Evaluating the Determinants of Land Information
Utilization by Land Professionals

By

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(2012)

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Thesis Assessment Board:

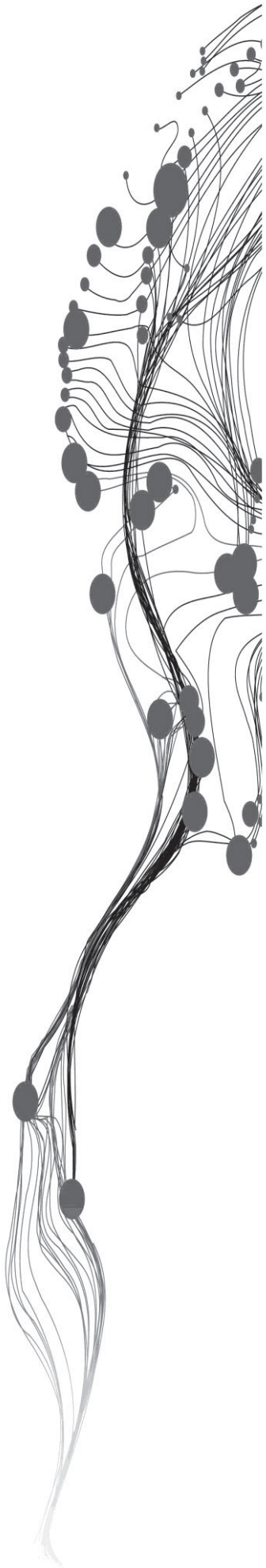Chair: Prof. Ir. P. van der Molen
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Abstract

The starting point of this research was the observation that in general public administrators have a different view on land information than land administrators. This research aims to evaluate the reasons for this difference.The evaluation drew upon a selection of 71 publications from 2000 to 2011. The research addresses three questions; what influence land information utilization by land professionals in public sector? When and how land information utilized in public sector? The evaluation shows that various factors influence land information utilization in public sector. Land professionals expertise, activities and the installation of Geo-ICT tools and techniques in organizations and the local regulations and policies are the main factors. Stakeholders primarily utilize land information in activities to satisfy their personal and organizational needs. When comparing land information utilization at different levels of government, the result shows that local level government have a higher stake in utilizing land information than national or federal government level.

Acknowledgement

I would like to use this opportunity to express my wholeheartedly gratitude to my first supervisor at the same time the Course Coordinator for Land Administration Ir. Walter de Vries and second supervisor Dr Gianluca Miscione. for their kindness and excellent academic supervision and guidance during the entire period of my research study at ITC University of Twente .Your comments, suggestions towards my research study have really positively shaped up my research study process until to the point where I was highly excited to realize that, doubts to meet the deadline for submission is no longer an issue to me. I am left with no more words other than just to say thank you so much for your contribution and may god bless you for the rest of your life.

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List of Acronyms

LI	:	Land Information
LIU	:	Land Information Utilization
PA	:	Public Administration
LA	:	Land Administration
LPVs	:	Land Professionals' Views
SDIs	:	Spatial Data Infrastructures
LIIs	:	Land Information Infrastructures
LIS	:	Land Information System
GIS	:	Geographical Information System
GPS	:	Global Positioning System
ICT	:	Information Communication Technology
PSS	:	Planning spatial systems
SDSS	:	Spatial Decision Support System

Chapter 1: General Introduction

1.1. Introduction

The main purpose of this chapter is to present an understanding of general components of the entire research study. It explains in detail, what is being researched, why it is necessary and how it will be done and for what benefits. The section is presented in this order; first it gives overview background information about the research subject, followed by, problem research statement, research objective, research questions and conceptual framework. It introduces the research matrix strategy to be used in answering the research questions. The research matrix tries to explain the link between research objectives, research questions, research methods, data collection techniques, and data analysis techniques to be used in the study which will lead to the final expected research output.

1.2. Background information

Since the late 1970s the academic discipline of public administration began to investigate the role of the emerging information and communication technology (ICT) (Branscomb, 1982). he discipline originally concentrated more on automation of information processes in government, however in the mid of 1990s a lot of arguments arise from different authors in favor of view the automation processes as infrastructure processes. Since then the terms information infrastructure (II), spatial data infrastructure (SDI) start to occur in the discourse of public administration. They make the link to public service and the provision of products and services to the citizens (Burrough & Masser, 1998).In the same vain now governments policies became the base in steering nations towards a more information based society and countries are reviewing and restructuring their regulations, financing operations and ownership to meet the demands of drivers of information based society (Cordeiro & Al-Hawamdeh, 2001). One of the crucial arguments became that this increment in technology use would drastically lead to the transformation of the way government doing business and land information products such as maps, structure plans and land use plans are among those products and services provided through the use of ICT and E-government (Homburg, 2008). Furthermore, Clara et al., (2008) argues that "*ICT, does not only change the platform used to serve public services but also the nature of these public services*".

The connection between ICT and government also initiated the concepts of electronic government (e-government or Egov). Gupta et al., (2008) describes the history of how the scientific field of e-government developed. They argue that current publications on e-government include decision making , service processes and the role of ICT enables services to the citizens ,organizational change and the role of government. Gupta et al., (2008) further state that e-government initiatives all over the world endeavor to integrate ICT to transform delivery of government services to their stakeholders by improving quality of services.

A fundamental omission in many of the SDI or e-government studies is the focus of the use, or utilization of information outcomes in public policies. Georgiadou, et.al., state that (2010)"*The use of geo- information in government is a study area of increasing relevance and urgency*". Likewise, Land information utilization seldom considered in research studies even though land information has a crucial role land administration and land

management. Enemark (2010) states that over the last decades land has increasingly become a scarce community resource. As a result, the management of land is especially a concern in the field of environmental and sustainable management efforts. With the emergence and rapid adoption of ICT tools within land management practices it is necessary to evaluate how land information is used. New technology can only be a success if it truly supports the implementation of land policies and the development of sound institutions. In short, land information is only relevant when aligned with good governance.

New calls in for geospatial information use are emerging time and again. Just very recently in August 2011 the UN Committee on Global Geospatial Information Management was established in Geneva to address global issues collectively by using the geospatial information. The idea behind this effort is that greater and wider use of geospatial information globally would derive policy decision making and would achieve better sustainable development and humanitarian assistance (DESA, 2011). So, what makes policy makers use geospatial information, or more precisely, land information?

Addressing this question prompts for a literature review on land information utilization in public sector. Many recent publications do not discuss or derive what determines land information utilization in the public sector. Determinants are referred to as causal or driving factors to utilization of research findings by public administrators such as the type of research results and the dissemination effort of the research results. Instead research studies primarily focus on development of technical issues such as information architectures, SDIs, GISs, Geo- databases and the like for example; Mousavi et al., (2007) stated that " *the rapid expansion of the use of Internet in the Iranian society during the past decade led the Government of Iran to take several steps towards building an e-society and in 2005, a five-yearlong project started for developing e-Enabled national services, such as e-commerce, e-learning, e-health and e-government .*" In support of the same intervention, Basu S. (2004) had been also concentrated on examining the infrastructure and legal issues related to e-governance in developing countries .Shin et al., .(2008) had also joined the same efforts and they claim that by providing timely information and facilitating cooperation among regions, the e-governments are believed to help public managers solve long-lingering problems such as poverty, corruption, and diseases. In 2010 Asiimwe and Lim just like other authors had also focused their research on studying usage of government websites in Uganda (Asiimwe & Lim, 2010) so as Beaumont et al., (2005) focused their research on a review of the development of geo-portals in support of e-government in the UK, looking at the technical and organizational characteristics of geo-portals

In contrast to this technical focus, this research aims at finding out what drives public administrators to utilize land information in public policy processes. The main focus of the research is to investigate the practice on how, when, and when not land administration professionals utilize land information in their professional activities, and against the backdrop of their preconceptions of geo-ICT technologies, and their views on better real estate markets, good governance, environmental management, spatial planning, and monitoring initiatives.

1.3. Research Problem

Based on literature review, of previous scientific research studies conducted in 2001 by Landry et al., (2001) " Utilization of social science research knowledge in Canada", Rejean, et al., (2003) " The extent and determinants utilization of the University Research findings in public administration" and another recent research conducted in

2010 by Georgiadou, et.al., (2010) on the "use of geo-information in government", it became evident that these research studies do not derive the determinants of land information utilization by public administrators probably because their study focus was more general than specific so they did not consider or realise the role of land information utilization as an essential object in contrasts of Dale (1998) arguments. Therefore to fill this gap of knowledge shortage on the determinants of utilization of land information by land professionals, a research study is needed in order to investigate and understand how, when, and when not land information is utilised by public administrators specifically land professionals in public sector.

The research will focus mainly on evaluating land professionals' views on land information utilization in their daily activities and finding out what are the driving factors (determinants) of land information utilization types. Land professionals I am referring to are the spatial planner, cadastral surveyor, politician, land administrator, land valuator, land registration officer and land information expert and project developer within and outside municipalities hence they utilize land information in their daily activities for public administration. The purpose of my research is to evaluate determinants of land information utilization in public sector by identifying all factors that influence land information utilization types from the grey literature and to look at how, when and when not Land Professionals utilize land information in their daily professional activities. The end results of my research findings will contribute to the literature industry

1.4. Research Objective

The overall research objective is to bridge the gap of knowledge shortage about the utilization of land information by land professionals. I bridge this gap through analyzing and determining which land professional's views influence utilization or non utilization of land information type in public sector for public administration.

