services

Office visits	18
Telephone	11
Email	4
Website	1

c) Data sharing and management

83% of GI organizations are involved in data sharing as represented in figure 16. The main reason advanced enabling data sharing is the current developments of the Kenyan NSDI whose vision is to manage the sharing of all kinds of Geo-data and core datasets of the cadastral, surveys and mapping

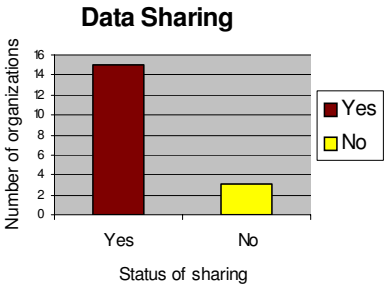

Figure 16 Data Sharing

However, a number of issues were perceived as major barriers to exchanging GI with other GI service providers and these are summarized below in there order of importance.

- ⇔ Insufficient knowledge of who owns what data and the status of the data
- ⇔ Insufficient knowledge of how to exchange geospatial data
- ⇔ Reluctance to share due to unforeseen benefits or risks
- ⇔ Different interpretation of datasets

90 % of the public organizations in Kenya indicated that they do not have a website.

Besides, responses also indicated that there are private public partnerships; 8 organizations were involved in joint provision of activities under RCMD Resource Mapping Programme. The key partners involved include; OFEK Aerial Photography & Mapping Ltd., Israel, Highland Surveyors, Kenya, Geomaps (E.A.) Ltd and MAPS Geo-systems Ltd.

3.5.2.2. Summary of questionnaire results from GI Private organizations

a) Access of GI from public organizations

From figure 12 and table 2, it can be observed that a total of 6 private GI companies from Kenya responded to the questionnaires. 90% of these private GI organizations had as their main activities; topographic map production, surveying and mapping, engineering surveys, digital vector data for engineering design & cadastral boundary.

Respondent's views were asked as to how access and copyright policies by public organizations shape private GI activities. Below is the summary of findings.

Access rights; 2 of the respondents indicated that access to public GI was not a problem while 4 of the respondents commented about bureaucracy incurred when getting topographic maps from Survey of Kenya. However, two main areas of concern were pointed out by of the respondents, these are briefly bulleted below.

- ⇔ Survey regulations (subsidiary legislation) in survey act cap 299 laws of Kenya. Director of Surveys may review the prices of products and services rendered by SOK from time to time.
- ⇔ Discretionary powers given to the director of surveys to wage up to 50% of survey fees leading to corruption.

However, the respondent was highly positive of the current "Access to Information Bill" which presents issues on freedom of information in Kenya.

Copyright polices. 3 of the 6 respondents indicated that the copyright law of 1964 was not clear as regards the extent to which work by GI organizations in particular is copyrighted. However they indicated that it was easy in Kenya to manipulate GI because acts of plagiarism were followed. It can be observed that lack of enforcement of copyright laws in Kenya may account for theft of very expensive GI and lose of ownership of GI.

b) Data Sharing and GIS

Through the developments of NSDI, private organizations have been obliged to share geo-data with other organizations. The approaches developed by these organizations vary and they include; signing of temporary agreements, license agreements while others specify strict charge to access data.

ESRI products dominate the GI industry in Kenya, mainly being ArcView and ArcGIS. Other GIS tools used include MapInfo, ILWIS, and IDRISI.

c) Network Use and Marketing of GI products/services

All the 6 private GI organizations developed a website which supports activities of advertising. The production of GI products/services organized in all of these organizations were organized based on customer requirements, which accounted for the type of financing of activities which depends on the transaction done from the market activities. Products were mainly sold in form of softcopies.

5 of the respondents indicated that the transactions were highly dependent on office visits. Payments for products/services were effected across the counter and by cheques paid through the bank. Pricing of a product like a map or digital dataset depended on the level of detail of a particular dataset.

An assessment of the most frequent customers in the years 2000 – 2003 reflected that mainly government institutions and private companies provided the clients for the private GI companies in Kenya. Table 8 below summarizes earnings of five private GI companies in Kenya of the annual revenue created in 2003.

A combination of threats were perceived as threats faced by private companies, figure 17 gives a representation and apparently, the lack of a awareness of the usefulness of Geoinformation and the donor projects which stagnant the GI market were perceived by 4 organizations as the most be threat.

Table 8 Income in 2003

Organization	Amount in dollars
Org-A	312,500
Org-B	10,000,000
Org-C	500,000
Org-D	200,000
Org-E	350,000

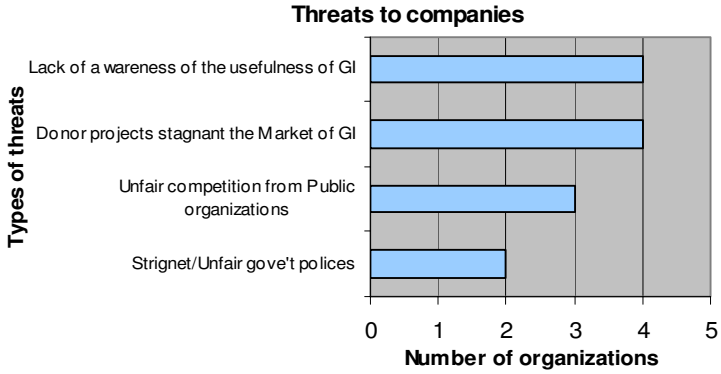

Figure 17 Threats to companies

Respondents were asked as to where they foreshow areas of most market potential. Below is an outline perceived by respondents;

- ⇔ Among the Government GIS users in software training and consultancy
- ⇔ Within the communities when enlightened of the usefulness of geoinformation
- ⇔ Cadastres
- ⇔ Land registration
- ⇔ East African region
- ⇔ Utility management
- ⇔ Sectors like communication for instance building data for navigation purposes

Various reasons were given as to what was considered as advantages over other organization providing the same or almost similar GI products/services. These are bulleted below

- ⇔ Use of modern geo-equipment like GPS for data collection,
- ⇔ Well trained personnel who manipulate software,
- ⇔ Good marketing methods,
- ⇔ International experience combined with local experience,
- ⇔ Provision of quality of high geo-data
- ⇔ Provision of cheap and affordable datasets.

Assessment of the Geoinformation Industry

Assessment of the GI industry targeted both the public and private GI organizations. Areas considered in the assessment include awareness of NSDI, the level of GI industry at regional level, what organizational advantages existed in GI provision and problems being experienced.

I. Awareness of National Spatial Data Infrastructure (NSDI)

The 6 GI private companies and 18 public GI organizations responded that they were aware of NSDI development in Kenya which is being coordinated by Survey of Kenya. Main contributions of each organization have been in collaboration with GI organizations in provision of views by participating in NSDI workshops/seminars and the creation of large scale digital map.

II. Smooth running of GIS

Various views were expressed as contributing towards having smooth operation of GIS activities among the organizations, these included;

- ⇔ Training and capacity building, which is readily available in institutions
- ⇔ Facilitation by management in financial and planning of organization ,
- ⇔ Dedicated staff,
- ⇔ Collaboration and networking among organization,
- ⇔ Qualified personnel in geoinformatics.
- ⇔ Equipment support from the government and donor organizations.
- ⇔ Presence of internet enables easy access of information from elsewhere.

III. Problems/Obstacles in GI provision

Problems/obstacles experienced in GI provision as perceived by respondents varied among organizations, these included;

- ⇔ Over- stretched staff due to high demand of geoinformation in Kenya,
- ⇔ Both the private and public organizations find acquiring of software and hardware a problem,
- ⇔ Not enough well trained personnel in geoinformatics in certain organizations,
- ⇔ Insufficient empowerment of the national mapping organization to carry out it's mandate in provision of information framework,
- ⇔ No funding for especially continuity of data updating and servicing the equipment,
- ⇔ Willingness not there to sharing knowledge and data,
- ⇔ Insufficient knowledge and understanding of seniors on issues regarding GI
- ⇔ Unclear policy regarding GI,
- ⇔ Inaccessibility of data that is available elsewhere and data sharing in terms of digital outputs

Accessing the level of GI industry at regional level

East-Africa's integration was considered to contribute to the growth of use of Geoinformation in various ways. These include facilitation of: exchange of expertise, joint ventures between projects thus reducing duplication and saving on cost, common understanding, stimulation of information sharing within the region, expansion of regional market, creation of openness**,** clear polices, intergovernmental participation, strengthening the development of GI, increase in the sharing of data, GSDI (accessibility of data cheaply, promote fast data access and exchange of time of need

3.5.2.3. Summary results of Interviews

The results from the interviews conducted gave a mixture of ideas and opinions about the status of Geoinformation market. In summary the following points were observed.

- Government agencies dominate the GI sector representing, 36.7%, government parastatals 20%, private 16.7%, semi-government 6.7% and others 20% (source Highland surveyors Ltd).
- Private GI organizations are involved in value adding, aerial photography, GIS software consulting, cadastral surveys and data collection in specific activities. The process of obtaining GI is considered to be very delayed making users unsatisfied
- Need to sensitize politicians within the government on the usefulness of GI has been considered very essential to contribute to an increased use and value for GI within government institutions and for strategic purposes of favouring budgetary allocation to GI activities.

- Government has a major role to play by providing financial assistance to create the NSDI framework which will contribute to the building of the GI industry. Important in enforcing checks of data authentication under the copyright policy.
- GI industry is a new industry and cutting across from production to technology developed and in which areas all market potential is high but not exploited. Major activities have involved in map production but various GIS capability of utilization in diverse areas like in utility management has not been exploited.
- Need to develop supporting legislation on GI was considered very important to contribute to maximizing data producers' returns on investment, consistent datasets and reduction on waste in geospatial data management
- NSDI till in infancy and being advocated for by organizations like, EIS-Africa, CODI, USGC, GSDI etc. and besides NSDI has been mainly project oriented and that's why it Lacks political support

3.5.3. Summary of surveys results conducted in Tanzania

3.5.3.1. Summary of questionnaire results from GI Public Organizations

a) Organizational status and accessibility and pricing of Geoinformation

A total of four questionnaires were administered, 3 to public organizations and 1 to a private company. Access to GI was unrestricted to all users' government and others indicated by all 3 respondents. Furthermore, the access is charged according production cost and clients were free to use the information on condition that they recognized and acknowledged the source of information.

Frequency of the mode of distribution is mainly through hardcopy and softcopy. For standard products, charges are done in accordance to price set by government pricelist, while for special products, prices are determined upon request based on production cost. Charging also depends on time spent on production and recovery costs. Differentiation is done according to customer, local communities are charged differently from students who get at a reduced price or even free at times.

b) Customer's requirement

Specific GI based products and services (digital or analogue) provided to customers include Land surveying services, cadastral and Topographic, printing and reproduction services and sale of aerial photographs. Access to services is mainly through office visits, telephone and written correspondence with main products purchased as administrative boundaries, control points, building and cadastral information and transportation (road network). Advertising is mainly done through the public media, through conferences and seminars. Partnerships or collaboration with other organizations for Geoinformation service provision or for development of any new products has been mainly the AFICOVER project. Competitors are mainly the private sector. Have copyright and pricing list.

c) Data sharing and management

Involved in data sharing with a major barriers as insufficient knowledge of who owns what data and the status of the data, unclear or non existing pricing, copyright and privacy policies, reluctance to share data due to unforeseen benefits or risks, different datasets, different purpose for which datasets are produced. Updating of Urban plans is done between 5 and 8 years, national Topo maps are updated between 15-20 years while cadastral plans are updated on the request by the client. No website

3.5.3.2. Summary of questionnaire results from GI Private organizations

a) *Organizational issues*

One private organization responded to the questionnaire with major activities in GI data collection, processing and analysis, thematic map production, environment analysis and GI training/education with major products at national level as regional Meta database, and thematic maps. Major competitor is UCLAS which provides scope for cooperation.

b) Access of GI from public organizations

The respondent indicated that when dealing with public organization's geo-data (foundation and framework data), his organization is affected by the access rights policy because people normally develop the tendency of personalizing the data and making it information that is confidentiality held. Apparently, although Copyright polices exist, they don't hinder/ hamper their operations because the policy enforcement isn't followed making it easy for them to manipulate the data. However the Pricing of government GI data is not well defined, there is no definite price for GI products although price lists are defined within organizations. A threat due to the above situation was expressed towards hindering access and GI dissemination

c) Data Sharing, GIS and Network Use

A number of organizations were expressed be using the same data or part of the data for their business and initiatives towards sharing this data was organized through memorandum of understanding. Information from other organizations was mainly acquired in the format of spreadsheet, digital copies and hardcopy through email, diskette, CD ROM, as the commonly used method for information exchange.

Problems experienced when exchanging geospatial data with other providers are mainly incomplete information, outdated information and delayed delivery. GIS data types used include vector data with tables, scanned maps and raster images.

The respondent indicated that the organization has developed website linked to www network and the main activities were being supported by the www facility include production and service delivery and advertising.

d) Marketing of GI products/services

The production of GI products/services are organized according to customer specification and private production funded by operations from the market and donors. Updating is done on request and depending on other data providers. What are easy to sell are services like consulting and training payment is done directly or through bank transfer pricing policy is on cost recovery. In 2003, the organization earned 26,000 dollars with the highest customers being the government. Threats faced include lack of awareness of the usefulness of geospatial information and donor projects which stagnant the market of GI.

3.5.3.3. Accessing the level of GI industry

This was done in the four major areas; awareness of National Spatial Data Infrastructure issues, smooth running of GI activities, major problems/obstacles in the areas of geoinformation and finally

the contribution of EA Integration towards the growth of GI industry. The summary of the findings are presented

I. Awareness of National Spatial Data Infrastructure

Collaboration with GI organizations in the private and public sector was being organized through seminars, workshops and training of government officials in GIS. Involved in the collaboration with GI organizations in private and public sector, NSDI initiatives CODI1-3, SDI workshop for SADC, AFRICOVER project, initiatives harmonization of Geodetic reference AFREF and Policies regarding access of geoinformation under AFRICOVER project.

II. Smooth running of GI activities

The smooth running of GI activities in the organization was highlighted to be enabled by; capacity in terms of trained staff and facilities in form of equipment.

III. Major problems/obstacles in the areas of

Major problems were listed in areas like; Limited funding of government budgetary, Private Public Partnership not yet developed to allow easy data sharing and exchange and finally Lack of clear polices regarding access, standardization, and legal framework of geoinformation

IV. Contribution of EA Integration.

At institutional level, regional initiatives were stated to be in place for instance cooperation with ILRI in enlarging capacity in GIS, Remote sensing, and software development. The respondent indicated that the EA integration would contribute to improve functionality especially by enabling polices. Such indicated were geo-data access, sharing and exchange, reduction in duplication of efforts in data acquisition and collection. They further indicated that strategies should be devised towards using more digital geospatial data, sensitizing the decision makers at national level so as to create more awareness of the use of GI.

3.5.3.4. Summary results of Interviews

The interviews conducted represented a mixture of ideas and opinions of what the Geoinformation market was. In summary the following points were observed.

- Development of GI is government's responsibility of providing services in order to fulfil its national duty and thus accounting for the provision of free services.
- Government experiences financial problems when delivering services leading donors and former colonies e.g. British Canada started supporting mapping activities and thus the provision of 1:50,000 at national level.
- In 1996 government was looking at restructuring programs with the aim of leaving production of maps to the private sector and the central government would concentrate on policy and enforcement of legislation with the aim of cost recovery.
- Under digital mapping, production of detailed base maps of urban areas has been done. Private organizations have been involved in adding value to these maps especially with the developments of ICT.
- Two schemes have been developed Plot Development Revolving fund and the Retained scheme as methods to boost the GI industry in Tanzania under Cost recovery.

- System of cash budgeting has been introduced in the survey and mapping division as a method that has been adopted by the treasury to release money according to what the division earns after its market transactions on a monthly basis.
- SDI is anticipated to reduce production costs since it stipulates issues of legislation and sharing of geographic information
- Private sector participate in the areas of aerial photographs, printing services, cadastral survey

3.6. Summary of Results

The results were to assess the status of GI production, use and exchange among Private and Public GI organizations within East-Africa. A number of observations are summarized below

⇔ The GI production and provision is dominated by government institutions which mean that success or failure of this industry is mainly in the hands of the government institutions.

⇔ The differences in legal framework and practices in each country are a main challenge to bring out full potential of GI within the region as a whole. For instance conditions governing access to public information in Kenya involves very bureaucratic procedures; acquire a topographic map in Kenya involves applying to department of defence, after clearance by this department, apply to the director of surveys indicating the intended use. That's only when this topographic map can be sold. While in Uganda, no administrative directives are involved, it's walk in and buy across the counter.