The research objective has three main components namely;

- Professionals' views on land information
- Types of land information utilization
- The relation between land professionals' views on land information utilization and land information utilization types.

1.5. Research Questions

1. Where and how do practitioners and scientists describe how they refer to land information and the utilization of land information?
2. Which categories and typologies of authors, views and utilization types can be made on the bases of these descriptions from the publications?
3. Which groups of land utilization types can be derived from the literature?
4. What influences the utilization of land information?

1.6. Conceptual framework

Based on literature review of previous research study findings, Rejean, et al.,(2003)states that "there is not yet an integrated conceptual model used by experts in the field of knowledge utilization."

Georgiadou et al., (2009) claim that the use of geo-information in government is a study area of increasing relevance and even urgency. A case in point is the use of earth observation in environmental policy making. They further argue that there is still lack of a rich conceptual understanding of how genuine humans' actors use geo information and associated technologies in real work settings. *We conceptualized the "Use of geo information" as people's actual use practices, the values to which people aspire and rules how geo-information should be used* (Y. Georgiadou, et al., 2009). It is evident from the literature review, that recent research studies were mostly focused on issues related to legal frameworks and technical infrastructures like SDIs, LISs LASs and, e-government than on other issues like impact, effect of land information utilization in the society etc. However this research study has focused mainly on exploring the relationship between land professionals' views on land information and land information utilization, by looking at various factors that are referred to and described by the various authors in publications. .Some of the factors that were pre-assumed by the researcher involving in land information utilization are, the various land professionals' activities ,the development of geoICT, urban development, Land market natural disaster and land management programs just to mention a few.

The main end result of the research findings was set to be proven statistically using relevant variables in relation to the research hypotheses statements as follow;

Hypothesis:1. There is correlation between land professionals' activities and geoICT tools in terms of land information utilization.

Hypothesis:2. There is a significant correlation between the activities and the type of stakeholders
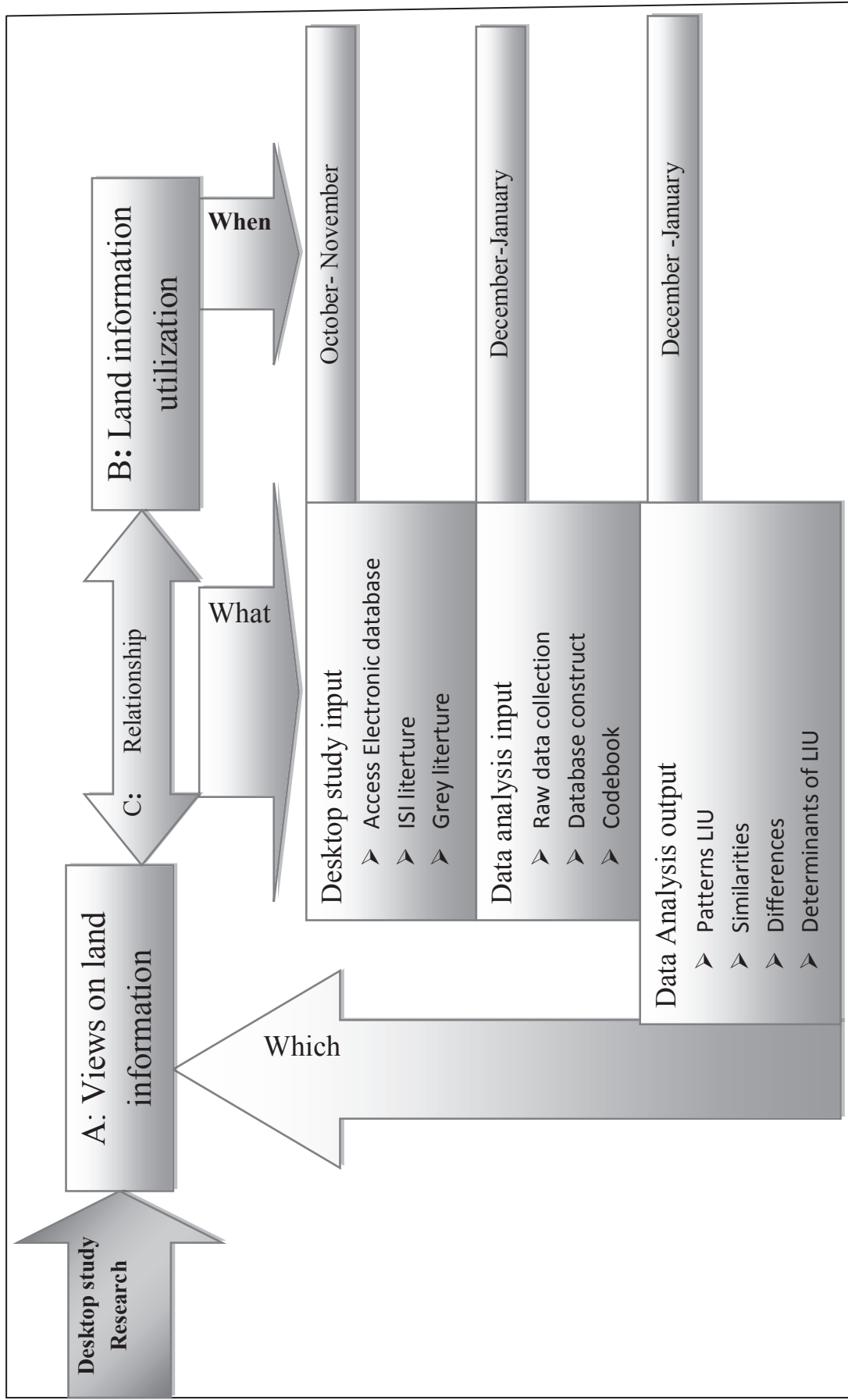
Figure 1: Conceptual framework diagram

B: Land information utilization

When

October- November

December-January

December -January

A: Views on land information

C: Relationship

What

Which

Desktop study input
- Access Electronic database
- ISI literture
- Grey literture

Data analysis input
- Raw data collection
- Database construct
- Codebook

Data Analysis output
- Patterns LIU
- Similarities
- Differences
- Determinants of LIU

Desktop study Research

Evaluating determinants of land information utilization by land professionals in public sector.5

1.7. Research Matrix

Below is the research matrix of the chosen method, data collection analysis, data analysis techniques, data sources and expected output in relation to the research questions of the study.

Research questions	Research methods	Data collection techniques	Data analysis techniques	Data sources	Expected outputs
1. Where and how do practitioners and scientists describe how they refer to land information and the utilization of land information?	Through content analysis method, two categories of content analysis were used in the research namely; conceptual analysis and relational analysis. The two methods have been chosen for this research to establish the existence and frequency of concepts in selected sample of publications about land information and its utilization by land professionals and to examine the relationship among the concepts of land information in the publications. According to Palmquist M.(1980) the two methods had been applied to examine any piece of writing and they have been used in larger number of	A search and selection strategies were used to find and select relevant publications using various key words and queries on various ITC databases such as web of science Sprinker-link and other targeted sources	Prior to data analysis different codes were generated based on research questions and hypothesis statements and labeled to publications texts of the research interest to enable the researcher find and identify relevant attributes /texts linked to land information and land information utilization. The evaluation (skimming over) of the text from the publications has been done in order to find the texts descriptions, patterns, similarities and differences on how different authors refer and describe land information utilization	ISI Publications from Web of science; Sciencedirect, Sprinker-link, and grey literature from OICRF databases, Public centre for SDI and land administration; land conferences proceedings from EGPA and FIG.	A table showing sample publications that are selected for text analysis about land information and land information utilization.

Research questions	Research methods	Data collection techniques	Data analysis techniques	Data sources	Expected outputs
	fields ranging from marketing studies to literature studies.				
2. Which categories and typologies of authors, views and land information utilization types can be made on the bases of these sample descriptions?					A table populated with attribute values about the categories, typologies, views of authors and land information utilization types
3. Which groups of land information utilization types can be derived from the literature?			The sample of publications content was analysed using both visual identification of texts in terms of land information concepts ,,associations and relations to land information utilization and Microsoft excel was used to generate graphs, tables and pies for statistical presentation of the data..		Qualitative and Quantitative descriptions about land information utilization (Texts descriptions, tables and Graphs showing patterns, similarities and differences of Authors' views on land information)
4. What influences the			The interpretation of the results that led to the overall		Evidence information based on the sample

Research questions	Research methods	Data collection techniques	Data analysis techniques	Data sources	Expected outputs
utilization of land information?			research output was done using both visual interpretation and statistical correlation using SPSS.		data about factors that found involved in land information utilization

1.8. Research Outline

Chapter 1

This chapter gives background information about previous research studies, and this is where the research problem, the purpose of the study, research objective, conceptual framework, research questions and research method are briefly discussed.

Chapter 2

This chapter presents the data collection approach which comprised of the search and selection strategies of publications such as ISI scientific articles and grey literature from electronic databases and other websites. The chapter shows the codes categories that were generated as a base for evaluating publications content and to enable the capturing of the relevant contents in the database. The chapter presents an output table showing a sample of publications that were finally selected for analysis about land information and land information utilization.