⇔ Diversity in pricing which may correspond to differences in opportunities for citizens and businesses a like. Most of the public organizations in EA are financed by public funds and at times assistance from donor organizations. This means they are not operating under "normal" market conditions yet under the drive for structural reforms; public organizations are faced with budget reductions and thus has resulted to their involvement in market activities.

The absence of such a policy is a considerable inconvenience to those in the GIS community, but more importantly it raises far-reaching questions about how government intends to perform its role as a provider of official information and how it intends public servants to manage in the future if they do not have reasonable access to information from elsewhere. Do we really believe Government will be more effective by not exchanging information?

⇔ East Africa is a multi-ethnic culture; different national administrative cultures and traditions are experienced in each of the countries and the impact of this extends to the regional level.

⇔ From the interviews and the responses to the questionnaires, it is observed that lack of an awareness of the potential usefulness of GI among the citizens and the decision makers is highly prevalent. This has resulted to GI not given priority at administrative levels and for its reduced use among citizens. This potentially is a challenged faced by the GI community which need for massive an awareness campaigns for GI to gain recognition.

A summary of a comparison in the three countries is shown in table9 below

Table 9. Overview of the GI market conditions in East-Africa

	GI Organizations	Countries		
		Uganda	**Kenya**	**Tanzania**
Demand and Supply	Private and Public	- Demand and supply usually results from increasing environmental problems and need to manage environment, need for improved decision making -Presence of a donor agency creates demand and supply. -need for service delivery leads to GI mandated organizations supply GI -need by private organizations to make profit leads to supply of GI	-a team effort of government, community & scientist. --need for service delivery leads to GI mandated organizations supply GI - Presence of a donor agency creates demand and supply. -need by private organizations to make profit leads to supply of GI	-Demand for service delivery leads to GI mandated organizations supply GI - Presence of a donor agency creates demand and supply. -need by private organizations to make profit leads to supply of GI
Pricing	Private	-Price reached by negotiation -Price set according to dataset details -Price differentiation among clients	-Price set according to dataset details -Price reached by negotiation	-Price reached by negotiation -Price set according to dataset details
	Public	-Price lists set by department heads and charging according to production costs, cost recovery -No fixed price list for digital products, depend on negotiation.	-Price lists set by department heads and charging according to production costs, cost recovery -No fixed price list for digital products, depend on negotiation.	-Price lists set by department heads and charge according to production costs, cost recovery -No fixed price list for digital products, depend on negotiation.
Customers	Private	-Customer specifies products and format of acquisition. -Customer negotiates how much they are willing to pay -Are mainly government agents -usually have current and updated GI -Usually have diversified GI products and services	-Specify products -Negotiate what they want to pay -customers mainly government agents -established with support from international organizations	-Specify products -Negotiate what they want to pay -customers mainly government agents -established with support from international organizations
	Public	-GI products defined by law -mainly sell analogue maps -Type of technology to use is defined by law -sell outdated inform -Take close to 10 years to	-Have defined GI products -Data distribution by analogue maps -use simply tech	-Have defined GI products -Data distribution by analogue maps -use simply tech

		update GI		
Service delivery	Private	- Use internet to advertise, communicate -Client relationship (follow clients to see how they are doing) -looking out for business opportunities(proposal writing) - Functions funded by market operations	-have websites -diverse activities -Tailor made -follow clients -have websites -looking out for business opportunities	-Tailor made products -follow clients -have websites -looking out for business opportunities
	Public	-No websites -no business initiatives (plans) -funded by government and donors agencies	-No websites -no business initiatives (plans -funded by government & donors (projects)	-No websites -government initiating business -funded by government and donors (projects)

3.7. Remarks and Conclusion

This chapter (field study) provides a description of the extent to which organizations/providers are exchanging geo information in East-Africa. The fieldwork as a methodology of data collection followed a structured method in the collection of information regarding accessibility and pricing of Geoinformation, customer requirement and level of the GI industry in each country of East-Africa. It utilized three main techniques (workshop, questionnaires and interviews) to gather information in a limited time. The workshop was mainly useful in understanding the Role of the GI private and public organizations, Projects and NGOs to the development of the spatial data market in Uganda and East-Africa as a region, Understanding the GI industry operational needs and the potential role of Geoinformation. Some questionnaires were issued during and after the workshop. Their collection strategy was during thee workshop and during interviews. The questionnaires were instrumental in providing easy and quick way of collecting large quantities of information since they had been structured to address specific issues. The interviews conducted were useful in clarifying unanswered issues as well as obtaining background information from target organizations.

A number of challenges were faced during fieldwork. In Uganda, workshops attract only if after attending the workshop there is a repayment, so this attracted very few. It was difficult to find some documents, people are always busy so some important interviews could not be done, time was very short since it is at times very difficult to find people in the offices, Contacting personnel through email has been very difficult since people do not answer to their emails accounting for the poor response from Tanzania, communication through emails is not always honoured. The Nairobi AARSE conference provided a good opportunity to meet very instrumental personnel from different countries. On average the fieldwork method for data collection provided sufficient information from representatives of all the stakeholders from government, private sector, non-governmental organizations and community-based organizations to explore the main issues relating to geoinformation market in East-Africa.

4. Assessment of the GI Market in East Africa

4.1. Introduction

The previous chapter provided the findings from the field study regarding the status of GI production, use and exchange among GI related organizations in East Africa. This chapter addresses research questions 3 and 4 by comparing field results with the market theory; which results are in conflict with the theory and which results cannot be related to market theory. Similarities and differences between East Africa and the European Union GI markets are drawn and finally strategies for strengthening the EA GI market are illustrated. While chapter 2 looked at international cases, here the perspective is from East Africa.

4.2. Review of market theory Characteristics

This section considers literature in chapter two in order to explain which part of the theory can be explained in accordance, which part conflicts and that which cannot be explained in accordance with the market theory. In today's environment markets are no longer always tied to a concrete locale; instead the term has come more to represent a set of conditions. These conditions generally are descriptions for each of the elements to include; demand and supply of GI, competition, pricing mechanism, transactions and regulation of institutions.

4.2.1. Results explained in accordance with the market theory

- **Demand and supply of geoinformation**

From figures 5 and 12, it can be observed that a number of public agencies are major suppliers of GI in EA. It shows that the demand and supply of GI is changing from the increasing need of government to deliver public services. NGOs, donor and GI private organizations have contributed to the increased production of GI. One can observe that the emergence of a private sector for information services has made it necessary to re-examine the role of public agencies within this new social and economic infrastructure. Private companies have the freedom to develop services, which exploit the possibilities of the market and thus their operations may be seen as contributing to making information available.

- **Competition**

National organizations generating geographical foundation data had a de facto monopoly on geo-information products. However this has been changing mainly since the broader introduction of ICT in society. Projects and the private sector have been getting access to technology similar to that of national surveys, which has resulted in alternative production lines and products and ultimately, a challenge to the monopoly. This is in particular reference to KISM which uses highly advanced technology and at times is overcome by the high demand for their products and services. It seems possible for competitors to overcome some of the apparent advantages of a natural (like Survey of Kenya, Survey and Mapping of Uganda) monopolist by using new techniques or by selling new products or services.

Inter-governmental cooperation, presence of cross boarder private companies like Geomaps Africa, WEGS consultants LTD, Geosystems Africa, regional projects engaged in GI projects encourage further collaborative efforts. These projects tend to incorporate technologies and expertise of the private sector over an extended period and are partially funded by International funding agencies.

- **Pricing Mechanism**

With reference to figures 6 and 14, pricing policies employed in organizations are diverse in East Africa, while public GI organizations price for their products and services according to production cost and cost recovery, private organizations charge for products according to market value and negotiation.

- **Transaction costs**

Based on interviews and questionnaires, it was observed that customers mainly pay office visits in order to inquire about particular datasets details. This is reflected in Tables 3 and 7. Further more, transactions here seem to be high because of all the costs involved before a client gets the exact type of data required. The costs involved like transport, searching preferred data type makes it expensive acquiring GI. An interview with WEGs illustrated that when datasets were purchased from BIOMAS and Surveys department, they were mismatching, so this client was forced to go and map the roads himself. All these experiences are transaction costs.

4.2.2. Results in conflict with the theory

- **Demand and supply of GI**

Economic theory approaches demand as a force tending to increase the price of a good while supply a force tending to reduce the price but when in balance, the price neither rise nor fall. Contrary, Geoinformation product is priced differently by organizations. Public organization cost GI at production cost and its reproduction doesn't involve any extra cost and depreciation, while private GI organizations consider market value and other attributes like the level of detail of a particular dataset. Donor organizations don't fund their activities from transactions of the market. Demand and supply are not proportionally distributed; there is high demand within projects resulting in non-pricing demands. The increasing quantities of GI by projects do not seem to influence pricing.

- **Competition;**

Governmental departments dominate in the provision of geoinformation in EA this is typical for Survey of Kenya, Survey and mapping department Uganda and Survey and Mapping Division Tanzania. Furthermore, some of these organizations are currently undergoing major transformations under the Structural Adjustment Programs with a vision of Open and Impartial public service. One key objective identified through this program is directly linked to provision of geoinformation "To create a social and legal framework in which equity, GI business can flourish. That means involving the private sector in service provision. Yet it is important to note that these government departments fund their activities out of market transactions. They have a dominate position by commercially exploiting their own information on the market, have authority to restrictive and discriminatory conditions for licensing and establishment of exclusive and privileged partnerships property rights.

From the summary of interviews, it was clearly reached that the legal framework that would be established to secure the Intellectual Property Rights as an essential component of an information market is almost none existent in East Africa. This seems to account for the current level of fragmentation of the GI market characterized by absence of GI standards and metadata.

- **Pricing Mechanism**

Pricing mechanisms vary among organizations, from figures 6 and 14; a combination of pricing methods can be employed in one organization. It seems to relate to individual transaction which involves price haggling, negotiation before a transaction is carried out.

Most of these organizations are gearing towards cost recovery even when they are still charging their products according to production costs. Pricing is an ambiguous situation; should the price be low in order to make the products or services affordable or should the price be fixed to meet the demand, or should the price equal an international rate, often lower than what is possible within a country? From the geoinformation Management perspective, the problem seems to be that there is no overall policy to make official GI available to other sectors and even to other parts of government.

Pricing is a critical element of valuing and marketing GI. A price set too high is a barrier to access the data and prevents the widespread use of the data. A price set too low will not cover the high costs of collecting and maintaining the dataset and will not provide the expected rate of return on the producer's investment.

4.2.3. Results that cannot be related to market theory

- **Demand and supply of GI**

From the pre-field and field interviews, it was determined that Private GI organizations in Tanzania get involved in organizing demand by writing proposals and illustrating their capability by analyzing what their client's needs are, at times they are involved in sensitizing would be clients in order to make them aware of what their needs are. It is only after determining their client's commitment, that production and supply can be organized. However this may be contrary to economic theory where demand has to be organized instead of looking for demand to determine supply.

- **Pricing Mechanism**

Certain GI assets such as, landscapes and diversity of biological resources are difficult to price or even they are actually unpriced. (Response from Uganda). As a result these cannot be traded in the market because they cannot be bought and sold in markets. Individuals have no incentives to reduce the use of these assets or to invest in their preservation and growth.

The goods and services obtained from nature are available to users at little or no cost apart from that of collection. Setting prices for data is never going to be easy because datasets will inevitably have different values in different circumstances. For example the contour lines on an Ugandan map do not have the same value to a hill-walker as they would to a civil engineering company.

- **Competition**

Public organizations have cost structures which differ from those of private GI organizations. Survey of Kenya, Survey and Mapping department of Uganda for instance in certain situations offer products at less than the market price which private organizations offer in each of the countries. In certain situations surveys and mapping department in Uganda customizes GI to the specification details demanded by a client. It seems that value adding to information on the market is being practised by public organizations.

4.3. Extent of GI market at National level

Reviewing of the GI Market, involves reviewing prices, regulations and degree of competition. This section relates to table 1 in 2.4 which gives a structural review of specific cases and table 9 (3.6) which give a summary of market results among the private and public organizations in East Africa.

Table 10 Review of GI market characteristics in East Africa

Characteristics	GI market characteristics of countries		
	Uganda	**Kenya**	**Tanzania**
Organizational involvement	Most GI is created and used in the public sector. Private companies collect and disseminate GI often in the form of local added-value information.	Collection and dissemination of most GI is most centralized in the public sector.	Collection and dissemination of most GI is most centralized in the public sector.
Access rights	Constitution provides in part: "Every citizen has a right to access information in the possession of the state or any other organ or agency of the state except where the release of the information is likely to prejudice the security or sovereignty of the state or interfere with the right to the privacy of any other person....."	There are no clear guidelines on classification and declassification to which legal framework governs access to important public information in Kenya. However current Access to Information Bill seeks to modernize Kenya's copyright law and to bring it in line with international instruments in particular the Berne Convention and the WTO instruments.	Article 18 of the union Constitution guarantees every person the right to freedom of expression, but also the right to seek, receive and impart information National Security Act (1970) gives the authorities discretion in deciding what official information should or should not be disclosed to the public.
Pricing policy	Promoting a pricing policy that meets economic, financial and equity objectives.	The rate charged for data sets from government agencies is essentially the cost of duplication.	This information is to be made available to other government agencies at the cost of reproduction.
Data sharing and management	No single led initiative to co-ordinate the provision and dissemination of GI at the national level. However sharing is being enabled through networks EIN, NIMES, MOU, Africover Global Mapping	Survey of Kenya coordinating GI sharing through the coordination of Kenya – NSDI. Some institutions in Kenya participate in the Environmental Information System (EIS)-Africa, which is a forum for data sharing environmental data and their involvement institutions is participatory Global Mapping (GM) Programme MOU with ICRAF	No single led initiative to co-ordinate the provision and dissemination of GI at the national level. The National Bureau of Statistics, Surveys and Mapping Division/Ministry of Lands and Human Settlements Development and the University College of Lands and Architectural Studies (UCLAS) are championing the SDI initiative in Tanzania. Africover(Mavima and Noongo 2004)
Copyright	Copyright Act (cap. 81), July 1964. Copyright Bill, 2002 is pending concerning amendment of the Copyright Act and provision for	On December 31, 2001, the Kenyan Parliament passed the Copyright Act of 2001, replacing the Copyright Act of 1966 (as amended).	1911 copyright law Copyright and Neighboring Rights Regulations G.N. No. 214 A, June 2000

	Related Rights and Collective Administration of Rights.		
Privacy	Article 27(2) of the Constitution of Uganda gives the right to privacy of person, home and other property. The legal provisions addressing privacy range from the Constitution to statutory law as well as international legal instruments.	Kenyan Constitution makes provisions for citizenship, the protection of fundamental rights and freedom of the individual	Section 16 of the union Constitution gives every person the right to privacy of their person, family and of matrimonial life, including their private communications.
Liability	Did not come across relating to geoinformation and liability, Absence of clear cases affect the market trust and may result in duplication and more importantly, it may raise far reaching questions as to how government intends to perform its role as provider of official geoinformation.		

4.4. National Government GI initiatives

4.4.1. Current government GI initiatives in Uganda

National efforts have been geared towards adopting policies that ensure minimal conflicts and duplication of efforts and resources. The overall view has been to prioritizing budget and funds allocation where the impact of sector target groups will be visible and felt most. The aim of this is to contribute to reduction in the poverty levels. These have been discussed by (Kiiza 2000; MWLE 2002; Nsita 2003; Musinguzi 2004). Systematic application of a series of key principles to any new policy or regulatory proposals have been enshrined in the "Regulatory Best Practice" which ensures that proposed new laws/regulations are the most effective in order to improve the quality of decision making. This directly has had impacts on geoinformation in a number of development initiatives

- Rehabilitation and modernization of the infrastructure of basic business services have been given top priority. The Government has sought, in particular,
    - To make the banking sector more efficient, deregulate the transport industry, liberation of the communications industry leading to communications act. These legislation changes are likely to lead to an increased use of GI. Besides, with modernization of the basic infrastructure would be of significant benefit to Uganda's economy.
- Uganda's land legal framework on land has undergone reforms under the drive to implement the Land Information System. This has contributed to development of the Land Act 1998 and the Condominium Property Act 2001. Other current legal reviews included Survey Act 1964, Town and Country Planning Act 1964, Mortgage Decree, Registration of Titles Act 1969, Expropriation Act; all these laws directly affect the gathering, capture, recording, use and dissemination of GI. This is expected to generate security of property rights, reduce the cost of land transactions and contribute towards the growth of the GI market.
- The Uganda Copyright Act 1964 has been reviewed and Copyright Bill 2002 is pending concerning amendment of the Copyright Act and provision for related rights and collective administration of rights. Copyright bill 2003 (Bakibinga 2004; Consult 2004; Wangwe 2004).
- The reform of the commercial laws is geared towards having modern laws supporting a competitive economy in a coherent and accessible form providing maximum freedom for

participants. One such proposed law will be the Competition Policy and Law. Its basic objective is to restrain firms with substantial market power from exercising that power in a manner that controls prices, limits production and shuts out competitors.