Chapter 3

This chapter presents the data analysis approach and techniques used in the process of evaluating publications content. The chapter explains the research operational strategy used in the study and presents an output table derived from the sample data which was populated with attribute values about the categories, typologies, views of authors and land information utilization types.

Chapter 4

This chapter gives qualitative and quantitative description results derived from the analysis exercise of the sample data of publications. It presents the descriptive statistical results of the sample data about the origin of authors, cases presented, methods of research, and types of land information, public sector activities, stakeholders involved, land information perspectives and qualitative descriptions.

Chapter 5

The chapter presents the data interpretation process and discussions of the findings from the study of the academic scientific literature and grey literature. The chapter presents the overall evidence information derived from the sample data results about things that influence land information utilization

Chapter 6

This is the last chapter and it presents the conclusion and recommendations for the potential future research studies about land information.

Chapter 2: Data collection

2.1. Introduction

The chapter addresses research question 1. It starts with a brief discussion on the entire data collection process. Section 2.2 commences with the data acquisition approach followed by the data search and selection strategies in 2.3. Then the listing and classification of scientific articles and grey publications that address land information.

2.2. Data collection approach

The collection of the data started through accessing the digital ITC scientific databases (Science direct, Sprinker-link, Geobase and OICRF) as well as the other external data sources such as websites of International Federation of Surveyors (FIG), Centre for Spatial Data Infrastructure and Land Administration, and so as the Global Geospatial Information Management (GGIM). The initial aim was to find relevant publications in both published ISI scientific literature databases and grey literature sources in the fields or domains of public administration, land administration, Urban planning and management, Economic and Social development, Information   and Information Communication Technology

The narrow aim was to find recent ISI articles, peer review articles and grey literature publications (such as reports and presentations from the international proceedings of public and land administration). The publications had to refer to concepts of land administration, land information management in public sector, geo-spatial information, new technologies and innovations in relation .to public and land administration for sustainable development. The search was further limited to articles in the international Journals of Environment and Planning, Geographic information Science, Information management, Land use policy, Government information quarterly, Computers, Environment and urban systems, Social Science and research policy, Applied science in earth observation and geo-information. Other sources included publication databases such as OICRF, which specifically deals with topics such as spatial data infrastructures, cadastre and land administration.

The sample size of the publications to be collected for both typological and content analysis was set to a minimum of fifty (50) and maximum of one hundred (100) publications from various accessible database sources within ITC and outside. The sampling was restricted to the publications of the year 2000 to 2011 which bear the concepts of land information such as spatial data, Land information, Cadastre, Parcel database, geo-information. The restriction to publications of the year 2000 to 2011 was set in order to gain a reasonable representative recent views about land information concepts and views of land professionals on land information utilization to enable the researcher to draw sound and reliable conclusion when answering the research questions. The data collection was entirely dependent on internet availability to gain access to various publications.

2.2.1. Search strategy

The concepts groups which were based upon during data searching were generated from the research topic perspective : "Evaluating determinants of land information utilization by land professionals" Some of the concepts are the land use planning, land administration, public administration, geo-information and earth observation, land information systems, environmental management and land management. The search key terms were also generated from the literature review of close related publications that

were found relevant to the research topic. Among others these are the main key words used for data search; land information, spatial information, land administration systems, cadastral data, parcel data, land information systems, geographic information systems, science and land valuation data. During the search exercise it was observed that in most cases these key concepts were found to appear in publications title, abstract, keywords and contents and this had made the searching and selection process relatively easier.The search strategy was set to retrieve articles that are fully related, partly related, slightly related and refers to land information. During the search it was observed that in most cases over 1000 articles (hits).are found and retrieved. Most of these articles or hits are not related to land information concept therefore the search has to be improved further to look for either the related articles or searching within the results by refining the results to a limit or exclude the type of articles until the hits reduced to a reasonable number of articles that are relevant and related to land information concepts.

The search exercise was conducted from two types of literature categories namely ISI scientific literature and grey literature. ISI literature are those articles that meets the requirements to be published in Scientific international Journals while grey literature are publications usually issued by governments, Academia, business and industry in both print and electronic formats but not controlled by commercial publishing authorities. Grey literature refers to newsletters, reports, working papers, theses, government documents, conference proceedings and other documents distributed for free. The ISI scientific publications were searched from ITC databases such as Science Direct/Elsevier, Web of science, springerlink, ITC Library catalogue Adlib and Repository ITC publications .The search of ISI articles was predominately done in the Science Direct and springerlink databases using various search queries. In cases where the Author and article title, Journal type year of publication known, the query was executed using advanced search with the input of the Authors' name and article title so as the year of publication.

While with non ISI literature, publications were searched in the databases of OICRF, Centre of Spatial Data Infrastructure and land administration and from the websites of International Federation of surveyors (FIG) and European Groups of Public administration (EGPA). The search was done by switching to the websites mentioned earlier and then search for recent documents that talk about public and land administration, cadastre, LIS, e-government and Geo –ICT, SDIs in public sector and land information infrastructure.

The search process of all literature was gradually executed until the relevant and related publications are found and the queries differ from one database to another. The Boolean logic has been used in most queries applied in the Science direct database, which restrict the execution query to specific terms and can as well allow a combination of query concepts to be executed concurrently. The searching of ISI literature was done on the search forms of each database and the initial results if is over 100 hits or more, then the use of refining results option is applied to either minimize or broaden the number of articles to reasonable hits of required article by using the search command options such as exclude, limit to certain Journal or to a specific title and year.

Most of publications selected are from three main international Journals. namely; Computers Environment and Urban Systems, international Journals of Geographic Information Science and Land Use Policy .By comparing these main Journals based on their scope ,
International Journal of Geographical Information Science Journal; is a forum used for exchanging original ideas, techniques, approaches and experiences in the rapidly growing fields of Geo -information Science It is mainly meant for those who design, implement

and use systems for monitoring, modeling, planning and policy-making. Published research covers innovative applications of geographic information in natural resources, social systems and the built environment, and developments in computer science, cartography, surveying, geography and engineering in both developed and developing countries.

Computers, Environment and Urban Systems Journal; is a forum for an innovative computer-based research on environmental and urban systems that privileges the geospatial perspective. It presents contributions that are emphasizing the development and enhancement of computer-based technologies for the analysis and modelling, policy formulation, planning, and management of environmental and urban systems that enhance sustainable futures. Application areas include environmental analysis, modelling and management, urban planning, economic development, emergency response and hazards, housing, land and resource management, infrastructure and facilities management, physical planning and urban design.

While Land Use Policy Journal, provides a forum for the exchange of ideas and information from the diverse range of disciplines and interest groups. It is primary concerned with the social, economic, political, legal, and physical and planning aspects of urban and rural land use so as effective land use policies. The journal examines issues in geography, agriculture, forestry, irrigation, environmental conservation, housing, urban development and transport in both developed and developing countries through major refereed articles It also aims to provide policy guidance to governments and planners.

Table 1: Search Strategy of Articles in ISI Journals

Data Source	Query execution		Results		Results reflection
	Initial	Final	Initial	Final	
Science-Direct/Elservier	**Specification** : Journals **Key words:** "Land information" OR "Spatial Information" Full text in all Science , Limit: Articles and review articles Year : 2000 – to date	**Refine results by limit** to Journals Computers , environment & urban systems, Landscape & urban planning, Remote sensing, International journal of applied Earth and observation and forest ecology. **Second refine results** by limit to key words : "Land administration" OR "Land administration systems" and journals; Land use policy Journals, Computers , environment and urban systems and International Journal of applied earth observation **Limit Year** : 2000-to date **Third refine limit topic**: Land Administration, Land tenure, Land market, Land , and urban land	11,107 hits	2890 hits	Articles were selected from this database in all initial and final results based on the abstract and contents relation to land information. This database dominated the other databases to the fact that most of articles that relate to land information were found here and were selected straight away.
				342 hits	
				51 hits	
Web of Science	" Land information" AND "Spatial Information" OR "Land	**Refine results** to study areas of Urban studies, Computer Science	5590 hits	837 hits	Relevant articles found were mostly from Journal of Landscape and urban planning

Data Source	Query execution		Results		Results reflection
	Initial	*Final*	*Initial*	*Final*	
	Administration" OR "Land administration systems" Limit year: 2000-2011	information systems and Remote sensing **Refine results again :** to **articles** then **keyword:** "Spatial information" and study areas of computer science information systems Geography and Urban studies		143 hits	
Springerlink Journal	**Key word:** "Land information" OR "Spatial information" AND " Land Administration OR Land Administration systems " '	**Refine results**: "Land information" **Filter** : Journal Articles	502 hits 207 hits	259 hits	Some of the articles found in this database could not be accessed straight away however their accessibility was linked to Sciencedirect database automatically.
ITC Library Catalogue Adlib	**Advanced search, Key word :** "Land information AND "Spatial information" "Land administration AND Land administration systems" Limit: to title and		263 hits 16 hits		Relevant articles were found and selected for analysis

Data Source	Query execution		Results		Results reflection
	Initial	**Final**	**Initial**	**Final**	
	articles in ITC academic output >1999				

Table 2: Search strategy of other publications

Data Source	Search Execution		Result		Comment
	Initial	**Final**	**Initial**	**Final**	
OICRF	**Key words:** "Land information" "Spatial information" "Land information systems" "Land Administration systems"		409 hits 171 hits 84 hits 84 hits		When the results are less than 500 hits the researcher has just scrolled down, page by page and select the appropriate documents based on the titles and contents for further discourse analysis. In case where the results is not satisfactory in number of hits then the search strategy was changed from the Key word search option to Abstract search option to find more hits.
CSDI & LA	Link to the website: http://www.csdila.unimelb.edu.au/publication/index.php **Publications**	**Author:** Williamson, then year by year till year the last year of publications within results. Year: 2011 Year : 2010 Year : 2009 Year : 2008	350 hits	10 hits 8 hits 8 hits 14 hits	Publications in this database were mostly authored and edited by Professor Ian Williamson and others about Cadastre, geo-information systems and land administration thus the search strategy used was Author Williamson throughout the search in this data base. Most of the publications are found related to land information utilization, so they were selected for analysis. The search was limited to publications of 2000 to 2011 and

Data Source	Search Execution		Result		Comment
	Initial	Final	Initial	Final	
					the search execution was done in a descending order from 2011 up to the last year of publications output however the results shown in the table are only up to 2008 in the final results but the search execution was done up to the last year of publication and related publications were selected and captured into the excel database for further analysis.
http://www.esri. com/industries/c adastre/index.ht ml **GIS for Land Administration**	"land information" "Spatial information" "Land administration" "Landinformation systems"		1770 2500 31 411	No option for searching within results to scale down the initial output.	Arc-news that related to land information utilization was selected from the initial results.

2.2.2. Selection strategy

The preliminary selection of relevant publications consisted of first reading and appraising the documents title, key words, year of publication, number of citation and abstract. To appraise an article as relevant depended on whether the article included the following key words: land information management, spatial information, land administration, information management, public administration, geo-information, Spatial data infrastructures, land information infrastructure , land administration systems ,e-government, land information system, geographical information system or geo-information communication technology. The second stage of selection was to read through the text content and conclusion of the documents in order to make a selection sense of the document if it is addressing the research object or not. Above 90 documents were selected in the preliminary round of selection and 71 documents were finally selected as they were found depicting the concepts of land information and views of land professionals in public sector. The selected publications were all stored into the endnote database management system to enable the citation and in time access.

2.3. Classification of literature

The database for selected publications was created whereby all relevant texts were captured into this database based on the codes label assigned to various variables form the publications. The inclusion of the relevant article texts enabled the process of browsing through the publications at a later stage. Prior to data capturing, the database code book for metadata was generated based on the data categories and research variables constructed earlier and was used as a base for data analysis to answer the research questions and serve as a guidance in the process of making conclusion from the sampled data analysis.The relevant text of contents of each articles, reports, proceedings selected for the study analysis were captured from one publication to another into the excel sheet database with all attribute values. . The attribute categories are the Authors name , Publication Title, type of Journals, type of research approach, references to land information definitions, the country origin of the Authors, Year of publication, Public sector domain of the publication, the publication degree of relation to land information, how authors describe or define land information, Which level of government does land information utilization occur, Who are the users of land information and what technology and public activities associated with land information .

Table 3: Metadata codebook

This table shows the metadata code classifications which were used during evaluation of each publication text contents.

Data code	Data heading	Variable codes & classes description	Text labelling description
Base 5	Main authors continent & county of origin by institutions or affiliations	Afc= Africa Amc =America Euc=Europe Asc=Asia	The origin of main authors was determined by reading the first pages of each publications where a brief profile of authors is given , in some cases from Autobiography of authors in publications, for example the origin by institution or affiliation of the author Williamson Ian can be known from this text derived from the first page of an article titled :Spatially enabling governments: **A new vision for spatial information** *Ian WILLIAMSON, Jude WALLACE, and Abbas RAJABIFARD* *Centre for SDIs and Land Administration* *Department of Geomatics, The University of Melbourne, Victoria 3010, AUSTRALIA* *http://www.geom.unimelb.edu.au/research/SDI_research*
Base 6	Type of country origin of the main author of each publication.	Devd = developed country Devp = developing country	The country level of development where the main author of each publication affiliates or institutionally belongs was determined through the use crosschecking the data in Base 5 with the list of developed and developing countries sourced from Goggle search engine ,links:http://www.ams.org/membership/individual/types/mem-develop AND http://en.wikipedia.org/wiki/Developed_country
Base 8	Study area or public sector domain of	PA= Public administration LA = Land administration	The labeling of various publications was done by first read the title, then key words and in some cases the researcher has to read further the abstract and introduction to get the context

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Data code	Data heading	Variable codes & classes description	Text labelling description
	publications		of the article where it belongs in terms of study area or domain, then after that the publications were classified to relevant study domains for example; the article by Victor Bekkers (2007)titled The governance of back office integration: organizing corporation between information domains, obviously this title's connotation qualify it to be labeled with the domain of public administration hence it is general and not specialized on one information domains like land information. Another example is from an article by Williamson I titled; **Land administration "best practice" providing the infrastructure for land policies implementation**. This one is also obvious that its title makes it qualify to be long to land administration.
Base 10	Research studies methods used in publications	EMPS = Empirical case study LS = Literature study	These classes were labeled by reading through the abstract or summary, or methods used in the publications, to find the physical words but in some cases authors used different words to mean the same so the researcher in this cases just made a sense of the meaning of the text and qualify it to the class where it belong. E.g. instead of using the classification term Literature study, they used theoretical approach, or study of publications while with empirical case study instead they use interview with officials or visiting municipal offices etc.
Base 12	Research studies approach used by authors in publications	EXPlo: Exploratory research approach which focuses on how events occurs and cause effects EXPLa: Explanatory research approach which focuses on defining the questions and hypothesis	Apart from reading the text , digital searching was also applied using the codes values verbs, like study, explain, explore, describe, interpret, etc.

Data code	Data heading	Variable codes & classes description	Text labelling description
		DCV : Descriptive research approach which focuses on getting detailed account of a situation ANLY&INTV= : Analytical & Interpretive research approaches which focus on development of conceptual frameworks or challenging a theoretical assumption. **Note.** Definitions of approach methods were derived from Qualitative report, Volume 13 number 4 December 2008 544-559 http://www.nova.edu/ssss/QR/QR13-4/baxter.pdf"	
Base 16	Group of people referred to in publications use or have a stake in land information utilization	PSP = Public sector professionals PSU = Private sector user LCU = Local community user	To qualify various text labels to relevant classes , digital searching for code values was done in all documents using nouns like valuers, farmer, leader, community, planner , expert, professional, manager ,administrator, surveyor, developer, official, decision maker, designer, informants, respondents, estates, agents .If the text label value is not specific i had to search more to get the clear meaning of the value to qualify it to the relevant class.
Base 17	Where Land information utilization mostly occur	PS = Public sector organizations PTS = Private sector companies LC = Local community such as farmers ………..associations	In this case the labeling was done through manual and digital searching in each publication using related terms applied in base 16 but in this case is to determine land information utilization based on the location terms such as municipality, local ,federal, regional, community, levels, government, public , private, sector, organization and institution, etc.
Base 18	Technology referred to and	geo-ICT = which includes tools and techniques terms such as GIS, RC ,LIS, ICT	The researcher had to do both manual and digital search in publications for the tools and techniques referred to in

Data code	Data heading	Variable codes & classes description	Text labelling description
	described in association to land information utilization	, PSS, SDSS, SDIs ,LII and e-government	publications using the text like GIS, Remote sensing ,LIS, ICT , PSS, SDSS, SDIs ,LII and e-government
Base 19	Activities referred to by authors utilize land information	SPD = Spatial planning and development monitoring DMT = Disaster management DM = Decision making LTD = Land tax determination LPF = Land policy formulation LDR = Land disputes resolution LPS = Land and property sales"	Labeling the of text to relevant classes in base 19 to base 22 was done through skimming all publications contents and make a sense of words context and meaning, then qualify the text labels to belong to where they should among various relevant categories/classes .
Base 20	Land information types	LI-Text = This includes all non spatial data such as registers of buildings and addresses, mortgages, land tax and rates, land use , property rights and restrictions, land ownerships, land values and land use regulations. LI-Vector/ raster data = This includes all spatial data ; vector and raster data like satellite images, aerial photographs , cadastral parcels, land use zoning maps , topographic maps, survey diagrams and urban structure plans. "	

Data code	Data heading	Variable codes & classes description	Text labelling description
Base 21	Land information utilization	LISD = Land information shared , exchanged within and outside organizations MP = Maps and physical Plans used for spatial planning and development LIDM = Land information used for disaster management and monitoring LILPT = Land information used for land and property taxization LIBDR = Land information used for boundary disputes resolution OPLAS = Operational of LASs ,LIS,GIS, SDIs for public service provision DEMAD = Demand of parcel abstracts and maps by citizens and private surveyors LIDRDT = Land information determined, recorded, disseminated and traded in all formats. EMRNS = Emergence response effective due to land information availability "	
Base 22	Land information utilization perspectives	"EP = Socio-Economic utilization perspective TP = Technological utilization perspective EVP = Environmental utilization perspective "	