- Government institutional reform is currently being carried out to improve the efficiency of the public sector activity. This for instance has resulted into the transformation of government departments into public agencies where they are given more responsibility for their own finances and planning and more freedom to develop new initiatives. For instance the Uganda Forestry Authority, Uganda Revenue Authority, National Planning Authority. These organizations act in the market and under cost recovery government is gradually reducing their budget and they are supposed to be self sustaining in specified years.(Nsita 2003).

4.4.2. Current government GI initiatives in Kenya

National efforts have been geared towards adopting policies that promote greater public access to geo-information, expanding investment in the collection of basic digital geoinformation, based on assessment of existing and future information needs, documentation of geo-information resources and publish this information widely for decision makers, researchers, academia, etc

- Draft Policy on Geo-information has been developed to be incorporated in the Information and Communication Technology (ICT) Policy which will address the issue of Geo-information and NSDI component and issues related to sustainable development.
- High level consultations for instance on Kenya's forest legislation; As part of national efforts to involve policy makers and legislators in making more informed decisions on natural resources, Initiative to involve members of parliament from the parliament committee on agriculture, lands and natural resources in an aerial survey of the Mt. Kenya and Mau Forest areas.
- Kenya Intellectual Property Office was established to protect and promote inventive and innovative activities in Kenya effectively and efficiently in order to enhance technological, industrial and socio-economic growth.
- Copyright Bill of 2001. The Bill seeks to modernize Kenya's copyright law and to bring it in line with international instruments in particular the Berne Convention and the WTO instruments. In the Copyright Bill, Kenya now expressly protects computer programmes and data by way of copyright.
- Access to Information Bill. The bill presents issues on freedom of information in Kenya and currently has adopted the International Commission of Jurists-Kenya draft Bill as a starting point.

4.4.3. Current government GI initiatives in Tanzania

Tanzania has embarked on a campaign to improve government communication with the public/society as part of a broader commitment to good governance, openness and accountability. This aims to ensure that all citizens, even in remote areas, have timely access to information to make informed decisions, provide input on public policies and improve their livelihoods.

- Government agencies often get involved engage in special partnerships and joint power agreements and with other governments and organizations to accomplish missions of general benefit. In some case they join to create NGO's to carry out special tasks that each agency could not do as well.

- Copyright Collective Management Association is currently working on enforcement issues concerning the intellectual property laws. The government plans to establish a commercial court that would also have the authority to deal with intellectual property issues in a timely and orderly manner.
- Government policies in Tanzania are increasingly focussed on decentralisation and increased stakeholder involvement, such initiatives include;
    - Through the Tanzania Information Services is a database centre for public and private media regarding gathering and dissemination of news in collaboration with Regional Information Offices and information is concerned.
    - Traditional Irrigation and Environment Development Organization (TIP) contributes to improve the position of women in regard to the access and control over land and water.
    - Land sector reforms regarding service delivery and allocation of land has encouraged greater private sector involvement in the provision of housing.
    - Mining sector reforms have contributed to an improve information flows through an appropriate information system and the establishment of a data unit with networks enacted new mining legislation

4.5. Review of Geoinformation Market failures in East Africa

In the chapter 2.6, market theory related to market failures were discussed. This subsection evaluates to which extent the collected data in the previous discussion above illustrates instances of GI market failures with specific reference to EA.

4.5.1. Monopoly of government institutions

- The government is the largest provider of GI in EA and all information created by the government is considered state resource. This is in particular true in the Survey of Kenya, Survey and Mapping departments of Tanzania and Uganda. These monopolise the provision of GI and thus create monopolistic tendencies which do not contribute towards providing level playing field for other GI organization thus resulting to unfair competition created by national institutions.
- The pre-field interviews concluded that involvement of NGOs and donor organizations in the provision of GI has contributed to creating an inactive culture among the public sector in Tanzania. These negatively affect operations in the market since these organizations do not fund their operations from the participation in the market operations.

4.5.2. Public good market failure

- The national mapping organizations (NMO) in EA provide base data to which other organizations can add value or even reproduce the same data produced by NMO. For instance UBOS, KDC, wetlands information system, national Biomass centre are among the organizations in Uganda producing mapping for their own requirements with the underlying data set from surveys and mapping department. It seems an example of data duplication in Uganda leading to redundancy, which is a sign of market failure.
- 13 of the interviewed organizations had to digitize data belonging to another department. There is no particular harm in doing this if the situation is properly managed; however it can mean that the

originating department loses all control of the information benefits from products/services enjoyed by an organization are almost less than the cost of producing the GI.

- Geo-data maintenance is often overlooked; 90 % of responses from the questionnaires indicated that update of GI was dependent on the availability of funds. The danger inherent is operational and strategic decisions may be made on essentially unofficial or even outdated information. Furthermore unnecessary duplication of efforts and several different versions of a dataset in circulation clearly illustrate the existence of substandard products. Considerable resources can easily be wasted because of poor quality data. The product on the market is substandard this leads to the presence of market failure.

4.5.3. Existence of a wide difference in income and wealth

- Some documents such as (Consortium 2001) and (Marcel 2003) illustrate the effects of difference in income. Further, they illustrate the poor state in which rural land offices mandated to handle GI are ineffective due to lack of funding. Officials are supposed to provide services but are unable to do so due to the constraints and shortcomings of the systems that they are working in. Problems associated to the economic performance of government departments are that they are weak at controlling cost and tend to influence and be influenced by non-commercial pressures. Thus, it can clearly be seen that lack of funding throughout the three economies results market failure in EA.
- The culture of the people where use of GI like maps is not common leads to very little use of GI. This is due because the infrastructure is not developed and thus does not necessitate the extensive use of maps for instance to identify places, manage utilities and conduct of navigational purposes.

4.5.4. Transaction costs

- From interviews and questionnaires conducted in EA, clearly base data from each of the national mapping organizations is being reused by other public, private, and NGOs/donor organizations for their own requirement. It seems that a market for GI exists.

  However cost associated with acquiring information about the GI product or service involves choosing, organising, negotiating, and entering into contracts. At times certain organizations have had to recapture datasets or even digitize data from another organization. For instance WEGs Consultants had to re-digitize the roads layers purchased from National Biomass study, Surveys and Mapping due to data mismatch.

  The costs involved is quite high even made worse as a result of the absence of data standards, policy framework and co-ordination in GI-management systems. The high transaction costs as a result of poor regulation enforcement are the de facto where high transaction leads market failures. The challenge remains for providers of GI products/services to provide their products in such a way to reduce the cost to the potential buyer.
- The Legal framework which is supposed to be established to secure the Intellectual Property Rights as an essential component of an information market lacks in EA. This accounts for the highly reported piracy instances in EA. In particular, the United States government recognised the importance of addressing intellectual property issues in Kenya in 2002 by identifying two major areas of concern; weak enforcement and inadequacies in the law in a report (IIPA 2003). In its report, it highlights the piracy rampant in Kenya. It brings enforcement experiences in Kenya illustrating how courts failed to provide relief against piracy for copyright owners. A case in particular included,

Microsoft corporation pursued action against a local system builder microskills Kenya limited accused of illegal preloading business software on hundreds of computers, in another case, Microsoft brought against action against a computer reseller accused of illegal preloading business software on personal computers they build and distribute (hard-disk loading piracy). The case was characterized by long brawn-out proceeding. In addition, the copyright law of 1966 was considered ineffective towards enforcing copyright issues.

In this case, the governments of Kenya failed to provide relief against piracy for copyright owners. All forms of business piracy (namely, retail piracy, corporate end-user piracy of business software, and government use of unlicensed software) have been reported in the Kenyan, Ugandan and Tanzanian market.

Lack of a common approach to pursue the problem associated with the infringement of the copyright law damages the domestic market, and threatens neighbouring markets as well.

However one wonders how much more cases haven't been forwarded in situations of infringement of copyright regarding to institutional reproducing of GI. Although this may seem in one hand to be a market but infact this poses a danger of damaging the growth of the GI market throughout EA.

4.5.5. Information failures

- Another market failure stems from the markets inadequacy in provision of information about GI. In most cases that are prevalent in EA, the client/citizens do not know which information is held in certain organization. That means that clients do not have optimal information concerning the market, and thus less than optimal decisions are reached due to lack of information. A lot of time is taken searching but also added costs of searching are incurred.
- Public-sector organizations at times collect GI which they have no particular intention to make available to anyone else due to a number of reasons, organizations worry about the copyright, privacy and the tendency of individuals in organizations to personalize the information. All of these could be considered to be reasonable excuses for denying access to data, but the most important problem is that organizations generally have no incentive or compulsion to release the information they produce.

4.5.6. Market impediments

- Ad hoc operations in which, copyright, access rights to information and the diverse pricing models within GI organization vary. Government's reluctance to enforcement ranging from raid to prosecution in the courts, as well as in regard to border procedures, make it virtually impossible for right holders to protect their rights in EA Police, customs, and other enforcement agencies are reluctant to pursue raids against copyright violations, sending a message to the pirates and the general public that there is no negative consequence for engaging in acts of piracy.
- Heads of Governmental departments have been given discretion authorities in deciding what official information should or should not be disclosed to the public. However this has resulted into restricted access to some GI produced and thus limiting the possibility of commercial exploitation of such datasets. Bureaucratic procedures make it cumbersome and increases transaction costs when acquiring GI. All these impede the growth of the GI market in EA.

4.6. Review of Government intervention in provision of GI in EA

This section is closely linked to sub-section2.7 in chapter two where the government intervention may seek to correct for the distortions created by market failure and to improve the efficiency in the way that markets operate. In EA, initiatives to foster the use of GI have been done at regional level and also at national level through various programs/projects, national policies have been reformed have been established. All these strive to eradicate poverty at national level which is a challenge taken upon by each individual state.

Sub-section 4.5.1, 5.5.2, 4.5.3 show the initiatives related to GI directly related to Uganda, Kenya and Tanzania respectively. The examples described in the outlined sub-sections rightly relate to government intervention, however below are some specific interventions.

- GI presents public good properties with reference to sections 2.5.2 and 4.4.2 and normally associated with externalities (2.5.3) and production characterized by increasing returns to scale. This explains why the production of geoinformation is not left to the production of free market and exit of private enterprises in the framework of competitive markets. Survey of Kenya, Survey and Mapping department and Survey and Mapping Division in Tanzania have been established to this effect.
- Competition policies have been introduced into markets (de-regulation) Policies meant to curb unfair business practices and to regulate those practices that will be identified as being anti-competitive and to prevent unfair competition that causes economic injury to business through deceptive and wrongful business practices are being introduced through creation of competition laws and acts in East Africa.
- At national level, regulations are being reviewed in order to harmonize them at regional and international level. The essence of the initiative is important for governments to create a favourable environment where its citizens are protected from exploitation availability and dissemination e-government
- Regional initiatives of regional integration in the regulation and standardization of products and activities at national level, we see regional projects and inter-governmental cooperation (RCMRD) established to provide services in the fields of surveying and mapping including aerial photography, photogrammetry, photo-interpretation, first order geodesy, remote sensing, calibration and maintenance of surveying and mapping equipment in member countries.

4.7. Comparision of EA and EU GI markets

Table 11 Comparison of East Africa and European Union GI markets

4.7.1. Similarities	4.7.2. Differences
Heterogeneous in many aspects • ***National policies*** -Different member states apply different rules and have different practices on the ways GI can be accessed and exploited and to various practices which hamper the availability of GI. -Lack of harmony in prices charged for Public Sector Information across the EU like in East Africa	• **Organization of the private sector** EU – RAVI, EUROGI (Networking) EA – NONE • Use of technology varies, in EA few organizations use sophisticated technology compared to the EU organizations

-The lack of standards in GI between Member States and even between regions just like in EA. • ***National Trends*** -In all EA/EU countries public organizations introduced strategies for commercial business development e.g. S&M department in Uganda; formulating policies to avoid duplication, (mapping policy), Tanzania; under decentralization GI units are being developed, Kenya; Draft policy on GI, copyright bill, access to information bill/. OS, Dutch Cadaster. - EC stimulates the spread of good practices through a public sector information group, consisting of amongst others officials of the Member States Directive 2003/98/EC on the re-use of public sector information was adopted by the European Parliament and by the Council • ***Consist of smaller markets*** For example, this can range from countries and regions collecting and releasing different information on companies and individuals due to differing data protection laws, • ***formulation of polices*** Although different policy statements stem from different departmental viewpoints, there are some common themes; - Government information must be made more accessible to a wider audience - the development of value-added information products and services is something to be encouraged. • ***Regional trends*** To overcome the barriers that limit the re-use of public sector information, the EC has defined a coherent set of actions; - - legislative action consists of a directive on the re-use of public sector information, adopted by the European Parliament and the Council on 17 November 2003 - Projects specifically aiming to bring out the potential of public sector information are co- financed under the eContent programme In EA intergovernmental organization and NEPAD under CODI-Geo, projects and networks are driving to bring out harmonized potential use of GI.	• Initiatives looking at a European level e.g. within the framework of PRINCE an active dissemination policy has been established. While in East Africa, regional initiatives haven't yet taken root. • Volume of activities varies, while EU experiences increased voluminous GI activities, the EA have reduced voluminous activities. • Whereas the developed EU countries have by and large consciously operational zed managerial reforms, EA is implementing the reforms under pressure from the free-market economic theorists, most notably, the IMF/World Bank coalition. • Considerable practical difficulties resulting from lack of transparency for citizens, administrations at all levels, populace ignorance of their rights in East Africa while unlike in the European Union, where most people seem to know what to expect, which makes the work of the judicial bodies easier as issues of interpretation are quickly settled. • Availability of public GI is an absolute prerequisite for the competitiveness of the EU industry. In this respect, EA companies are at a serious disadvantage compared to their EU counterparts which benefit from highly developed, efficient public information systems at all levels of administration • While in EU issues of copyright, access rights, privacy and liability of information are highly enforced, this doesn't happen in East Africa, resulting to piracy and un-enforcement of such rules because they are not well managed and enforced.

4.8. Lessons learnt

- A well established GI legislation is an essential component of the GI market environment. Market distortion deriving from misuse of such as copyright, privacy polices is likely to have a negative impact on use and trust in spatial information. Development of institutional, national and regional framework in which legal and economic constraints under which citizens, GI businesses and other

organizations may gain access to available data would be prerequisite for the competitiveness of an EA GI market. Contribution of this will;

- Reduce redundancies and inconsistencies in the collection, storage, maintenance, processing and distribution of GI.
- Policy provides the legal and administrative framework as well as the business environment to clarify the responsibilities to guide various actors involved in geo-data management. Regulations details specifications in terms of the tasks for the units as well as coordination strategies and procedures for the internal and the external access of GI from organizations.
- Sustainable development of an EA GI market require joint policies in GI that clearly defined standards and norms that will facilitate the sharing and exchange of GI without any problems amongst various user groups. For instance use of Metadata can prevent duplications that may arise from limited knowledge of available data residing at different locations in a country

- Achievement of the above may require improving a number of concerns:

  i) Administrative procedures

  ii) Some issues may require technical solutions

  iii) While others may require political solutions.

For instance for objective performance of the NMO may require improving the budget systems, formulation of clear policies regarding access and use of GI, fight against corruption among others may contribute to creation of an improved GI business environment.

- Institutional relationship have a role to play; GI agency/government, private sector/industry and academia institutions augurs well for creating maximum impact geoinformation access and exploitation thus enabling growth of the GI industry.
- Government efforts such as those towards decentralisation require countrywide and detailed geo-data and thus require data access for an increasing number of users. Modern information technology enables real time access to GI for an approximately unlimited number of users. New developments of hard and software meet these requirements: New Technologies opens unlimited opportunities to acquire more and detailed data in a shorter time
- Creation of an informed society that understands the usefulness of GI leads to increased use of GI, while decision-makers need different education and training programs in information technology as people involved in the implementation or maintenance of IT systems.
- The market oriented and entrepreneurship requires not only new policies, but also a change in behaviour. This change at national level may require considerable time and capacity building of experts of geoinformation at a local level about data acquisition, data processing, and the visualisation of data.