Chapter 3: Data Analysis

3.1. Introduction

This chapter addresses research question 2. Which categories and typologies of authors, views and land information utilization types can be made on the bases of these sample descriptions? The chapter presents the overview of how the ISI scientific literature so as Grey literature publications were analysed and evaluated in attempt to find answers to the research question mentioned earlier. ISI Scientific literature is a collection of various articles, peer review articles that are accepted in international publication of Journals, while grey literature are non peer reviewed publications. Weintraub (2000) describe them as publications issued by government, academia, business and industry, in both print and electronic formats, but not controlled by commercial publishing interests and where the publishing is not the primary business activity of the organization. Scientific grey literature comprised of newsletters, reports, working papers, theses, government documents, bulletins, conference proceedings and other publications distributed free. The two types of literature are believed to be sufficient enough for analyzing and comparing land information (utilization) types. The chapter aims at deriving a specific out, which is a table populated with attribute values about the categories, typologies, views of authors and land information utilization types. In view of the objective of this chapter, section 3.2., describes the process followed when evaluating the selected publications, followed by 3.3. Research operationalization

3.2. Evaluating of publications

The analysis of the sample publications was done using the content analysis method categories namely; contextual analysis and relational analysis. This process has initially involved coding of meaningful terms and small phrases about how land information referred to and described by land professionals and secondly exploring relations between frequency of selected or labelled terms and phrases derived from the sample publications. Analyzing of publications using the two content analysis categories; relational and contextual analysis methods is almost similar to text analysis method which was described by Ratcliff (2002) as a method of looking at documents, text, or speech to see what themes emerge. *"It is a theory driven as it determines what you look for in the documents or text and it has its own rules of data analysis. The analysis goes gradually and considers that all data fits some category and context. Start by reading all way through, and then specify rules. It is originated with analyzing newspaper articles for bias counting things in print"*(Ratcliff, 2002). However, according to Palmquist, M. (1980) the difference between content analysis method and text analysis method can be observed because content analysis has two categories of analysis and described them as follows; in conceptual analysis, a concept is chosen for examination and the number of its occurrences within the text recorded. , conceptual analysis begins with identifying research questions and choosing a sample or samples. Once chosen, the text must be coded into manageable content categories. The process of coding is basically one of selective reduction, which is the central idea in content analysis By breaking down the contents of materials into meaningful and pertinent units of information, certain characteristics of the message may be analyzed and interpreted. While the other category; relational analysis referred to as an analysis method that builds on conceptual analysis by examining the relationships among concepts in a text. And as with other sorts of inquiry, initial choices with regard to what is being studied and/or coded for often determine the possibilities of that particular study (Palmquist, 1980).

The process of evaluating the selected publications consisted of a number of steps. The first step was to prepare the database properly, so that analysis would be possible. This consisted of the following actions; Step 1, Data capture: This is to ensure that the database is fully populated with relevant attribute values that are assumed related to research questions. Step 2, code book alignment: This is to ensure that the codes categories are consistent with the text contents of all publications captured. Step 3, Analysis focal points: This is to keep to the analysis target as originally set in order to find patterns, differences, similarities about land information utilization from all publications. Step 4, Software application: This is to ensure that appropriate data analysis software such as Microsoft excel and SPSS are applied to generate the statistical results which will enable the final data interpretation.The analysis of publications concentrated on the articles, reports and workshops proceedings that bear the concepts of land information. The main analysis was limited to a sample of more than fifty (>50) to hundred (100) publications which address the concepts of land information, or the views of land professionals on land information and the technology associated with land information.

The research aims was to classify variables related to land information utilization through a process of labeling sections of text guided by pre-constructed data categories and data attributes headings. The approach draws upon guided coding techniques and was deemed operational enough for this research. It provides text-based evidence about the links between land information and utilization of land information in a particular context. What matters is nothing else but the context of the publications selected for analysis where the practices of land information exist theoretically.The statistical software package SPSS together with Microsoft Excel supported the analysis of evaluating and deriving patterns, similarities and differences about land information. All publications attributes were stored in the excel sheet. All statistical analysis operations relied on SPSS. The statistical operations included correlation analysis of the following variables; the two methods of research namely empirical case studies and literature studies used by authors in the sample data. The operations were done using SPSS statistical software. The operation started with analyse > correlate >bivariate>then select the two variables to participate in correlation which were geoICT versus land professionals activities, empirical case studies versus literature studies), then specify the correlation method (spearman's rho) then press ok, then the output table was generated as described and illustrated in chapter 5, subsection 5.2.1 table 7 and table 8.

The following two tables below show the counts of the sample data used in executing the correlation testing between the four variables which participated in the statistical test. The tables were generated to show the counts of the data participated in the correlation process.

Table 4: Sample frequency count of geoICT and Land professionals' activities

Land proffessionals activities	counts	GeoICT	counts
Spatial planning	32	GIS	43
Disaster management	10	SDIs	18
Desicion making	20	GPS	8
LIS development	12	Remote sensing	5
Land & property transaction	14	e-goverment	31
Land & property taxes rates determination	10		

Table 5: Sample frequency count of empirical case studies and Literature studies

Main authors, origin	Emprical case studies	Literature studies
Africa	7	12
Europe	26	8
Asia	13	8
America	5	3

3.3. Research operationalization

The actual analysis consisted of

1) I looked for the Land information concept definitions by the different Authors, attributes related to land information utilization, variation of views of land professionals on land information and factors that influence utilization of land information and land information utilization indicators.
   During data analysis I first had to look for things that are depended upon by the variation of land professionals' views on land information utilization. These things may include land professional's educational background, daily professional activities, Local regulations and Information Communication Technology utilization (ICT) and variation of views from each set of professionals such as Economic view, political view, technological view that influence land information utilization.
2) Secondly, the analysis had to consider the type of public activities that influence land information utilization such as physical planning and land disputes resolution, disaster management, policy formulation, land tax determination. The research will seek for insights about land information utilization perspectives and land information indicators.
3) At last not least the analysis exercise had to evaluate the relationship between land professional views on land information and land information utilization in order to get an understanding of the actual situation about the research object and this will facilitate the process of making final conclusions on what determines land information utilization by land professionals in public sector.
4) Then I had to compile the findings from all publications analyzed about the concepts on land information and views of land professionals on land information utilization, and I had to use the construct of land information utilization matrix that I constructed as a base for criteria of land information utilization.

If I found that in all literature cases, a combination of various Land Professionals' views influence utilization of land information types then I concluded that land information was fully or partly utilized based on a list of combined factors that I termed as determinants of land information utilization by Land professionals. If I found that in one of the literature type or the other there was no utilization of land information then I looked for a constellation of various land professionals' views and find out which views influenced the non utilization of land information. Finally, if I found that in all publications studied, land information utilization degree and factors that influence utilization of land information are equally the same then I concluded that the situation about what determine utilization of land information in public sector was likely to be the same across the border based on the findings from the theory and I proposed for the future research to test and observe the same concepts in reality at local (municipal) or regional levels of public administration.

The output from the analysis is a construct of land information utilization criteria matrix table which is used for future research about land information and serve as a guide to test, prove in reality at municipalities, the relationship between the views of land professionals on land information and land information utilization types.

Chapter 4: Results

4.1. Introduction

This chapter addresses research question 3. Which groups of land information utilization types can be derived from the literature? The sequence of this chapter is as follows: section 4.2, starts with describing the statistical results and section 4.3 gives qualitative description of results. The final output is figures and tables showing categories of authors, origin of authors in terms of affiliations and institutional belonging, origin of cases presented, type of cases approach methods used, academic domain of publications, types of land information, geoICT tools addressed in publications, public sector activities related to land information utilization, stakeholders involved in land information utilization and factors that influence land information utilization. Section 4.4.provides a conclusion to the research question 3.

4.2. Descriptive statistical results

The analysis relied on seventy one (71) publications published between the years 2000 to 2011, and addressing the issue of land information in the public sector. The description of results contains the following items. First I address the origin of authors to determine if there is a difference or similarities in views about land information and to find out what is the impact of their originality towards their views on land information. Then, I looked at the type of research cases presented and research approach methods used in publications in order to determine which views were based on theory and which views based on the ground truthing and also to find out which research method approach dominated in the publications. I considered the type of land information referred to by authors in order to determine which land information type is dominantly utilized and where the utilization does mostly takes place. I further looked at public activities that depend on land information for their implementation, so that I can determine which activities is more influencing land information utilization and which one does it less. I considered the stakeholders involved and geoICT tools and techniques for me to find out which stakeholder is more active in land information utilization and which geoICT tools and techniques is dominantly influence land information utilization.

4.2.1. Origin of Authors

Most of authors originate from Europe or Asia & pacific institutes and affiliations. From the 71 publications, only 11% were written by authors from American institutes/affiliations, and 10 % from Africa while 47% from Europe and 32 % from Asian institutes/affiliations. Eight two (82%) percent of publications were written by authors from developed countries and eighteen (18%) percent from developing countries. Most authors seem to have a similar educational or academic background. This would suggest a certain bias in relation to the term 'land information'. The fact that there are relatively few authors from America is remarkable at the least. This would suggest that either American authors refer to another term than 'land information', or that 'land information' is less of an issue in American research. Articles that address cases from America focus more on technological issues. They do not clearly use the term land information instead they mostly use the term geospatial information or geo-information in relation to a number of technical issues of new technology with reference to GIS and remote sensing that allow the availability and accessibility of geospatial information , data sharing and interoperability, planning and managing emergence , development of

national spatial database infrastructure and monitoring real time events, , so as electronic government .