4.9. Conclusion

This Chapter reviewed field results with regards to what can be explained in accordance with the market theory, which results are in conflict with the theory and finally which results cannot be related to market theory. Specific issued mentioned include, pricing of GI, access of geo-data and the structure of the GI market. Comparison of the East-Africa and European Union GI market drew the

differences and similarities existing in the two situations. Analysis indicates that GI market in East Africa is still developing and where GI does exist within government, current arrangements for access are variable. Many legislations and policies are lacking in support of the development of the market. Nevertheless, these informal, ad hoc arrangements may represent the delicate beginnings of an extensive network of the GI products and services which both the public and private GI sector needs. Lessons for the EA GI market a growth requires three varied solution embedded in institutional reforms, technical as well as political solutions. Thus consideration of how these solutions shape the GI market environment in EA is inevitable and thus chapter five, considers the analysis of the GI market environment. Scenarios are used as criteria to assess the dynamics governing GI products/services and growth of the GI market.

5. Using scenarios to assess the GI Market environment

5.1. Introduction

The previous chapters concentrated at looking at individual organizations and compared individual countries. This chapter evaluates the GI market environment as described in chapter 2. Scenarios are used to formulate clearly the extremes that a situation can develop to if a decision is considered to follow a given direction. Decisions considered shape the GI market environment and are essential to clarify what possible implication this would have for a GI manager. Three scenarios were considered; (1) One tight government control, (assumption considered is that of a public organization which is developing a market fully under government control). (ii) Loose government control, (the assumption of a principal agent relation where production of GI is done under the authority of a principle but carried out by an agent. (iii) No government control/authority (assumption of a private company is considered here).

5.2. Methodological approach of Using scenarios

The approach taken here is adopted from (Wilson and Morrison 1996). This uses six steps which are interlinked. The scenarios aim to create a good fit between the characteristics of the organization for which a strategy is being designed and the GI business environment surrounding the organization. The choice of approach considers elements from the results of study (chapter3), international trends and references to literature. Comparative description of each scenario step guides GI managers such that they can see how these scenarios differ along given dimensions. The six interrelated steps are depicted as blocks in figure 18.

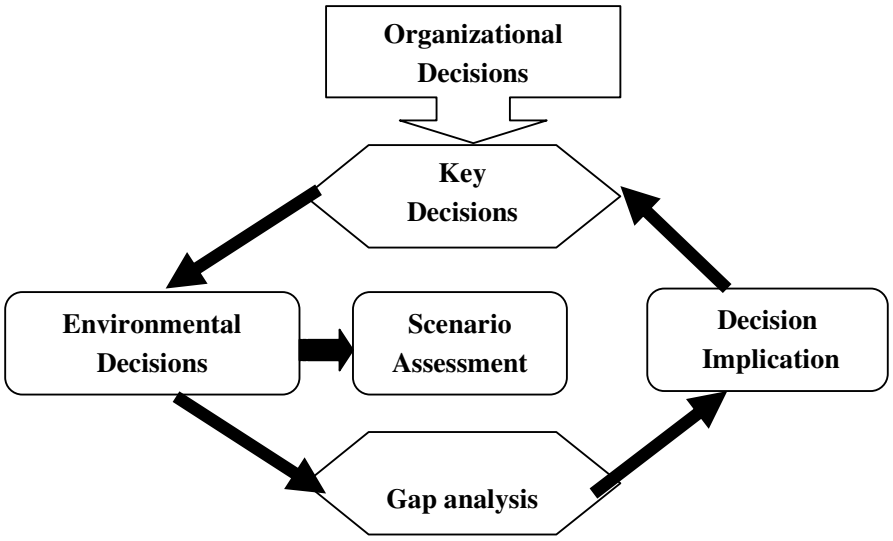

Figure 18 Scenarios by Wilson and Morrison 1996

It starts by considering "organizational decisions"; which refer to the strategic decisions of the organizations as perceived from the field study (chapter 3) and which scenarios should help to address

based on surveys, interviews, questionnaires and workshops. After a description of the organizational decisions, key decision factors are considered; (Wilson and Morrison 1996) identifies these as "the main things organizations should know about the future in order to make decisions". For the purpose of this thesis, three main key decisions have been identified (1) Commercialization and privatization of GI, (2) Technological developments, (3) Legislation issues of GI.

The third step Involves identification and assessment of key forces that will shape the future of these "Key decision factors". These include a collection of trends, developments and realities that organizations are faced with and which eventually culminate to change. Further more, the identified driving forces for change are sorted in relation to perceived degree of strength of impact and uncertainty. The next step involves the assessment of the previous environment in order to determine the probable strategic needs and the impact of the driving forces on the market. The high impact and high uncertainty forces are then evaluated to give conclusion to the future dependency of the GI market.

The fifths step involves a Gap analysis where comparative descriptions are made to help GI managers see how the scenarios differ along given dimensions and finally, an interpretation of the scenarios is made.

5.3. Characteristics of Scenarios

Interviews, questionnaires and workshops were used to arrive to the description of the characteristics of organizations categorized in each of the scenarios. Table 12 detail the type of organization, its category and the characteristics.

Table 12. Organizations in East Africa

Scenario type	Identified organizations in East Africa	Major Organization characteristics
Tight Government Control	Survey of Kenya Surveys and Mapping Department-Uganda Surveys and Mapping Division Tanzania	Carry the legacy of the ordnance survey of colonialist institutions, to date, that culture has hardly changed. It is still characterized by strong hierarchical management structures headed by the minister with tight description of production and work process. In this regard, these organizations may probably be good in regulating but it is unlikely that a dramatic change will be introduced.
Loose government Control	Kenya Institute of Surveys and Mapping National Forestry Authority RCMRD	Formerly government departments which have been transformed to publicly owned agencies that operate like commercial companies. Their income depends on both national budgets and the revenue they collect. Employees use business altitude towards customers.
No government control	GeoMaps EA Ltd Inforbridge EA ltd Geo-Communications LTD	Are relatively new companies, proprietors are creatively looking for new solutions using technology; they target their clients by advertising their capabilities. But at the same time most of their contracts are with government agencies. And still dependent on donors. There seems limited business to business done in EA.

5.4. Building GI market environment using scenarios

This section presents the assessment of each scenario as adopted from (Wilson and Morrison 1996). Each scenario is assessed by a way of understanding the dynamics shaping the GI production

environment within the organization. Further analysis of relevant entities is done to build and complement the findings. The first scenario "tight government control" is detailed below.

5.4.1. Tight government control

The organizations and major characteristics are reflected in table 12. The assessment is a six step method which begins by identifying organizational decision that shapes the GI production environment.

5.4.1.1. Organizational decision

As referred to in section 5.2, organizational decisions are strategic decisions of the organizations as perceived from the field study and to which the scenarios should help to address. These include;

- NMO have well described GI production and work process for Geodetic surveys, Cadastral surveys, Hydrographic surveys, International border surveys, Engineering and topographic surveys, Aerial surveys and standardized pricing lists to the cost of production/distribution.
- NMO have Copyright policies which are well stipulated but not enforced. "Free access" to information is the main policy to access information from the organizations but in certain situations written agreement specifies terms and conditions of possession and utilization of GI from these organizations.
- Clients mainly visit the office to find GI products inform of hardcopy and Softcopy. These are sold across the counter.

5.4.1.2. Key decision factors

The key decision factors include; commercialisation and privatisation of GI, advancement in use of Geo-ICT and Legislation issues of GI.

5.4.1.3. Environmental forces and drivers

The environmental issues considered are a collection of trends, events, developments and realities that interact within and outside these organizations and thus creating a situation that culminates in change. These include, external environment factors, national trends, partnership and collaboration and constraints.

- **External environment issues**; Two issues are considered; Globalization and technological advancement

  Globalization is setting the stage for our national and local economies and the rules under which economies, public and private sector must operate. Current trends are geared towards regionalization. RCMRD, CODI-Geo, AFRICOVER and LVEMP are examples of regional projects operating across boarders. All these influence spatial data and increasingly determine GI business and intergovernmental activities. This highlights of Globalization of the GI market place that is well underway and thus drives the need for change among geo-data organizations and especially mapping departments.

  Technological advancement; major technological trend for geomatics involves use of improved methods for data capture, analysis and dissemination. Recent emphasis among GI producers is the creation of interoperable datasets to link the multitude of existing spatial data bases. The marketplaces of most GI now reside in organizational websites which support transactions over the

internet. Further initiatives have included the development of spatial data infrastructures so as to enable data sharing. Thus GIS related projects (CAMP, CAMPU, JICA) have been established as units within the national mapping organizations in EA and these use advanced GI technology in service delivery.

- **National government Trends**; various publications such as (EUROGI 1999; FGDC 2000; Fornefeld, Oefinger et al. 2000; Longhorn 2002; Corbin 2004) suggest that national mapping agency roles will be reduced to coordinators of government activities and national standards, with the production of spatial data taken over by the private sector and non-government organizations. To respond to this (possible) trend Governments in EA are looking carefully at how they can formulate and enforce policies and deliver services in more integrated ways. The response is taking the form of: reductions in the size of the public service, commercializing of certain government activities, restructuring of the government machinery and a redefinition of the process for developing public policy. An example of the changes in policy related to GI Legislation is considered here; Sections 4.5 shows the various initiatives by government that emphasize amendment to existing legislation. Copyright amendment in all the EA countries include; Land and ICT policies amendment. These are geared towards harmonization and reformulation of most national acts to streamline the government roles as regards service delivery. One can clearly observe that the national government trends infer that the role of government in spatial data production and management is changing.
- **Partnership and collaboration**; (Oxera 1999; Groot and McLaughlin 2000; SoK 2001; Longhorn 2002; Oefinger 2002) show cases of Partnerships between government departments and the private sector. EA is responding to this kind of trend; NMO do not operate in isolation, partners have been identified as integral to NMOs' business. For instance Surveys and mapping Division Tanzania operates together with InfoBridge to provide benefit in terms of maintenance improvement of taxation databases. As data providers, SOK, SMD, SMD do not compete in the applications market other than for products needed in the national interest, such as core paper map ranges.

Three issues; (1) environmental issues, (2) national government trends, (3) partnership and collaboration have been illustrated above as contributing to the changing environment of GI organizations. These issues are further sorted by ranking each in terms of its level of impact to the organization and the degree of uncertainty that the issue considered is likely to impact changes to the GI environment in figure 19.

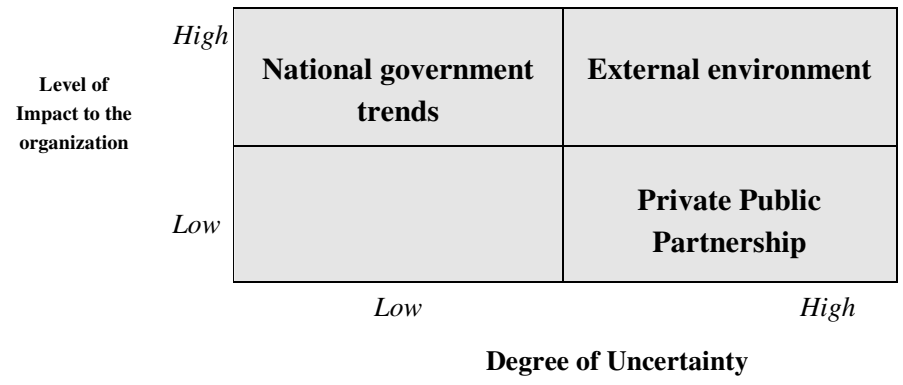

Figure 19 levels of impact and degree of uncertainty

5.4.1.4. Assessment of the above environment

This step establishes the basic structure of the scenarios by examining the "high impact" and "high uncertainty" axes. This is done by establishing two opposite logics of different views and how they might work in the future. The determination of axes is based on field results and interviews. Table 13 below gives the summary.

Table 13 Assessment of tight government environment

Axes	Two opposite logics and how they might work in future
High Impact/ Low Uncertainty **National Government trends**	***Commercialization*** **Logic-1; NMO roles will be regulators of government activities** • trends geared towards formulating and enforcing policies to deliver services in a more integrated way • well articulated framework would help actors in GI market environment define their roles and responsibility helping to stabilize practices and relationships **Logic-2; Commercialization of GI with public sector agencies will increase** • Competition by private GI companies • Legislative policy amendments • Due to continued reduction in budgets
High impact/High Uncertainty **External Environmental**	***Global economies*** **Logic-1; GI will depend on national public sector despite global economic development** • public sector departments are still producing under their mandates, and also have the powers to determine what is considered appropriate for the citizens **Logic-2; Global economic development will shape national economies and their institutions** • Global economy impacts are considered high for the embracing effects they cause to the national economies and which in turn affect GI. For instance pricing mechanism is rated to the dollar and this either causes a shift of prices upwards or downwards depending on the fall or rising rate of the dollar.
	Technological changes **Logic-1; GI production will increase regardless of technological advancement** • Still follow work and Production procedures described since 1965, e.g. registry maps production follow procedures as stated by mandates. **Logic-2; GI production will continue to follow technological advancement** • GIS, GPS introduced to government departments through projects. CAMP, JICA, AFRICOVER
Low Impact/Low uncertainty **Partnership and collaboration in production and dissemination**	**Logic 1; GI will continue to be primarily a public sector responsibility** • Currently most of GI is produced and consumed by the public sector. • most public sector departments are still producing under their mandates, although GI projects are established, they eventually expire after their life span **Logic-2; Privatization of GI production will increase dramatically as the role of government reduces** • NMO experience budget reductions thus are forced to look for alternative ways. • Involvement in Private Public Partnership to deliver services

5.4.1.5. Gap analysis

These detailed comparative descriptions convey the essence of what the above results mean.

1) *Commercialization issue;* Decision between serving "National interest" and "Profit making". Making a decision either to become regulators of public policy or to engage in commercialization of their activities.

2) *Global economies and Technological changes;* NMO have the challenge to understand how development will continue and how changes for instance in the mobile technology will continue to alter the nature of data usage and interactions. GIS introduced through projects but not incorporated into the daily NMO production procedures at times prove to be a challenge. E.g. CAMP-France funded in SOK which collapsed immediately after the French left, JICA-Japan with very little coverage of Nairobi and Nakuru conversion of analogue to digital under compus project, digital mapping, EIN project and the current proposed GIS centre to implement LIS. Although these are good initiatives, there is no clear and consistent set of principles throughout EA. This means the EA industry itself is in competitive disadvantages. Very little government initiatives has been dedicated to embrace use of technology in daily production system, yet projects face a problem of little or no follow-up after closure. The drive for change is ad hoc managed and characterized with little or no follow-up to ensure continuity of the organization. This could be due to lack of funds and human resources to manage the developments.

3) *Partnership and collaboration in production and dissemination;* These NMO have remained traditionally coupled with strict production and work described procedures, yet clients demands have changed from traditional maps to demands of fit purposes for data. The strive towards satisfying customers should be supported by provision of up to date data, maximizing access and utilization through web, clear policies and finally having defined standards for interoperability.

5.4.1.6. Decision implication

The step seeks to interpret the above gap analysis and this is detailed below.

1) Government services a critical public interest role, but at the same time we observe that government is faced with the need to change the way it delivers its services. The assessment of environmental drivers identified effects brought about by globalization, technological developments; these have hard far reaching effects. Government organizations like NMO in EA are shaping their core business. This change may require a coordinated leadership and the involvement of institutions that can facilitate this process. Such may include facilitating consensus formation on GI standards, develop well articulated policies regarding copyright infringement, these present common challenges to NMO and may present unambiguous cases. However some government intervention is unavoidable and government decisions can and do influence users of GI throughout the economy.

2) Government to develop a framework/system for sustainability. Development trends in EA have tended to link to individual politicians rather than a whole community. Yet we see that decisions are made at various levels such as administrative and organizational level. However it is important to realise that current trends in modern development require transparency and involvement of the communities as recipients of the services. The GI managers should develop clear, consistent and appropriate framework that governs the GI industry. Such may include proper legislation concerning GI exchange and use among organizations, pricing policies, copyright polices etc. NMO in EA should develop clear institutional framework; this could be helpful if done at a regional level so as to cater for harmonization at various levels and sectors.

3) Implementation of a framework/system; for instance the establishment of a spatial data infrastructure requires cooperation between the private and the public sector. Others may include amongst all professionals involved in land management. Land registers and land cadastres as part of SDI mostly are the responsibility of public authorities. But decision-making processes demand additional thematic information about land, collected and maintained by various public or private institutions or by professionals trained in a particular trade. Partnership and cooperation among all groups is necessary for successful geoinformation management.

5.4.2. Loose government control

The categories of organizations and their major characteristics are reflected in table12. Category of organizations with "Principal Agent" relationship is considered here. These have profit motive which are translated to efficiency-seeking and profit-seeking incentives. These in turn ensure that the internal structure of the firm maximizes efficiency and profit. The six step analysis of the environment of organizations in this category (KISM, RCMRD and NFA) begins with the identification of organizational decisions.