There are a number of authors and articles which are more frequently cited and referenced than others. These include the following in the table below;

Author (s)	Article	Journal	Times cited	Cited references
Bennett, R; Wallace, J ; Williamson, I (2008)	Organizing land information for sustainable land administration	Land Use Policy	7 in Web of Science	34
Ian P. Williamson & L. Ting (2000)	Land administration & cadastral trends - a framework for reengineering	Computers, environment & Urban systems	14 Web of science	0
Ian P. Williamson (2001)	Land administration: "best practice "providing the infrastructure for land policy implementation	Land Use Policy	19 in Web science	0
Kalantari, M [1]; Rajabifard, A [1]; Wallace, J [1]; Williamson, I (2007)	Spatially referenced legal property objects	Land Use Policy	2 in Web of Science	0
Li, W ; Feng, TT; Hao, JM (2009)	The evolving concepts of land administration in China: Cultivated land protection perspective	Land Use Policy	3 in Web of Science	53
Mitchell, D ; Clarke, M ; Baxter, J (2006)	Evaluating land administration projects in developing countries	Land Use Policy	2 in Web of knowledge	55
Cheng, JQ ; Turkstra, J ; Peng, MJ ; Du, NR ; Ho, P (2006)	Urban land administration and planning in China: Opportunities and constraints of spatial data models	Land Use Policy	10 in Web of science	33
Steudler, D; Rajabifard, A ; Williamson, IP (2004)	Evaluation of land administration systems	Land Use Policy	14 in Web of science	27
Jude, Wallace & Ian Williamson (2006)	Developing cadastres to service complex property market	Computers, environment & Urban systems	2 in Web of science	0

Table 6: Number of times articles cited and referenced

Williamson Ian appear to be dominantly feature as a an author than others in the frequently cited articles probably because he has extensive experience in land administration hence he is a professor in surveying and land information, and at the same time the Director of Centre for SDIs and land administration. The other contributing factor is that his teaching and research interests are concerned with designing, building and managing land administration, cadastral and geographic information systems in both developed and developing countries that is why he is dominantly featuring mostly in the frequently cited articles. His article of 2001 titled Land administration: "best practice "providing the infrastructure for land policy implementation has been cited 19 times more than the others because it underscores the best practice of land administration and land use policies worldwide concerning the management of forest, coastal zone management and managing urban environment and bear the description of infrastructure which facilitate the implementation of related land management policies and programmes.

The other most cited and referenced articles are Evaluation of land administration systems and Urban land administration and planning in China: Opportunities and constraints of spatial data models these articles are cited more because they are recent and their focus is in line with current demands of global economic market whereby each country in the world try to adopt new land administration systems in order to achieve socio- economic and sustainable development. Most of the cited articles are from the land use policy journal simply because it is primary concerned with the social, economic, political, legal, and physical and planning aspects of urban and rural land use so as effective land use policies for land administration.

4.2.2. Cases presented

42% percent of case studies are from publications that present cases on Europe, followed by Asia (including Australia) with 33 %, Africa 14% percent and America with 11 % percent.
These figures do not correspond to the affiliation of authors because author from either America , Africa contested in research studies which are not necessarily in their location of affiliation. Thus the affiliation figure to Europe is high than the cases from Europe which means authors are affiliated to Europe but still they attend to cases in Asia and Africa . However American authors seem to write about American cases probably because their research focus are more specialized to the technology advancement so an author from Africa will not have capacity to take up the cases from America due to high demands of local context which may be not easily understood by a remote researcher without the back ground of the area. This argument is substantiated by the results of the classification of publications that are addressing cases from America. Articles addressing cases from America are predominately have a technological development perspective and refer to geo-information as a tool for managing and monitoring spatial emergencies than other perspectives such as socio-economic perspective which is more addressed in articles from elsewhere like articles from Europe address land information concepts in an economic perspective probably because of the EULIS initiative which is there to strengthen European economy through land information products nationally and cross border transactions.

Main author origin by Affiliation	Affiliation %	Cases %
Europe	47	42
Asia & Pacific	32	33
Africa	10	14
America	11	11

Table 7: Percentage of authors' affiliations and research cases

Mixtures of type of research cases approach in figure 2a and 2b were conducted mainly in Land administration (LA,) and Public Administration (PA) domains. The frequency counts in figure 5b were 54 (76%) for LA and for PA 17 (24%)counts .
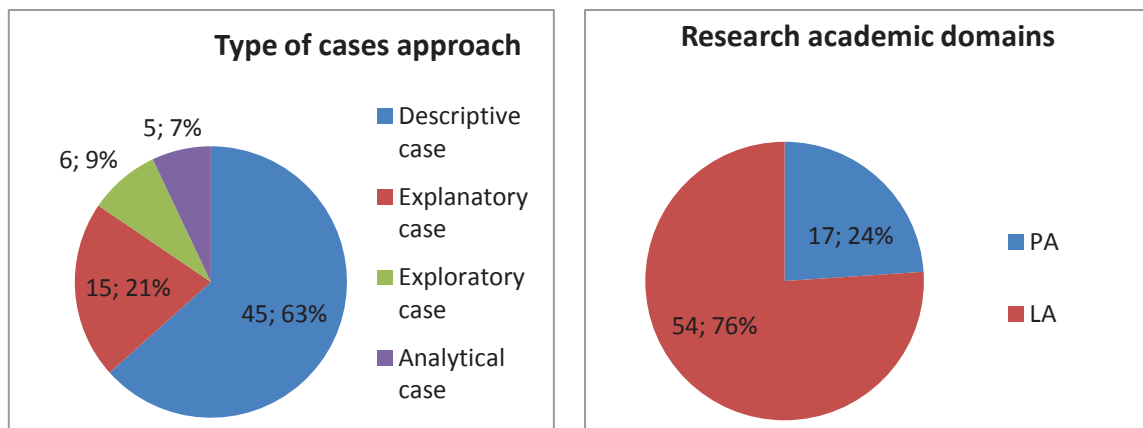
Figure 2a &2b: Types of case studies approach and Academic research domains

4.2.3. Methods of scientific research studies

Authors used primarily two types of research methods to address land information or land information utilization namely: empirical case studies and literature studies. Seventy two (72 %) of Authors used case studies approach while twenty eight (28 %) of authors used literature studies approach method. The disparity of percentage in these approaches is probably due to the fact that the scientific fields in which most of the authors work prefer to test theory in empirical environments than to derive or discuss concepts through comparing literature. In other words, there is no big methodological contest. One could thus conclude that there exists a fair amount of agreement among researchers on the preferred methodology.
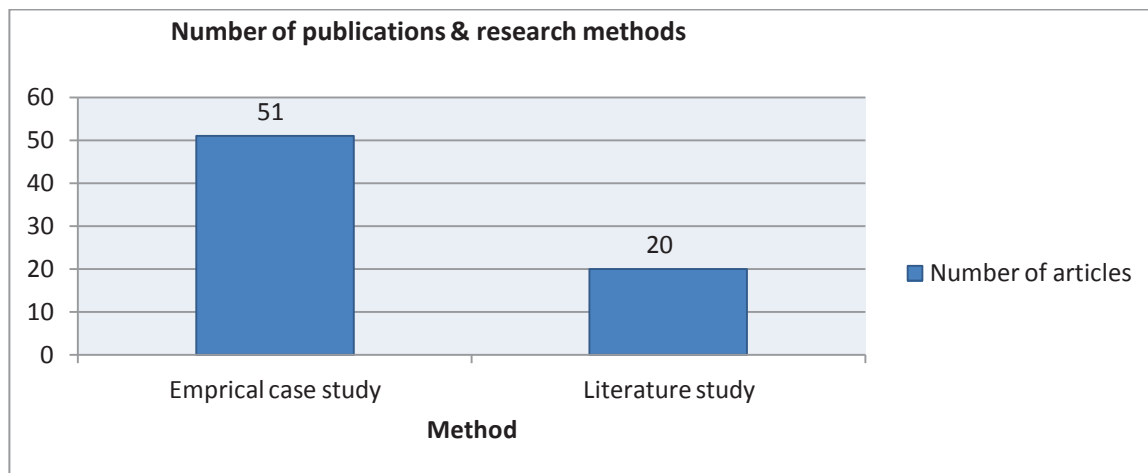
Figure 3: Number of publications and research study methods

4.2.4. Description degree about land information by articles

65% of publications were found addressing specific concepts and definitions of land information, as they contain information about land ownership, land value, land use, Geo-ICT tools and techniques, spatial information, various stakeholders as well as public sector activities that use land information.