5.4.2.1. Organizational decision

Organizational decisions are strategic decisions of the organizations as perceived from the field study and to which the scenarios should help to address. These factors affect the outcome of the decisions made in these organizations and they are identified to ensure that the scenario is correctly identified.

- The major transformation involves the corporatization of government departments/activities; KISM, RCMRD and NBC. These organizations aim to operate on commercial principles; (Drichi and Bjella 2003) indicate that NBC aims to ensure that demand driven products and services are delivered in a manner that is financially viable, cost effective and where quality assurance is guaranteed. NBC revenue earning from its consultancy services ranged from zero in 1996/97, 54 Million Uganda shillings and 101 Million Uganda shillings in 2002/03 (Drichi and Bjella 2003).
- (Ottichilo 2004) states that RCMRD provides services on demand driven basis and in a business-like manner. He further states that to realize the Centre vision, it upholds highest standards of services to its customers and continuously strives to improve the quality of its services and products within the new technological innovations in the fields of ICT.
- These have clear commercial objectives and the management has the responsibility and authority for accomplishing the organizations objective within the commercial parameters described by their mandates.

5.4.2.2. Key decision factors

The key decision factors include; Commercialisation and privatisation of GI, Technological developments and Legislation issues of GI.

5.4.2.3. Environmental forces

Identification of environmental forces is the third step and four categories related to the external forces are identified each representing a collection of trends, events, developments and realities. Analysis of each is considered in the discussion below.

- **External environment**; the external environment influences are many and complex. Three critical examples have been identified to include World Economy, Globalization and Technology.

  The World Economy; The drive for change done through Structural Adjustment Program has been the catalyst for renewal and review of government activities in EA. The trend has directly contributed to varied changes among GI organization. Former government departments have had to reshape their own destiny in order to thrive in the emerging information society by seeking new ways to deliver programs and services. In 1998, the government of Uganda decided to divest the Forest Department and create an autonomous body known as the National Forestry Authority. This affected the then National Biomass study which was revised and transformed to National Biomass Centre as a unit within the NFA. The centre is currently challenged to provide its products/services in a financially viable and cost effective ways.

  According to (Ottichilo 2004), although RCMRD operations are funded in major part by contributions from contracting member States and support by development partners, the Centre however revised its strategies in 2001 to provide its products and services on demand driven basis and in a business-like manner.

  As a result of Civil Service Reform Programme, Ministry of Lands and Settlement proposed to change KISM to a semi-autonomous status in 1998. As a semi-autonomous organization, KISM would be mandated to generate income for its operation, while the government would provide it with salaries for its personnel. (KISM 2004). Besides collecting tuition fees, KISM's additional sources of revenue include, printing work, short-term courses, and sales of maps. Other services cover professional productive and consultancy services such as GIS design, GPS survey, conventional field surveying, mapping, map digitizing, map printing, sales of aerial photographs, textbooks etc.

  Globalization; The economic situation is driving a globalization process, one that goes beyond national to regional economic arrangements creating interdependence between nations thus impacts on both the public and the private sectors. Nations are moving from independent states dependent on trade within a small group of nations to interdependent states buying and selling in a global trading system. The implication of this is far reaching for organizations like RCMRD which have a regional orientation. The enlargement of their markets will enable them to produce more and benefit from scale economies, making them even more competitive. They will also benefit from the new market structures that are being created, entering profitable niche markets where discerning consumers are willing to pay a premium for specialty products.

  Technology; The changing technologies are driving the geomatics future. For example small scale map coverage can now be provided by automatically processed imagery from satellite remote sensing systems. Differential GPS services are being established and expected to grow in importance and extent. Interoperability define the pathways for linking disparate and isolated spatial information systems also imply the existence of common user interfaces that support the integration of consistent, reliable data sets. (Hecht, 1995)

- **Changing role of government;** Government reform initiatives have put a strong emphasis on reducing the role of government and reforming traditional public sector bureaucracies by adopting aspects of private sector principles and practices in EA. Thus the reforms have involved the reductions in the size of the public service, commercializing of certain government activities,

restructuring of the government machinery; and a redefinition of the process for developing public policy and the role of the various players involved in this process. This is typically true as shown by (Drichi and Bjella 2003; KISM 2004; Ottichilo 2004) when defining how their respective organizations NBC, KISM and RCMRD aim to operate in the market structure.

- **Market Perspective**; what we see regarding KISM, NBC, RCMRD is the drive towards developing competent business; this means to provide businesses with a comprehensive overview of a market. The implication to these organizations is for them to know their market competitors by the strength of their GI product presence, emerging and niche areas. This information helps them identify the best opportunities and the competitors' strength or alternatives and substitutes up against in the market. This information also helps them identify the investment they'll have to make to give their GI business the market visibility essential to make their business succeed.
- **Internal perspective**; this specifically targets the way these organizations are to align their principle objectives with government policy. These organizations have increasingly focused on reducing their costs from government. Funding is mainly through a cost reduction programme, by seeking to be self financing to generate sufficient surplus for financing investment programs. They aim at creating a surplus by generating greater revenue through the private sector.

The above environmental issues are next sorted by ranking each in terms of its strength of impact on the organization and the degree of uncertainty to cause changes to the GI environment. Summary of the ranking is in figure 20 below.

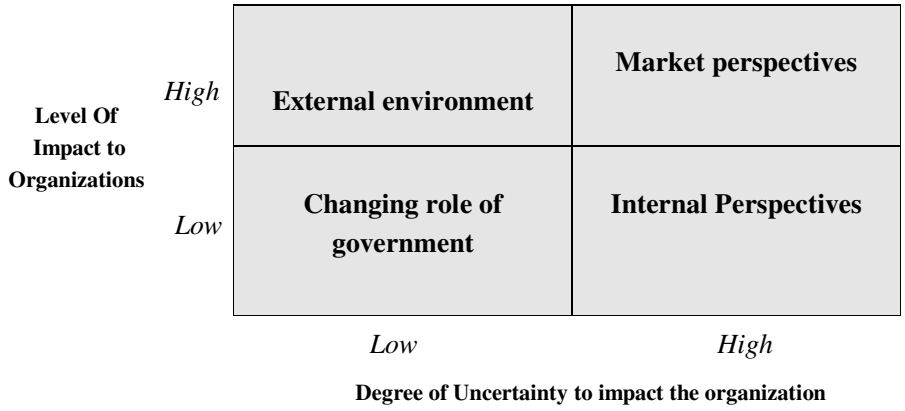

Figure 20 levels of impact and degree of uncertainty

5.4.2.4. Assessment of environment

This is the fourth step and it establishes the basic structure of the scenarios by examining the high impact/high uncertainty" axes. This is done by establishing two opposite logics of different views and how they might work in the future in table 14 below.

Table 14 Assessment of environment

Axes	Two opposite logics and how they might work in future
High Impact/ low Uncertainty **External environment**	*Global economy* **Logic-1; Global economy will shape GI at national level** • Move towards integration and harmonization of GI business process, legislation to enhance market conditions at Global level. That means looking beyond national to regional economic arrangements **Logic-2; national economies will continue to strive despite global economies** • Budget managed at national level • Main targets as national citizens since national arrangements will continue to dominate GI
	Technological advancement **Logic-1; GI will continue to follow technological developments** • GPS, GIS-enhance GI collection, analysis, management and dissemination. • Web services to enhance marketplace **Logic-2; GI production will increase regardless advancement in technological** • Departments still use traditional methods defined in their mandates despite ICT advances
High impact/High Uncertainty **Market perspective**	**Logic-1; GIA remain as they were with a growing government control** • Resistance to change **Logic-2; become very independent and act as commercial company** • Competition • Product orientation
Low Impact/Low uncertainty **Changing role of government**	**Logic 1; GI production will continue to be primarily a public sector responsibility** • Most GI is currently produced and consumed by government **Logic-2; Commercialization of GI production will increase as the role of government reduces** • involved partners in investments for managing changing technology, • Embrace advances in quick delivery of GI products to all customers and improve customer interaction, dialogue, and satisfaction at all levels
Low Impact/High Uncertainty **Internal perspectives**	**Logic-1; GI production will become very structured** • competencies (clear vision/strategy) • develop infrastructure for service delivery • financial monitoring and management **Logic-2; GI production will increasingly become ad hoc.** • go beyond their main objectives • Diversify beyond mandates

5.4.2.5. Gap analysis

These detail comparative descriptions to convey the implication between either logic.

1) Global trends as regards GI such as the move towards development of integrated and harmonization of GI business process, legislation are moving too fast in the developed world while the situation in EA reflects a slower rate at which the organizations are embracing changes. This has many implications, either the organizations concerned adopt or continue despite global drivers.

2) We observe that changes in technology are continuing to shape GI collection, analysis, management and dissemination. However, one of the main challenges is the rate at which geo-technology is being adopted and used in organizations is very low. This implies that efforts such as in GI harmonization that would enable harmonization of GI business processes at a Global level will continue to face a problem thus affecting the whole GI sector.

   One of the most intriguing concerns is how the law requires these organizations to acquire GI under conditions that allow the organization to make it available to the public. State open laws sometimes make the cost recovery policies somewhat problematic. These laws require free access of information from public offices; a slogan driven by the need of transparency. However, the extent to which disclosure of information is usually invested in departmental heads, this discretion applies to particular GI products /services, which are often uncertain.

3) Market perspective means developing a business attitude and thus a change from a civil servant perspective to business attitude. In most cases these changes are always driven by external a circumstance which makes the need to change in most are donor driven, yet to fully change need cooperation and belongingness of introduced changes by employees. That is why in EA the incorporation of such changes is met with resistance.

4) International perspective. Having structured production organization necessitates, strictly delivering those services to which the organizations are mandated. However if these organizations involve in ad hoc management, it would mean they grab whatever they come across which might result in those organizations dealing beyond their mandates.

5.4.2.6. Decision implication

The step seeks to interpret the above gap analysis; bullets below detail the interpretation

1) GI expertise are key in taking the organization forward for their roles which are crucial to ensure that the business is market orientated and proactive in its dealings with the customers and the GI industry.
2) Internal perspective of the organizations should be shaped with business plan, database valuation methods, strengthening the management team, enabling and encouraging improved communication, financial management as key to the success of these organizations. In essence the main organizational objectives should be achieved. Adoption to change should be embraced while considering their main business objectives/mandates
3) To enable business partnerships necessitates well defined institutional issues to enable business transactions are required. Institutional environment in which trust is reward may necessitate a government institution/ low that monitors strong government control is inevitable to safeguards as regards business partnership. Stronger government control on safeguarding business partnerships benefits in terms of cost, time capacity building and technological exchange.

5.4.3. No government control

Many kinds of thematic data are collected by private companies: geo-communications LTD, InfoBridge consultant's ltd, Geo-Africa, Highland Surveyors ltd etc. These collect and disseminate digital GI, often in the form of added value information products not provided by NMOs. The assessment of the GI environment among private GI organizations begins with the consideration of the organizational decisions below.

5.4.3.1. Organizational decision

Private GI companies operate in a market structure environment; implying proprietors of the above mentioned companies design, develop and market their GI-products. GI from NMO is at times considered as framework data to which these companies add value. Besides, they are at times involved in collection of their own data. The implication is that the proprietors must understand work and production process. For instance to develop a GI-application, a GI-expert starts with identifying a potential user and analyzing his/her needs for information. Thus this requires sufficient familiarity with typical application areas such as planning, transportation, ecology or utilities as well as knowledge in economics since the product must sell in sufficient quantity and at a good price; otherwise the idea of a GI business would economically not be feasible.

5.4.3.2. Key decision factors

This is the second step and the key decision factors have been identified in section 5.2.

5.4.3.3. Environmental forces

This is the third step and includes a collection of trends, events, developments and realities that represents the strategic context within which these private companies operate. These include;

- Areas where GI is providing new opportunities including critical trans-national areas. These in particular refer to the management of the Lake Victoria which is shared amongst the three countries and thus necessitating its management as a whole. The drive is the need to have shared spatial databases of known quality. They include the setup and management of spatial databases and GI products/services for major utility network (electricity from Uganda to Kenya and Tanzania, telecommunication network which has involved the construction of cable to link the cities of the three countries, others include, oil, defence, transport and environment.
- *Technological advancement*; this has come with use of computer power; with powerful software and digital databases has democratized map making. With major changes from conventional map making to complex and conscious process of data collection, analysis and dissemination. Consequently, developments in Geo-ICT have empowered all persons to become cartographers and create their own products which they will use to the extent of their abilities.
- *Organizational issues;* Initiatives address issues that pertain to SDI so as to reduce some existing institutional impediments to access GI. In Tanzania, although at national level, there is no single institute that champions SDI, we observe that institutions like National Bureau of Statistics, Surveys and Mapping Division and the University College of Lands and Architectural Studies (UCLAS) are championing the SDI initiative in Tanzania. SDI initiatives in Kenya are championed by Survey of Kenya, while in Uganda; consideration is being done at national level with the establishment of NIMES. Other initiatives are project driven to include AFRICOVER, RCMRD, LVEMP, EIS-Africa, SDI-Africa.
- *Political Issues;* Institutional reforms encompass all policies, regulations, incentives set up by institutions and member state in pursuit of improving conditions favorable for GI market growth. Importantly, recent developments include GI policy in Kenya, copyright bill 2002 Uganda/ Kenya. Other government initiatives pointed in sections 4.3.1., 4.3.2, 4.3.3 are establishing and encouraging a lot of private public partnership in areas where they are not competent enough. For instance liberation of the information sector, private companies like MTN, Celtel, KTN.

Sorting of these trends is done by ranking each in terms of its strength of impact on the organization and the degree of uncertainty of the trend in figure 21 below

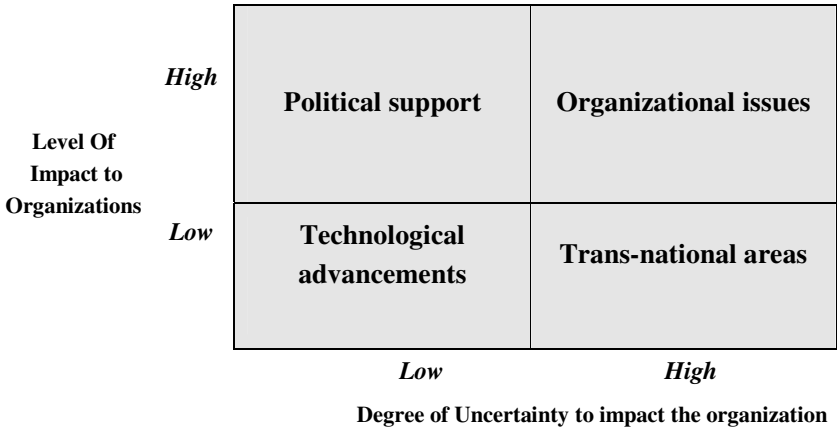

Figure 21 levels of impact and degree of uncertainty

5.4.3.4. Assessment of environment

This is the fourth step done by establishing two opposite logics of different views and how they might work in the future. The table below gives the summary.

Table 15 Assessment of environment

Axes	Two opposite logics and how they might work in future
High Impact/ low Uncertainty **Political support**	**Logic-1; regulation of GI will continue to be a public sector responsibility** • Pubic sector main provider of framework data **Logic-2; deregulation of GI production will increase as government's role decreases** • Enabling government policies • competence of private companies
High impact/High Uncertainty **Organizational**	**Logic 1; coordination and management of GI will continue to depend on organizational setup** • entrepreneurship, competence, quality control, business plans **Logic-2; players in the GI production will shape the GI environment** • types of clients will continue to determine the type of business e.g business to business
Low Impact/Low uncertainty **Technological advancement**	**Logic-1; technological advancement will continue to be driven by the private sector** • willingness to venture • always competent and looking for new solutions **Logic-2; public sector will continue to rely on private sector Technology** • Government contracts private sector especially as regards technologically related issues
Low impact/High Uncertainty **Trans-national areas**	**Logic-1; Trans-national will orient business** • Depend on type of client **Logic-2; orient will depend on the stakeholders** • Determine products, Technology to use, Marketing strategy

5.4.3.5. Gap analysis

Comparative description to convey what is happening in the two opposite logics above

1) Although a big percentage of GI is held and consumed by the public sector, the absence of national public efforts to coordinate GI is hindering the government's application increased use of GI and GI technologies. An effort to make GI data available across platforms and with varied users is ad hoc organized amongst few institutions. .

2) NMO in EA carry the legacy of the ordnance survey of colonialist institutions characterized by strong hierarchical management structures headed by the minister with tight description of production and work process. This up to date still dictates how the coordination and management of GI is organized in these organizations. While categories of organizations in loose and no government control fully design and pursue their objectives depending on the arrangement within the business plan of the organization.