35% of publications were slightly addressing land information concepts as they only refer to it not specifically addressing it throughout the text especially publications with cases from America which are primarily discussing technology in association to geo-spatial information in order to keep pace with technology advances to be able to retrieve geo-information in a few seconds after any disaster events probably to avoid a situation experienced after the Hurricanes Katrina in gulf coast where digital records were nonexistent aftermath of the hurricanes(NRC, 2007).
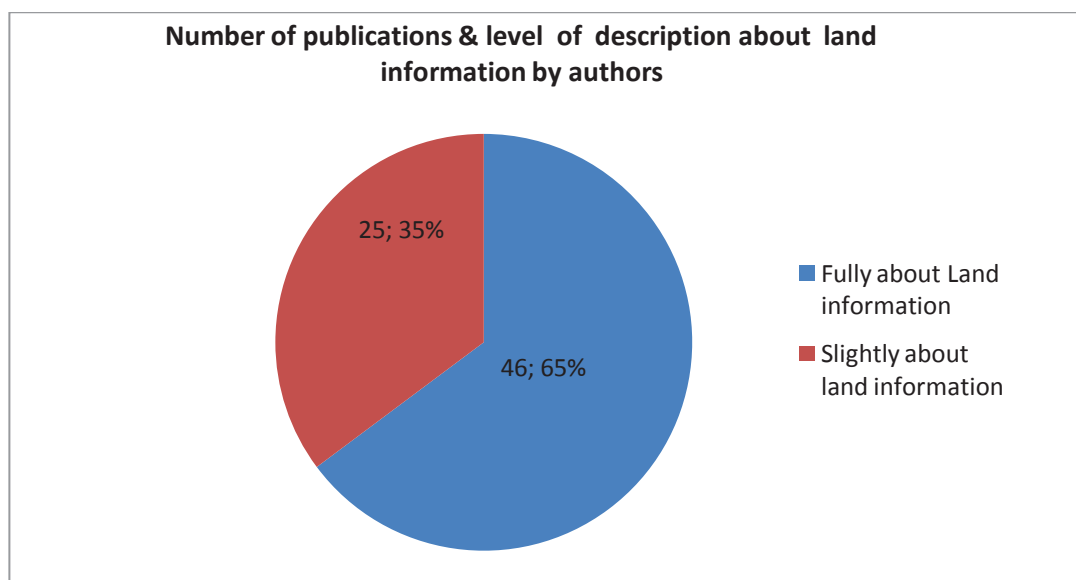
Figure 4: Number of publications and level of description about land information

4.2.5. Types of land information

Land information is found at all levels of government, be it, national regional and local levels. According to van Elzakker & van de Berg (2010) refer to land information as physical planning maps, and state that physical planning maps play an important role in the realization of land use plans and also in the communication of information about what is and what is not allowed in a geographical space or on a specific land parcels. Another Author by the name Onoma (2008) refer to land information as title register and maps, which are utilized as evidence inland disputes during tribunals proceedings. 54 % of Authors addressed the use of land information at municipal local levels and 46 % focused on national levels. Articles such as Spatially Enabling Land Administration: drivers, initiatives and future directives by Wallace et al., (2011)addressed the issue of emerging initiatives to manage and utilize land information. They discussed the international initiatives (The Australian, European and United States contexts) relating to national approaches to manage and utilize land information. They pointed out that the importance of information about the build environment held by local governments is increasingly recognized. In FIG report of 2010, Rapid Urbanization and Mega cities, Authors emphasized that spatial information has became indispensable for numerous aspects of urban development, planning and management. Cities like Buenos Aires have invested in providing access to spatial data as part of their public websites, reporting information about aspects of city administration such as land tenure, use, planning, environmental and disaster management information.

Land information is mostly needed in cities as it plays a role in combating emergencies and reducing losses for example one of the major problems that New York city faced during September 11, 2001 rescue operations was the lack of readily available integrated data which was supposed to be available to enable the instant response to the event and possible rescue many from the disaster (Anand & Feick, 2009).

Figure 5 below shows that 59% of land information referred to in the publications is utilized , in the form of vector and raster which includes maps, spatial plans, aerial-photos, parcel layers, satellite images while 41 % of land information is utilized in the form of textual description which includes information about land policies and regulations, land and property values ,physical addresses and mortgages .Wallace et al.,(2011) describe land data typologies as data relating to tenure , valuation, development, planning, the environment , topography and imagery .

Number of publications & type of land information addressed

- 29; 41% — Descriptive information
- 42; 59% — Graphical information

Number of publications addressed land information utilization at government levels

- 25; 35% — Central level
- 46; 65% — Local level
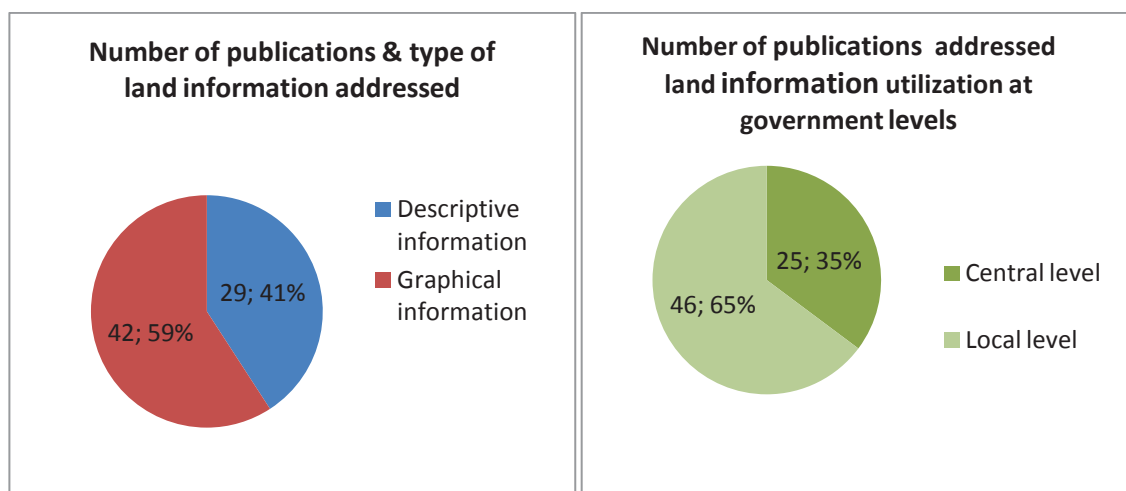
Figure 5a &5b: Number of publications addressed land information types and utilization at government levels

4.2.6. Public sector activities and users involved

Among land information stakeholders who were referred to in publications are the spatial planner, geoICT expert, land administrator, local user, surveyor and valuers. These groups were grouped based on counts of each document where they were referred to in order to determine which group of stakeholders is dominantly referred to in all together publications. These groups were identified through both manual skimming and digitally searching the group name and synonyms names for instance the group name spatial planner was searched further using synonyms like urban planner, land use planner and town and regional planners. In the case of local users I used terms like farmers, communities, really property agents and property developers. Various land information stakeholders utilize land information to execute various public sector activities.
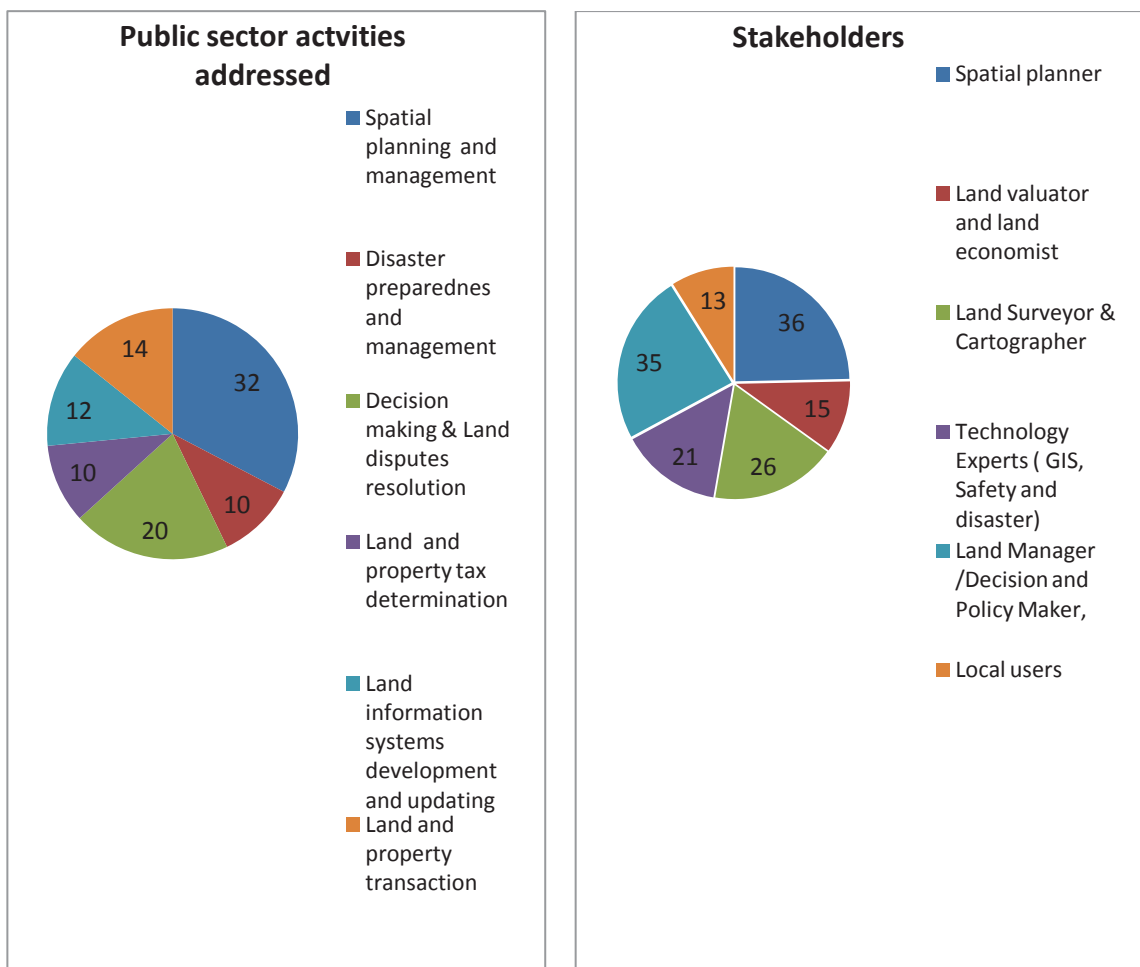
Figure 6a &6b: Public sector activities that use land information and stakeholders involved

The public activity planning and management is dominantly with 32 counts referred to using land information for its implementation than other activities and this argument correlate with the stakeholder the planner who is also referred to in 36 articles use land information for planning and management activities. Decision making on various activities by the decision makers has the second highest count 20 and this is also

correlate well with the 35 counts of the decision maker / manager who is referred in the articles to relate the activities of decision making. The stakeholder referred to as local user has low counts with 13 of partaking in the use of land information and it correlate also with the low count with 14 of land and property transaction in the articles.