3) Use of GI technology in the public sector is mainly project oriented while along side; government units still follow prescribed work and production procedures. That means little or no technology is incorporated into the work process of government departments. An example in EA, private surveyors use GPS to produce digital surveys but unfortunately, the NMO in Uganda, Kenya and Tanzania is not equipped to examine digital survey records.

5.4.3.6. Decision implication

Step that seeks to interpret the above Gap analysis

1) The above scenario reveals a number of interdisciplinary areas in which GI-experts are required to demonstrate at least basic knowledge before an effective design of a GI-product, which is useful to a user and can be economically produced. It shows that it's possible only when a GI-expert fully understands the specific problems of handling spatio-temporal data and knowledge. Hence, they are expected to understand the entire process including conceptualization, production and marketing of the GI-products

2) Private companies must cooperate with traditional partners Government departments; since most private companies use framework data as base to which value is added for new applications. Creating a platform to represent private sector interests to coordinate with state organizations in close co-operation to follow involvement in control of resources contributes to shaping up the business environment of GI. For instance the production of tourist maps and atlases, all cadastral activities could be left to the private sector.

3) Private GI companies identify themselves as competitors operating in a market structure. The private sector is seen as a key geospatial services provider illustrated by institutional reform aimed at working more as an efficient economy, encouraging free competition and creation of business opportunities by letting the private sector get involved in provision of goods and services. This is part of a major national campaign to computerize and build up the private sector in all sectors of the economy. For instance, in Tanzania, the Interim Steering Committee is tapping into expertise from colleagues from private companies to help shape the country's SDI initiative; Kenya's Geographical Information Council has a private sector representative on the Board to represent Private sector interests.

5.5. Lessons learnt.

Below are the lessons learnt from scenarios and what is considered relevant to ensure growth of the GI market in EA.

From the assessment of the GI market environment in EA, we observe that NMOs are still managed by colonial legislations of the 1960s yet the environment in which these organizations operate has changed. While long before they were monopolists in GI, developments in Geo-ICT has changed the trend. The Gi environment is being shaped by changes brought about by Globalization and structural adjustment programs by the donor bodies, as a result, this has affected the way delivers services to its citizens. However at a regional level, there are still very few initiatives that aim to structure the transactions involved when dealing with GI. Each partner state is driving GI policies at national level. It can thus be concluded that the GI market in EA is characterized by heterogeneous structures and lacks government support.

Below are issues considered relevant to contribute to the growth of the GI market in EA.

I. *Government's role should be evident to provide the foundation for creating an effective framework/structure for the GI market development*. From the tight government control scenario, we observe that, National Mapping organizations are still characterized by tight government production procedures. However, this places these organizations in a better place as regulars of GI policies since they are good at following defined procedure. This implies that Government should adjudicate the increasingly contentious nature of GI market transactions. It should create and sustain an environment conducive to GI development, lay in place an appropriate set of rules under which GI activity can occur. This can be achieved by building sound GI institutions and infrastructure at regional level. The three partner states should get involved in GI harmonization and standards development. It is important to know that no matter how efficient or brilliant a GI policy maybe, if there are no structural mechanisms to support this GI policy planning, its development or implementation, then a healthy GI market environment cannot be achieved. A GI Infrastructure permits sound GI policy-development, consultation, accountability and effective service delivery.

II. *Level field competition in the provision of GI products/services.* Once the institutional structures are in place, it is the responsibility of government to invent ways to organize the structures effectively and to use their capacities creatively. For example, in order to attain its strategic goals for GI market growth, it may consider enhancing competition by rewarding performing GI organizations and encouraging Private Public Partnerships. Competition among GI providers further heightens the likelihood that governments may choose from the best-suited organizations for public service provision.

    Promoting and encouraging Private Public Partnership has numerous benefits. First, successful GI business ventures often rely on the growth of other ventures and help create a pool of GI suppliers, expert contactors, and laborers. As well, they create local employment and may be an important resource for training and community education. The partner ship should be encouraged by involving more participation of the private sector through outsourcing and contracts. This should be done at a regional level where GI companies from any of the partner states can competitively participate through the allocation of bids. Yet, in order to reap the benefits of GI

use and prosperity, it is critical that governments develop a solid working relationship with the GI business community.

In opening the dialogue, public sector officials will achieve a better understanding of the needs and challenges facing its GI entrepreneurs and will in turn develop policies that better serve their common goals. Perhaps most importantly, competition among policy-makers leads to better decision-making as it encourages skeptics to raise their concerns, to challenge assumptions and identify weaker elements of the proposal.

III. *Remove day-to-day decisions regarding GI policy management from the political arena*. The general Geoinformation management should not be the responsibility of political leaders. In fact, a separate organization can be devoted to pay attention to the dynamics shaping GI market development. The biggest challenge facing Uganda, Kenya and Tanzania has been that development related ideology has been pushed by politicians. During the process of formulation of framework to coordinate GI, this issue should as well be considered. Professionals should be enabled by policies to perform. In the end, this strategy improves the likelihood that the GI market environment will operate according to business principles freed from political power struggles.

5.6. Conclusion

This chapter's main purpose was to use (Wilson and Morrison 1996) approach of strategic planning to get a better insight to the possible scenarios from a GI market environment perspective. This involved evaluating the organizational environment as a whole, in which the anticipated trend implication derived through the gap analysis contributed to identifying the implication to the GI manager. Results from the tight government control scenario environment concluded Government departments still follow strict mandates which place them in a better position to be regulators of public policy. Private GI companies identify themselves as competitors operating in a market structure. This process involves interdisciplinary areas in which GI-experts are required to demonstrate at least basic knowledge from conceptualization, production and marketing of the GI-products. However, for the creation of a GI business environment, government control is inevitable to safeguard business partnerships enhance effective performance of the GI market. This means that it is the obligation of the state to establish a sound framework to ensure coherence in all GI policies such as in GI exchange, reuse, pricing policies and the intellectual property related to GI. Comprehensive planning for this strategy should foresight how developments are likely to unfold in the future by incorporating stakeholder from various sectors (private, public, NGOs, and donor community) input and values. The key benefit to GI managers from scenarios is the knowledge that, having explored many alternatives well, the selected course of action is defensible and prudent. This will, in turn, strengthen capacity and better the various GI providers/sectors to compete in the global economy. While other inputs to support GI market growth are important, (such as access to GI, dissemination policies, pricing policies, GI marketplaces, and geoinformation management) effective framework structure must be in place first in order to ensure transparent and smooth GI transactions.

6. Evaluation of scenario method

6.1. Introduction

The previous chapter detailed assessment of the GI market environment using scenarios. This chapter focuses at determining the validity and usefulness of the scenario method (Morrison's approach) as compared to the SWOT method. By reviewing each step undertaken, specific insights are elaborated as compared to the SWOT. According to (Groenendijk 2001), SWOT consists of four basic steps; (a) external analysis; identifying opportunities and threats, (b) internal analysis; identifying existing strengths and weaknesses, (c) generation of alternative strategies, (d) formulation of a strategic choice.

6.2. Why not scenarios?

The purpose of evaluating the GI market environment using scenarios as part of the strategic planning is to establish whether remedial action is necessary to take advantage of current trends or to counter future bottlenecks. This implies that one requires an accurate description of the current trends, and an appropriate assessment of what could be a bottleneck and what not. The usefulness of scenarios is thus very dependent on the degree of accuracy by which one could predict the future. For example, the number of business transactions done through the internet. Even if it is predicted that the number will increase and confirmed by historical statistics, it is difficult to determine whether the increase will be linear or exponential (for example) in the upcoming years, or whether there may even be a temporary decrease. This has an effect on the resultant gap analysis, and ultimately on any resultant decision. One could increase the accuracy by building scenarios regularly through involving stakeholder's participation, interviews and questionnaires.

6.3. Comparison of scenario method to SWOT

By formulating scenarios, one does not only describe possible changes in the future but through its formulation one also achieves a better understanding of the boundaries and the processes within a GI market environment. The effect of this is that one can apply more appropriate management instruments. To assess the scenario approach, one could compare it with a similar approach, such as SWOT. Such an assessment only makes sense if one compares the steps in the scenario approach with similar steps/parts in a SWOT analysis approach. The sections below describe the comparison in detail.

6.3.1. Organizational decisions;

Within Morrison's approach that of "organizational decision" is similar to the internal analysis in SWOT. Internal analysis in SWOT explores existing strengths and weakness whereas Morrison's organizational decision clarifies the strategic decision the organization is faced with. Even though this is similar, Morrison's approach provides a better insight to challenge existing business models and stimulate new ideas, because one would look at strengths and weaknesses in a future environment,

rather than the current environment. Consider the following example when evaluating the GI market environment in Uganda. The constitution states that there is freedom of information: A SWOT analysis would typically consider this as strength, and would thus generate a strategy that would take advantage of this strength. In Morrison's approach, on the other hand, one could look at this with two logics: one that would foresee actual freedom and access to all information and one that would foresee serious bottlenecks (for example as a result of protection behavior or misuse of information) in having access to information. This logic provides therefore a broader range of scenarios, in which the original strength of freedom of information may no longer be strength. Obviously, to overcome this disadvantage of SWOT, one could propose to conduct a SWOT analysis more frequently. However, this is already incorporated in Morrison's approach. The bottom line is that the more the future status of the organization is known, the better the quality of the decisions can be. Although both steps provide a basis in which issues identified in this stage form the basis of a strategic debate, organizational decisions focus define boundaries and establish focus for the discussions. Otherwise discussions would easily drift into broad generalizations about the future or society and the implication for particular organization would be lost.

6.3.2. Key decisions factors;

SWOT's external analysis is compared to Morrison's key decision factors. External analysis explores threats and non-exploited opportunities while key decision factors consider things that should be considered in the future. When compared, Morrison's approach gives a better foresight which can be translated to initiating competent programs or replacing redundant, irrelevant programs with innovative and relevant ones. Consider the key decision factors in chapter 5 which include commercialization and privatization of GI, technological developments and Legislation issues of GI. It is the interaction amongst these factors and their interaction with the market that creates the great forces that culminate in change.

While SWOT's external analysis considers opportunities and threats here, it does not take into account that external environments are dynamic. Some factors change over time while others change very little. Morrison's approach presents a more flexible approach of not only considering the organizational threats and opportunities but further looks beyond into the future. Unlike SWOT where the dynamics in the environment are not considered, to make an equivalent to this Morrison's key decision factors, SWOT would require several matrices to star SWOT in the past, continue in present and focus on the future. This makes SWOT time consuming and cost ineffective. Thus considering key decision factors in this step clarifies which decision factors are important and this helps to focus on work-process and the concentration of what is important for the planning purpose. Thereby increasing organizational business success which often depends upon sensing what is coming in the future.

6.3.3. Environmental forces;

SWOT looks at external environment in dichotomous way: all is either threat or opportunity, or nothing else; the method of Morrison refers to the environment as a more continuous spectrum of a collection of trends, events, developments and realities representing a strategic context within which the environment operates. Consider an example of the dynamics brought about by the changes in geo-technology. While SWOT would look at this as an opportunity, Morrison's approach would involve understanding the interaction and uncertainties that would come about with use of this geo-

technology. It goes further to classify the identified environmental issues into high impact, low impact, low, high uncertainty. The more the multiplicity, interaction and uncertainties of these forces are understood, the more realistic the planning is likely to be. This provides a better opportunity to describe dynamics of the investigated environment an advantage over using SWOT.

6.3.4. Assessment of the environment;

As a basis for strategy formulation using SWOT, matching of Srengths-Weakeness-Opportunities-Threats is done in order to generate alternative strategies. Compared to Morrison's approach, basis for strategy formulation involves further assessment of the environment by building up two opposite logics. From Tables 13, 14 and 15, one can observe that each issue considered is further analyzed from the two extremes which are likely or unlikely to happen. This determines the probable future of the GI market that it must develop knowledge of and to which the future of the market is likely to evolve.

Unlike SWOT which looks for fit between its existing strengths, opportunities, weakness and treats it chooses to develop, Morrison's approach allows the analysis to stretch and look for strengths that match opportunities that can be categorized in the analysis of the environment. This presents a more active approach of identifying the most attractive opportunities and then stretch to meet these opportunities. This provides stability and predictability in the GI environment and further gives a sound basis for continuous monitoring of this GI business environment.

6.3.5. Gap analysis;

Within Morrison's approach that of "gap analysis" is similar to the generating of alternative strategies since both steps seek to arrive at a number of alternative strategies that may form the basis for further strategy formulation. Even though this is similar, Morrison's approach provides a better insight by considering a comparative description of the assessed environment. Consider an example of gap analysis related changes in technology. While it is observed that geo-technology is continuing to shape GI collection, analysis, management and dissemination, the gap arises due to the challenge faced by organizations. The rate at which technology is being adopted is very low; this implies that GI harmonization which would further enable harmonization of GI business processes at a Global level will continue to face a problem thus affecting the whole GI market sector.

Thus unlike SWOT which is limited to matching strengths, weakness, opportunities and threats, Morrison's' approach presents a wide variety of issues in a manner that enhances business and product-development decisions and sets the stage for effective monitoring and adjustment. This creates the possibility of genuine transformation by considering and allowing management to get beyond the question of "What future is most probable?" to more powerful questions like "What future do we fear the most?" and "What future do we want to create?" thus giving better assessment of risks.

6.3.6. Decision implication;

While SWOT discusses and analyzes sets of strategies summarized in the SWOT matrix, Morrison's approach arrives at decisions through the description of an evolving environment. Although these steps are comparable in that strategic choices are made, Morrison's approach seems to create a more flexible plan for the GI market environment composed of a variety of options. During the planning process in all the steps, the possibility at a situation can easily result through shifting its weight between various options is well elaborated and considered. This enables the an organization to adapt

its plans to the evolving environment and thus enabling a more complete understanding of dynamics of change thus reducing the vulnerability to surprises. Whilst a strategic choice in SWOT depends on the adequacy of strategic factors in the analysis phase and the trade-offs appraised.
Using Morrison's method in chapter 5, it was possible to identify potential strategies and how to act on future opportunities. It was also possible to suggest new strategies and alternatives and test whether a strategy is flexible enough to weather unforeseen events. This is an advantage over SWOT which directs the attention of participants to the environment and its on-going development restricting its assessment to only internal strengths and weaknesses.

6.4. General Appraisal of Morrison's method

Method seems subjective, in terms of how people interpret trends, future, wishes, etc. During the interviews that were held for this research, this seemed to relate to personal experiences and preferences. The implication of such subjectivity is essentially no different than when applying SWOT techniques. Results of both SWOT and Morrison workshops largely depend on group dynamics, evolving interests and interaction between the groups involved. To overcome this subjectivity, it is necessary to derive these perspectives of future trends by employing special skills and inter-functional cooperation. For example, a GI expert in a market competitive environment does not only need to understand the knowledge underlying the production process of GI. But must also understand that his/she product must sell in sufficient quantity and at a good price. Otherwise the idea of producing these GI products/services would economically not be feasible. This requires the GI-expert to have knowledge in economics. Thus when conducting scenario analysis to completely predict the future process, GI managers should go beyond discipline of GI to such as economists, technology and also know the dynamics shaping customer requirements.

6.5. Use for Geo-information management

This section mainly looks at how Morrison's scenario method is of added value to the field of Geo-Information Management (GIM). The presentation considers main objectives of GIM according to (Georgiadou and Molen 2003) and how these can be reached through use of method. Table 17 below presents the summary of GIM objects and how through the scenario methods these objectives can be reached.

Table 16 Scenarios for Geoinformation Management

GIM objectives	Scenario method
Understand the need for alignment between business objectives and ICT at a strategic level	Because GI businesses must survive in a very competitive environment the scenario method provides a tool to model this environment. Example: For an individual GI company, like Geo-Communications in Uganda, the scenario method could potentially be used as a test bed for the organizational' current strategy. Assessment would detail the resilience of current strategy, its flexibility to deal with different possible conditions, things that can be done to improve its resilience. By this assessment, it would be possible to determine if the organization is achieving its vision. If found not, then the assessment would ggenerate contingency plans to put in place to help move in different direction should that be necessary.

Evaluate and apply appropriate methods to develop, manage and disseminate GI.	Scenarios stretch the element of out thinking, both about the future and about out strategies. This provides the possibility to stimulate participants to explore new strategy options. Example: The national Biomass centre a former government department developed a business plan based on description of most important products and services and a judgment of their current and predicted demand from the market transactions. This provided the possible new products and services to be marketed in future thus giving priorities to the development of these identified products/services.
Analyse a problem encountered in professional practice and develop an appropriate method to study and/or solve the problem.	Use of Scenarios stimulates the possibility to explore new strategy options. By using scenarios, there is a possibility to portray different futures and these futures would obviously require different strategies.

6.6. Conclusion

This chapter focused at determining the validity of the scenario method. By use of a number of scenarios as a basis for "designing the future", it was possible to highlight the importance of understanding the dynamics shaping transaction among GI providers and to place them in a context so as to adjust the GI market environments actions in beneficial ways. By reviewing each step, undertaken, specific insights are elaborated as compared to the SWOT. Each strategic step generated better insight to the choices by bringing out the benefit and bottleneck of the step. Morrison's method identifies potential strategies and how to act on future opportunities. It further suggests new strategies and alternatives and test whether a strategy is flexible enough to weather unforeseen events. This is an advantage over SWOT which directs the attention of participants to the environment and its on-going development restricting its assessment to only internal strengths and weaknesses. Scenarios further identify potential strategies and how to act on future opportunities, they suggest new strategies and alternatives, and they test whether a strategy is flexible enough to weather unforeseen events thus giving a better grip of the GI market environment.

7. Conclusions and Recommendations

7.1. Introduction

This chapter summarizes the conclusions of the research and makes recommendations for further investigation and other issues that would be interesting for further research.

7.2. Conclusions

The main objective of the reseach was to evaluate the GI market environment in East Africa by focusing on the dynamics shaping public and private GI organizations.

In order to achieve the research objectives, the GI Market is evaluated as the environment of interaction which involves organizational and individual transaction. Issues considered in this evaluation include access rights, pricing policies, GI sharing and management, copyright and liability policies. This is done with specific reference to EA, the Netherlands, UK, USA and South Africa. Secondly, scenarios are developed to evaluate to what extent government intervention will contribute to the growth of the GI market using a six step strategic planning methodology developed by (Wilson and Morrison 1996).

The main conclusions of the research are;

a) There are a number of GI related Projects, intergovernmental cooperation, NGOs and commercial companies in EA. One can therefore conclude that there exists cross border GI activities. Projects both government and donor oriented are concentrated around Lake Victoria which bestrides the three countries and thus inevitably acts as a symbol of their natural and lasting unity. Apparently there is a GI market for EA, yet we see that each country have specific policies, institutions and national trends.

b) An eclectic choice of market theories based on various studies on GI market are used to describe which part of economic theory is applied to GI market. Access rights, pricing policies, GI sharing and management, copyright and liability policies are used to explain the GI market.

c) The main GI producer in EA is the public sector at local and national levels. There are a number of NGO's and private sector organizations that are involved in GI manipulation. (Production, use and dissemination of GI). The private sector uses more Geo-ICT as compared to the public sector, more so they are more vigilant to exploit GI market niches. GI data exchange in EA is mainly informal, pricing of GI products/services considerably varies among organizations however there seems to be ambiguity between cost recovery and production cost. NSDI is being advocated for by organizations like, EIS-Africa, CODI, USGC, GSDI etc. and besides NSDI has been mainly project oriented and that's could be the reason why it lacks political support.

d) The sharing of GI production among sectors; governmental and private GI companies were enabled by (a) areas of law influence the sharing of GI within countries and across national boundaries for instance the principle of open and unrestricted access to government information has been beneficial in terms of supporting commercial exploitation of government GI by the private sector in the USA. (b) Cooperation enhanced by technological advancement. For instance ESRI cooperates closely with SAP on joint development projects to provide GIS functionality to SAP solutions including spatial analysis, visualization, and routing. (c) There is a growing number of applications and services utilizing spatial data to provide business solutions in government agencies, business enterprises and the communities such as emergency management, disaster risk management, natural resource management, land administration, environmental monitoring, health, geo-marketing, routing, tourism and finance. (d) Institutional efforts to coordinate and manage GI activities. These are in form of projects and NGOs where GI is considered an important component For example INSPIRE, EUROGI, RAVI

e) Comparison of the EA and European Union GI markets highlighted a number of similarities and differences existing in the two situations. The major similarity indicated that EA and EU GI markets were heterogeneous in many aspects. The heterogeneity in areas that include, changing policies, Institutional settings and both markets are made up of smaller markets. The major differences indicated that the level of organization of the private sector considerably differs. EU is highly characterized by aspects of networking among organizations for instance RAVI, EUROGI while EA does not have this. Use of technology varies, in EA few organizations use sophisticated technology compared to the EU organizations. Analysis indicates that GI market in East Africa lacks much legislation and policies to support development of the market. The market is mainly characterized by informal and ad hoc operations. Nevertheless, these may represent the delicate beginnings of an extensive network of the GI products and services which both the public and the private-sector needs

f) Using scenarios proved a rapid analysis tool of evaluating the GI market environment in EA. Each strategic step generated better insight to the choices and lead to the development of flexible, innovative and strategic options. Various factors were considered to shape the GI environment in EA, these include (1) historical legacy of the ordnance survey of colonialist institutions which up to date is still carried by the National mapping Organizations in EA. These are characterized by strong hierarchical management structures, tight description of production and work process. With this regard, the strategy suggested that NMO are in a better place to be regulators of agreed GI standards and procedures for creating, exchanging and using GI at various levels. (Local, national and regional levels). (2) Changing government role, (3) advances in Geo-ICT in collection, analysis and dissemination of GI, (4) the trends in the world economy, (5) the changing work patens enhanced by partnership and collaboration amongst the various GI sectors and (6) the need for trans-national GI datasets. Each of these factors has contributed to the existing relationship among the GI sectors (Public organizations, donor organizations, private sector and the NGOs). However to adjudicate the increasingly contentious nature of GI market transactions, government control is inevitable to safeguards as regards business partnership. This in the long run would benefit in terms of cost, time capacity building and technological exchange among the organizations and thus leading to a growth of the GI market.

g) Scenarios identified potential strategies and how to act on future opportunities. The main strategies identified to contribute towards growth of the GI market in EA include. (1) creation of a level field competition among the GI sectors; such by rewarding performing GI organizations and encouraging private public participation in various GI product/service delivery ventures, (2) by creation of sound institutions and infrastructure like GDI in order to initiate and strengthen GI market activities, (3) by removing day to day decision regarding GI policy management from the political arena. Thus results from using scenario method indicated that the GI managers have the possibility to answers questions like "What future is most probable to the GI market environment?" to more powerful questions like "What future do we fear the most about this GI environment?" and "What future do we want to create?" Suggesting new strategies and alternatives, contribute to giving a better grip of the GI market environment creating the possibility of genuine transformation in implementation and management of the future GI Market.

7.3. Recommendations

The recommendations are categorized into two; issues to be further investigated as regards to the research questions and issues that arose and could be interesting for further research.

7.3.1. Issues to be further investigated

- Any further follow-up of this study should consider addressing more in detail dynamics shaping the GI market in Tanzania more than I was able to do in this fieldwork.
- In order to formulate strategy from Morrison's' approach, there is need to develop a decision support system from the multi-criteria analysis focusing on the Gap analysis.
- There is need to develop regional standards for GI in EA. The essence is to improve the standard of GI as a product. This could be done by creating and presenting metadata at regional level. The process could be based on existing international standards or even open standards.

7.3.2. Issues interesting for further research

- There is need to conduct a more detailed analysis of the impacts of legislations on GI market environment.
- Comprehensive data was not collected during the fieldwork this should be considered for further research. Documentation (budgets, management, policies) concerning organizations are useful reference to, management issues, costs and resources to predict the environment.
- Existing transaction amongst organizations should be considered in details so as to get the in-depth factors enabling the GI market environment.
- Use of the scenario method should be further investigated on the use, advantages, and disadvantages and when can it be used, or when not and finally how it should be applied for other cases.

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Appendix

Annex 1: WORKSHOP ON THE ROLE OF PUBLIC AND PRIVATE ORGANIZATIONS IN THE GROWTH OF GEOINFORMATION MARKET IN UGANDA

Place: Makerere University Kampala, Faculty of Forestry

Date: 08 October 2004. **Time** 8:30Am – 16:00Pm

Background

Over the past few years there has been a growing awareness of the general importance of the use of geographic information. This can be attributed towards the country's initiatives to implement National Spatial Data Infrastructure that will enable Geoinformation to be seamlessly available from the National level through to the local government level. This is expected to support the development, implementation and monitoring of key government priority areas related to the citizen in areas such as land management, health, education, water and sanitation, infrastructure development and Poverty alleviation.

However, it is important to note that the stipulated developments depend on the existence of Geoinformation organizations, which are affected by the government changing policies, the unreliable funding support from the donor institutions, which affects the performance of these Geo-information organizations.

To sustain the existence of these Geo-information organizations, a clear cut as to how Geo-information could be of an economic value as a major component of government information base has to be established and therefore, presuming the existence of a market and how possibly this market can grow or expand. The current changing polices and use of Geo-ICT require new approaches to Geo-information management in order to realize GI as an economic asset and thus generate economic activity and effectively support and achieve the country's sustainable development objectives.

Purpose

The one-day workshop is proposed to be held in Kampala. The workshop's main aim is to bring together representatives of all the stakeholders from government, private sector, non-governmental organizations and community-based organizations to explore the main issues relating to geoinformation market in Uganda.

The purpose of this workshop is to:

- Outline the Role of the GI private and public organizations, Projects and NGOs to the development of the spatial data market in Uganda and East-Africa as a region
- Understand GI industry operational needs and the potential role of Geoinformation.
- Bundle experiences and knowledge on the issues of geoinformation management policy
- Identify opportunities and blockages for better exploitation of Geoinformation in the renewable business.
- Promote an active dialogue between the different actors in order to facilitate future collaboration.
- Explore/evaluate regional and national focus of niche market developments
- Proceedings of the workshop will be used as input in MSc. thesis and made available for a wider audience as reference material

The target groups for the workshop will consist of:

- private and public organizations involved in GI production
- Non-governmental organizations involved in GI production
- Local government officials and politicians
- Academic institutions
- Donors

Programme

The programme is designed to exchange experiences and generate new ideas/possible actions for future consideration in the dynamics regarding spatial data use in Uganda.

Registration: At the workshop. **Entrance**: Free of charge

For further information, main Contact

1. Ms. Tukugize Caroline
Karamoja Data Centre
Tel: 00256 77 434175
Or 0031 64 897445/ fax: (31)(53) 4874 335
Email: tukugize07846@itc.nl
Or tukugic@yahoo.com

2. Mr. Amadra ori-Okido
Managing Director
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The workshop is supported by:

2. Mr. Ir. Walter T. de Vries
International Institute for Geoinformation Science and Earth Observation (ITC)
Urban-Regional Planning and Geoinformation Management (PGM)
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8:30 – 08:55 Registration
09:00 – 09:15 KEY ADDRESS NOTE FROM THE SDI REPRESENTATIVE IN UGANDA
1st Session
09:15 – 09:45 GI PRODUCTION BY PUBLIC ORGANIZATIONS
(Presented by Dr. Okia Ministry of Lands, Water and Environment)
Reactions
9:45 – 10:15 GI PRODUCTION BY PRIVATE ORGNAIZATIONS, NGOs, PROJECTS
(Presented by Mr. Amadra Geo-Communications Ltd
Reactions
10:15 – 10:45 Coffee Break
10:45 – 11:15 ROLE OF SDI IN GI MARKET DEVELOPMENT
(Presented by Mr. Moses Musinguzi)
Reactions
2nd Session
Break to Group discussions (11:15 – 12:15)
Group 1 Discussion (what role should government play to stimulate market growths for the use of geoinformation in Uganda)
Group 2 Discussion (What issues/activities could non-governmental organizations/individuals etc focus on for market growths of GI production/use)
Group 3 Discussion (What actions or Actions/Implementation plan could be considered, at what level, Regional or national)
3rd Session
Group Feed Back
12:15 – 12:25 Group 1
12:25 – 12:35 Group 2
12:35 – 12:45 Group 3
12:45 – 13:00 Summary of Key issues
13:00 -12:00 Lunch/Closing

Annex 2: Invitation letter

Invitation

Ref: 12 September 2004

Contact:

Ms. Tukugize Caroline
Karamoja Data Centre
Tel: (+256) 77 434175
Or (+31) 64 897445/ fax: (31)(53) 4874 335
Email: tukugize07846@itc.nl
Or tukugic@yahoo.com

To: GI Organization

Subject: **Workshop on the role of public and private organizations in the growth of Geoinformation market in Uganda**

Place: **Makerere University Kampala, Faculty of Forestry,**
Date: **08 October 2004.**

Time 8:30Am – 16:00Pm

DEAR SIR/MADAM,

It is my pleasure to invite you to attend a one day's workshop on the "role of public and private organizations in the growth of geoinformation market in Uganda" to be held in Kampala, Makerere University Faculty of Forestry on the 12 October 2004 from 8:30Am to 16: 20Pm.

In December 2003, through NIMES, an initiative to build a National Spatial data was established. Realizing that geoinformation is a very important asset for economic development needs concerted efforts from both the private and public organizations. This can only be achieved if jointly the two parties are involved in discussions, meetings, workshops in order to bundle experiences and knowledge on the issues of geoinformation and also identify niche areas that can be explored.

I would like to take this opportunity to encourage for your participation to attend this very important workshop and contribute to building the Geoinformation Society in Uganda.

Find workshop details attached. Please you are requested to confirm your participation.
I look forward to your active participation at this important event on 08 October 2004.

Yours faithfully,

Tukugize Caroline

Cc: Mr. Ir. Walter T. de Vries
http://www.itc.nl

Annex3: QUESTIONNAIRE –ASSESSING THE STATUS OF GEOINFORMATION PRODUCTION, EXCHANGE AND USE AMONG PUBLIC GEOSPATIAL ORGANIZATIONS IN EAST-AFRICA

(October 4th - 23rd 2004)

A. Organizational status

1. In which country is your organization based?
   Tanzania Uganda Kenya All the three

2. Which of the following best describes your Organization? Tick where applicable.
   Local authority/municipal council
   Academic institution
   Private company
   NGO
   Donor funded project
   Semi-government
   Government
   Other (Please specify)……

3. At which level does your organization function?
   International
   National
   Local
   Provincial
   Regional

4. What is the major GeoInformation activity of your organization?
   Utility (borehole drilling, waste management, water, electricity, telephone/mobile, drainage)
   GeoInformation Data Collection, processing and analysis
   Social /demographic data provision or analysis
   Thematic Map production and analysis
   Topographic Map Production
   Environmental analysis
   GI training/ education
   Disaster management
   Engineering surveys
   Geodetic Network
   Land Surveying
   Road Network
   Security
   Other…….

5. Does your organization follow any nationally/regionally/internationally recognized standards in the provision of the above activity?
   Yes No

   If yes please check where appropriate.

   Organizationally developed standards
   International standards,
   Metadata
   National Data standards
   if so please specify……
   Others please specify……..

B. Accessibility and pricing of GeoInformation

6. Which of the following best describes access to geoinformation data through your organization?
   Accessed through memorandum of understanding
   Restricted to government organization
   Unrestricted to all users government and others (free access)
   Restricted to internal use only
   Other, please specify……

   Where there is (unrestricted use) open access, what access policy is applied?
   Free Charged (production cost)
   If free, are there any conditions?
   Yes No

   If yes, please outline these conditions
   …….

   If charged what is the pricing policy?
   Reproduction Cost Cost Recovery
   Market Value Others? Please specify……

7. In what format is access to information provided, please indicate the frequency of the mode of distribution?
   Hard copy Digital
   Email Internet(website)
   Others specify……

8. What are the current fees or prices for your Geoinformation products and services? Briefly state how they are determined?

   ……
   Does the price charged per product type differ according to different users?
   Yes No
   If yes, please state how the price differs?

   …….
   How often was it sold in 2000 - 2003?

   To government-organizations To commercial firms

C. Customers requirement

9. What specific Geoinformation based products and services (digital or analogue) do you provide to your customers?

   Land Surveying
   GIS sales, training and consultancy
   Software training
   Software sales
   Other (Please specify)……

   ***Standard* map**
   Hydrology maps Thematic layers
   Geological maps Topographic
   Cadastral Other (Please specify)……
   Customized map
   Integrated with tabular information Location Specific

Layer Specific Other (Please specify)……..

Geo-processing services

Image processing and analysis GIS spatial analysis
Statistical analysis other (Please specify)……

Online GIS services

Interactive map production Viewing and publishing
Map querying other (Please specify)……

Any other Products and Services provided? (Please specify)

……

10. How do your customers access your services?
    Office Visit website
    Telephone Internet
    Email Other (Please specify)……..
11. Main products purchased by the different users and clients
    Utility location (water points, hospitals etc) Buildings & cadastral information
    Administrative boundaries Transportation
    Vegetation Hydrology
    Control points Others (please specify)……
12. Which advertising medium is most often used/ or most effective within your organization?
    Public Media (The News papers, television, radio)
    Focused group discussions among users and clients
    Internal adverts, Bulletin, Brochure
    Through conferences and seminars
    The Internet (websites)
    Billboards
    Other (Please specify)…….
13. Have you engaged in partnerships or collaboration with other organizations for Geoinformation service provision or for development of any new products?
    Yes No

If yes, please briefly explain

……..……

14. Do you have any competitors?
    Yes No
    If yes, please list them below

    ……

15. Does your organization have any of the following policies regarding the production of Geoinformation?
    a) Copyright policy
       Yes No
       If yes, how is it being enforced?
       Follow-up of copyright infringement
       Any specific cases?
       Others please specify
    b) Pricing policy
       Yes No
       If yes, how is it being enforced?
       Price lists any specific cases? Please highlight

D. Data sharing and management

16. Does your organization share data with any other organizations?
    Yes No
    If yes please specify the organizations
    ……..

17. What has been the major barrier to exchanging geospatial information with other GI service providers?
    Insufficient knowledge of who owns what data and the status of the data
    Different reference frame (coordinate system-projection and datum)
    Unclear or non existing pricing, copyright and privacy policies
    Insufficient knowledge of how to exchange geospatial data
    Reluctance to share due to unforeseen benefits or risks
    Different interpretation of datasets
    Incompatible software platform
    Different format of datasets
    Different output quality
    Other (Please specify)……

18. What specific geoinformation do you integrate from other organizations, Please indicate in what form?

……..

19. Please outline and state how your organizational datasets are often maintained (updated)?

Type of dataset	Daily	Weekly	Monthly	Yearly

Other (Please specify) ……..

20. Does your organization have a website?
    Yes No

If yes, what type of Geoinformation does it provide and who is responsible and how often is it updated?

……..……

Awareness of National Spatial Data Infrastructure

21. Have you heard of NSDI initiatives in your country
    Yes No

If yes, which of the following NSDI initiatives are you aware of?

Collaboration with GI organizations in private and public sector
Development of a Clearinghouse for geographic data
Digital Cadastral Index Map creation
Training of Government staff in GIS
Large scale digital map creation

Establishment of GIS Centre
Establishing a GPS Network
GIS in Schools
Others, kindly specify……

22. What role is your organization playing in any of these initiatives? Briefly explain

Coordination…….
Facilitation……
Participate……..
Support……..
Observation……
Non…….
Other (Please specify)……

23. What specific conference or other National or regional GIS related activities have you participated in since the last 2 years?

……

24. Has your organization been involved in regional efforts of,

Standardization of Geoinformation Harmonization of Geodetic reference

Policies regarding access of geoinformation

Accessing the level of GI industry

25. In your personnel view what is enabling the smooth running of GI activities in your organization?

……

26. What are the major problems/obstacles you facing in the provision of GI in your organization?

……

27. Are you discussing cooperation with other organization/people from other 2 counties of East-Africa? Yes No

If yes, which areas are stimulating for regional cooperation?

……

28. In your personal view, how does/will the East-African integration contribute to the growths of the GI industry in the region

Thank you for your kind cooperation in completing this questionnaire.

Optional

Name:

Contact:

For any further reference, please contact

1. Ms Tukugize Caroline, Email tukugize07846@itc.nl
2. Mr. Ir. Walter de Vries, Email devries@itc.nl

Annex4: QUESTIONNAIRE: ASSESSMENT OF THE STATUS OF GEOGRAPHIC DATA PRODUCTION, USE AND EXCHANGE AMONG PRIVATE GEOSPATIAL RELATED ORGANIZATIONS IN EAST-AFRICA

(October 4th - 23rd 2004)

Organizational issues

1. In which country is your organization located (Kindly tick the appropriate one/s)
   Tanzania Uganda Kenya All the three
2. Do you have any work or contract with public or private companies outside the country?
   Yes No

   If yes, from which Country? Uganda Kenya Tanzania

   Is majority of contracts from foreign countries? Yes No

   If Not, Where is most of your work?

   ……

3. Please specify the main activity/(activities) of your organization?
   Utility (water and sanitation, waste management, electricity, telephone, drainage)
   Socio-economic baseline studies and analysis
   GI Data Collection, processing and analysis
   Topographic Map Production
   Thematic Map production
   Environmental analysis
   Surveying and mapping
   GI training/ education
   Disaster management
   Engineering surveys
   Geodetic Network
   Road Network
   Security
   Others, please specify…….
4. For specific output, kindly specify what products/ services your organization provides at national/regional level

   ……

5. Which other organizations (private, public, Projects, NGOs) provide the same or very similar products with yours? please list them below

   ……

   Do you see these organizations as?

   Competitors
   Redundant
   Scope for cooperation
   Others, please specify…….

6. For what specific functions do you require the use of geospatial information? (Kindly tick the appropriate one/s)

   Value adding (generate new products/service for customers)
   administrative boundaries
   Draft statistical reports
   verify of locations
   Delivery of goods
   Conduct analysis
   Route Planning

Others (Please specify)…….

Access of GI from public organizations

7. When dealing with public organization's geo-data (foundation and framework data) how is your organization affected by the following polices?

   Access rights

   ……

   Copyright polices

   ……

   Pricing of government GI data

   ……

   Which policy is bad for your business and why

   …….

8. Where do you see most threat of the above polices to your organization?
   …….

Data Sharing and GIS use

9. Is any other company using the same data or part of the data for their business as your organizations?
   Yes No

   If you have almost the same data, do you have any initiatives towards sharing this data
   Yes No

   If yes, state whether there is a formal agreement
   Memorandum of Understanding
   License Agreement
   Others, please specify
   ……

   If no, kindly tick one of the following as reason.
   Threat to organizations' business Avoid competition
   Avoid legal costs others……

   In what forms do you receive geographically related information from other organizations?
   Spreadsheet (tabular) Graphical data
   Digital copy Hardcopy
   Reports Other (Please specify)……

10. What has been the most commonly used method for information exchange?
    Network CD ROM
    Email Tape
    Diskette Other (Please specify)…….

11. When was the last time you interacted with your data provider?
    Not more than 7 days a go 2 weeks a go
    1 month Last 2 months
    Other (Please specify)…….

Do you keep track of communication (email address, memorandum of understanding etc?)

……

12. Which problems do you experience when exchanging geospatial data with other providers?

Incompatible data formats	Fixed scale and boundary
Incomplete information	Inaccurate information
Poor customer service	Outdated Information
Physical Proximity	Delayed delivery
Others……..	

13. Which GIS data types have you used? Kindly tick where applicable, to provide an overview of what GI datasets are required and used.

Vector data with tables	Raster images
Scanned maps	Rectified images/Orthophotos
Other (Please specify)…….	

14. What is the status of GIS software use in your organization?

Esri products (ArcView, ArcGIS, ArcInfo etc)	GeoMedia
MapInfo	AutoCAD
Other (Please specify)……	

Network Use

15. Is your organization linked to any network?

Yes No

If yes, please state what type.

Local/internal network
World Wide Web
Other, please specify……..

16. Which activities are supported by the Internet/Intranet facility and how?

Production and service delivery	Internal Communication
Sales & Marketing	Administration
Advertising	Management
Accounting	Other……

Marketing of GI products/services

17. How is the production of GI products/services organized in your organization

co-operation with other private/public organizations Customer specification
Private production, based on a law,
Others, kindly specify……..

How is the production and updating financed?

From operations of the organization (market value)
Donor
Others……

How often is updating of information done?

Depends on other data providers	Every two weeks
Once a week	On request
Everyday	Others……..

18. What is easy for you to sell?

Hardcopy product	Softcopy product
Services. Please specify below	Others please specify below
……	…….

Do you conduct online transactions (e-commerce)?

Yes No

If yes, Please outline for which products and the frequency

……

If No, kindly state how transaction are carried out in your organization

……

19. Does your organization have a policy on pricing

Yes No

If yes, what is your policy on pricing?

……

Is this policy in line with the general policy of government?

Yes No

If yes, explain how does this affect your business?

……..

20. Who were your most frequent customers in the years 2000 - 2003? please fill in the appropriate letter by selecting from the list of customers provided below

Customers Government (G), Commercial firms (C), Individuals (I), NGOs (N)

Period	**Frequency of customers**			
	Very High	**High**	**Low**	**Very Low**
2000				
2001				
2002				
2003				

What is the total amount of the revenue collected in 2003?

.....

21. Where do you see the most threats to your company?

Lack of awareness of the usefulness of geospatial information
Stringent/unfair government polices on the use of GI
Stiff competition with the other private companies
Unfair competition with the public organizations
Donor projects stagnant the market of GI
Others please specify……..

22. Where do see you see most market potential?

.....

23. What advantage does your organization have over others providing almost similar products and services like yours?

.....

Awareness of National Spatial Data Infrastructure (NSDI)

24. Have you ever been requested to contribute to NSDI discussions in your country?

Yes No

If yes, in which area did you yourself contribute to NSDI discussions?

Collaboration with GI organizations in private and public sector
Establishing a GPS Network/African geodetic reference system
Seminars, workshops to define the NSDI activities

Digital Cadastral Index Map creation
Training of Government officials in GIS
GIS in Schools, university, institutes
Large scale digital map creation
Establishment of GIS Center
Others, please specify……..

25. What role is your organization playing in any of these initiatives? Briefly explain

Coordination……

Facilitation……

Participation……..

Support……..

Observe……..

None ……

Other (Please specify)……..

26. What specific conference or other National or regional GIS related activities have you participated in since the last 2 years?
……

Accessing the level of GI industry at regional level

27. Which GIS/GI company/organization do you know from other countries in East-Africa?

Uganda Kenya Tanzania

…… …… ……

28. In your view, how does/ (will) the East-African integration contribute to the growth of use of Geoinformation in the East-African region?
……

Thank you for your kind cooperation in completing this questionnaire.

Optional

Name

Contact

For any further reference, please contact

3. Ms Tukugize Caroline, Email tukugize07846@itc.nl
4. Mr. Ir. Walter de Vries, Email devries@itc.nl

Annex 5: Summary of Presentation

Key address note

Introduced the various opportunities for GIS use growth in areas alike increasing appreciation of GIS application advantages (Spatial Coverage, Analytical capabilities, Spatial Analysis, Decision support systems and Visualization) in Uganda. Furthermore, he noted that Data, infrastructure and human resource issues for GIS use being increasingly resolved and NSDI issues on-course would contribute by providing key player in GI Market growth.

- Various areas of growth in the GI Market (Public and private initiatives) in areas like Hardware, software supply and system services, GI Production and supply, Socio-economic and Natural Resource surveys, Thematic and topographic map production, Data capture: instrumentation and techniques (mobile GPS, Remote sensing), Geo-data Management, Geo-Information Management, etc
- GIS analytical capabilities for added value decisions in various areas like Environmental Assessments, Environmental modelling and Management, Early warning systems (Natural and Man-induced disasters), Carrying capacity/adequacy of networks (roads, water, electricity supply, social services: health and education), Spatial/Physical Planning, Security concerns, etc, Capacity building (training, GI Systems support), Applications development, decision support systems. Site suitability assessment for the proposed Muko Iron Mine, Kabale District, South West Uganda (with ArcGIS Spatial Analyst).
- He concluded by pointing to the Challenges facing the GI industry in Uganda
  - Responsibility for Data production
  - Data standards, access and use: access rights, exchange, data formats for exchange copy right policies, availability, pricing
  - Stimulating GI market growth: what role for private and public institutions
  - Data sets spatial and temporal resolution: missing links in socio-economic and bio-physical data
  - Capacity building and institutional development to exploit GI analytical capability and arising opportunities.

First Presentation

The first presentation entailed the Role of public organizations (Lands and Surveys department) in GI market development; The Introduction stipulated Lands and surveys is a national mapping organization responsible for Geodetic surveys, Cadastral surveys, Hydrographic surveys, International border surveys, Engineering and topographic surveys and Aerial surveys. Furthermore it is also responsible for Mapping entire country of Topographic maps, Land cover, Land use, Navigation charts, Geoidal, National atlas.

Traditionally all maps and charts were produced by lands and surveys however this is changing now in some cases due to new technological development. Still surveys and mapping remains a core department in mapping. There is need to formulate a comprehensive mapping policy

Dissemination of map products Map sales, Campus and large scale sections but the Problems involved are found in the areas of high pricing, Current information and Copyrights

He pointed out Current developments which included Conversion from analogue to digital includes Campus project, large scale digital mapping and Semi-analytical photogrammertry. Support to decentralization through Dissemination of maps to districts and Training of staff from districts and other departments Collaboration with other institutions through EIN-Project and the proposed GIS centre and Formulation of LIS

He concluded by highlighting the challenges Surveys and mapping department should do

- Coordinate and expanded LIS to include GIS

- Guide the development of policy formulation of regulatory framework for the use of Geoinformation in Uganda to include issues of copyright, intellectual property rights, data standardization and general management of geoinformation
- Create conducive environment since there are many players generating GIS
- Get involved in the sensitization of politicians on the value of geospatial technologies so as to work towards using more geoinformation.
- Contribute towards making geospatial data more available.
- Coordinate with other institutions towards creating a conducive GI industry in Uganda.

Second Presentation

The second presentation entailed the role by private organization to the development of this GI market in Uganda. The presenter commenced by highlighting the GI industry being composed of the GI production system components to include; Data (paper, electronic: Image, Photo, Dbase, Spreadsheet, GPS readings, survey measurements etc), Hardware (PCs, Scanners Digitizers, GPS, ArcPad, Internet etc), Software (OS, Application), Professionals (Users, Producers, Trainers) and Procedures (policies & regulations). He outlined GI Products to include Data, Satellite Images, Aerial Photos, GI Software and Hardware (Plotters, printers, PCs, GPS etc)
Furthermore, the GI Actors with their specific Responsibilities were discussed. Below is a summery.

- Government of Uganda responsible for laws, rules and regulations, e.g. standards for the different actors
- The Public sector; data collection, processing, production, provision, Note that initial data collection is a very expensive exercise, hence not attractive to the private sector in Uganda, Can contract private Co. to resell.
- The Private Sector; National and International companies, Complement each other, Mostly dealers for multinational companies for Software, Hardware, Satellite Images and are involved in Undertake training, support and training locally. These organizations are involved in the provision of Simple maps and Analysis
- Universities & other training institutions engaged in Training and Research
- NGO's, CBO's & Civil Society who are Primarily users of GI products, Require GI data to implement their programs, Create market for GI products, Do not have resources to produce their own data, Short-term programs

In a way of conclusion, he pointed out that the GI market can only make qualitative assessment in order to determine how big the market is however several factors were pointed out to favour the exponential growth of the GI market in Uganda which included, Enabling economic conditions, Conducive government policies (taxes waivers, decentralization), Technological advances and the Increasing user community due to local and international trainings. Private Sector position in the market is not yet developed because of the low use of geoinformation in Uganda.

Third Presentation

The third presentation considered the role of NSDI towards the development of the GI market in Uganda and EA as a region. Business Environment of GI involves Acquiring, storing, adding-value and integrating data. Current environment is favourable through the Policy of decentralization encompassing better information management at the district level. Business environment composed of Data, Access and manipulation has been facilitated, Use has increased, and sophisticated spatial awareness has developed
Providers (Diverse users and user' needs, Large variety of specific requirements, High degree of change Geo-information perception depends on the shape and form of (Markets, Projects, and Technology). Framework is important in providing clear grounds upon which description and clear operation of organizations is well stipulated under a clear framework. Clear sharing polices, pricing etc.)

Annex 6: Outline of secondary data collected

(a) Uganda

Business plan for the national biomass centre
The National Water policy, 1999;
The National Environment Management Policy for Uganda, 1994;
The Uganda Forestry Policy, 2001.
UBOS GIS Policy Statement
The Environment Statute, 1995;
The Land Act, 1998;
Town and Country Planning Act, 1964
Registration of titles Act, 1964
Environmental Impact Assessment (EIA) Guidelines and Regulations, 1998;
The Wetland Sector Strategic Plan (WSSP), 2001 – 2010;
Review of the status of Land Information and land Information systems. MWLE, Uganda
MWLE Bulletin Volume1 No1. April 2003
GIS Capacity development for UBOS
Department of Lands and Surveys: Financial year 2002/03 summery
Department of Lands and Surveys; revenue returns from September 2003-july 2004

(b) Kenya

Survey Act
Statistics Act
Official Secretes Act
The Kenya Communications Act (No. 2 of 1998
Kenya Intellectual Property act
Copyright Bill of 2001.
Access to Information Bill 1999
International intellectual Property Alliance 2003 Special; 301 Report
CD AARSE conference
AARSE conference papers
RCMRD Bulletin. Mapping resources for sustainable development
RCMRD annual report 2003

(c) Tanzania

Land Act, 1999
Telecommunications Act, 2000
The United Republic of Tanzania; National Land Policy
Land Survey Ordinance 1957