4.2.7. Factors which influence land information utilization

The variation of local characteristics of either urban or rural setting influence the use of land information in one way or another., thus about 17 % of land information is in demand and utilized by local farmers, individual developers , financial institutions, and real estate agents for land information about land use suitability and land value to satisfy their local needs. If I compare various factors from the publications ,that depend and influence land information utilization I conclude that the combination of Geo-ICT tools and techniques , land professional activities, local context of localities seem to influence more land information utilization than other factors that may involve in public administration therefore in the absence of one or two of the above combination will result in less utilization of land information.
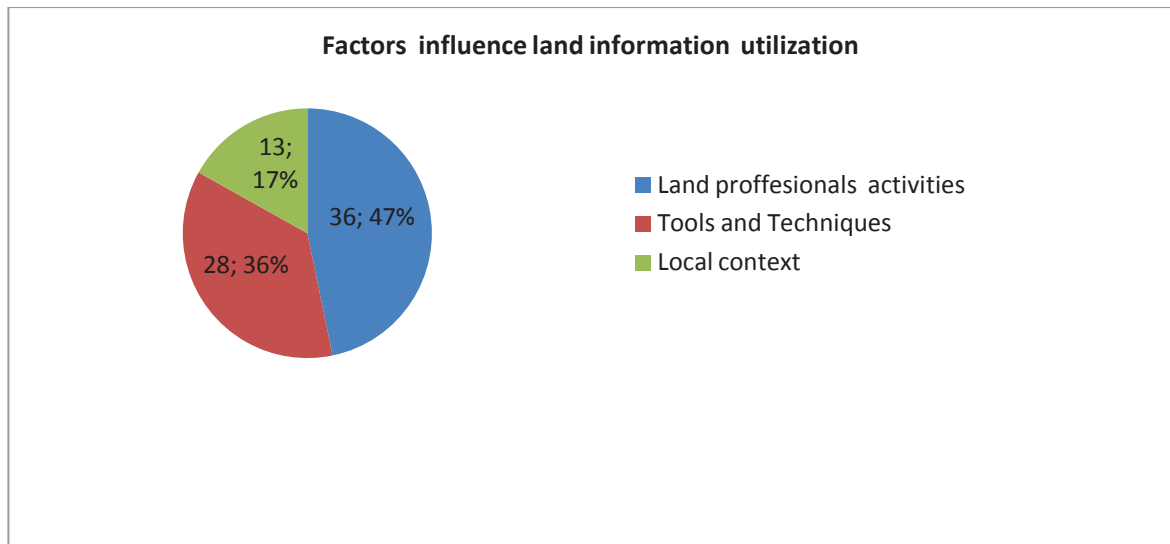
Figure 7: Factors influence land information utilization

4.3.Land information description and definition by publications

In comparison of the general contents of sample publications from each of the journals, they seem to differ. The text contents from the publications in the International Journals of Geographic Information Science address issues like the development of baseline data (inventory about buildings and structure values) and the need for SDIs. The publications from this journal have underlined some key stakeholders such as geographers, planners ,designers sociologists, engineers, and geoICT tools, visualization techniques like GPS, GIS, remote sensing which are mostly used in acquisition of land information.. In the Journal of computers environment and urban systems (CEUS), the content of publications are addressing issues of cadastral systems and land information, urban management due to scarcity of land, the absence of information about land and land uses. Authors like Williamson & Ting (2001)address issues of participatory planning, land administration infrastructures, cadastral systems and tools such as cadastre, LIS, LII, Pgis, SDSSs and

PSSs and e-government. All these issues have created a growing need of land information utilization in order to meet the demands of global drivers such as sustainable development, urbanization and economic reform. Williamson & Ting states that the role of land information has been increasing in the broader context of land administration which includes land valuation, land use planning and land markets. While in Land Use Policy Journal, an article by Cheng et al.,(2006) focus on the development of land information systems to manage information about land tenure , land value and land use. Williamson (2005) refer to land information as a one of the complex commodity, which can be found in the form of maps and text for example information about tenure securities, urban land market, , leases, taxes, land uses, land rights and land restrictions.

These indicate that there is a fundamental differences in describing land information between types of publications sourced from different type of journals despite the fact that all they address the concepts of land information in public administration but in different perspectives and context.. Some of the publications treat land information in the context of Informatics and technology (geo ICT) focus on land administration systems design or architecture and roles of SDIs in public administration whereas other Journals like Land Use Policy and Computers Environment and Urban Systems treat land information in Socio – economic perspective, more focusing on cadastral data land tenure data, land value, land use data in land management and land administration for sustainable development, environmental management and socio- economic development .

A number of articles define land information and describes land information utilization in different perspectives because various authors are from different academic fields ,institutions and their educational backgrounds are not the same, this influence the way they define and describe land information and its utilization. Some examples derived from the publications on how land information defined and described are as follow; The article by Onoma (2008) titled The Use of Land to Generate Political Support defines land information as information found in title registers, and cadastral maps This information is used in the fields visits during tribunal as evidence to solve land disputes especially in countries which are experiencing discriminative land tenure regimes like Namibia, South Africa, Zimbabwe and Kenya. Based on a survey result by van Elzakker & van de Berg (2010) which was conducted in the physical planning departments of Netherlands municipalities and town and country planning companies, land information is utilized in the form of physical planning maps such as land use plans and structure plans, aerial photographs and topographic maps at least once a week and usually every day mainly for their function of municipal civil servant. Another article titled Land Information in the Federal republic of Germany by Mueller(1999) land information is referred to as information found in the regal land property register and the real estate cadastre. This information is regularly updated and authorized by government because it is important for the purchase and sale of land properties, for mortgage management and other substantial needs of a modern society.

The article by Williamson et al.,(2006) titled Spatially Enabling Governments: A new vision for spatial information, defines land information as a commodity which has ability to transform the way government and private sector organizations do business due to demands of increased population, environmental degradation, water scarcity which require governments to have much more accurate and comprehensive information than ever before. The article describes that land information is a back bone of a land market and its potential value outstripped the current value as a support for simple land trading

and delivering security of tenure. Thus now basic land, property and cadastral information are used as an integrating technology between many different businesses in government, including planning, taxation and land development.

FIG Report no.48 (2010) highlights that as cities get larger , spatial information becomes indispensable for numerous aspects of urban development, planning and management and is regarded as a is key resource in efficient delivery of e-government services, public safety, national security and asset management. The same report gives an example of New York cities and Buenos Aires that invested in providing access to spatial data to the public in aspects of city administration of land tenure, land use, planning environmental and disaster management. The article by Cheng et al., (2006) described that the availability of land information about tenure security, land value and spatial land use policies makes an urban land administration system socially credible and functional therefore land related information should be register and structured at a detailed spatial level, such as parcels in order to support the regal land ownership and collection of rates and taxes form land and properties.

NRC Report (2007) refers to land information as land parcel data stored in the database that would be used for multipurpose as it will support law enforcement needs, improve disaster planning and response efforts, facilitate real estate transactions, promote equitable property taxization, and assist in the identification of fraudulent insurance claims and real estate appraisals. While the periodic newspaper of Kadaster international,(2007) associated land information with e-government for improving the activities of public sector organizations. The paper emphasizes that if government wants land information to be utilized, safeguarded, accessed and availed, it should first of all create an infrastructure that can enable the electronic, legal economic transaction in a public participatory environment.

In a number of articles by Williamson et al,.(2005) have defined land information in reference to Dale & McLaughlin (1998) definition as information about land tenure , land value and land use and management. Even though this definition has been referred to in many publications that are fully addressing land information, Georgiadou et.al,. (2009) conceptualized geo - information in three aspects *value, practices and rules.* They say optimal geo -information use is poised to advance certain values like efficiency, equity, privacy and sustainability and people use geo information in routine, every day practices. They identified that politicians use geo-information in decision and policy making while citizens use it in routine locational questions and civil groups in participatory planning processes.

In the whole body of 71 publications various categories of land information utilization were constructed in order to observe and visualize patterns, similarities and differences of attributes about land information from the publications contents. The main categories of land information utilization are Technology development perspective, Economic or commercial utilization perspective, Land information utilization as a monitoring tool, and lastly land information utilization as a law enforcement.

By comparing the contents of the publication based on the categories mentioned earlier, 20 publication address land information utilization in a commercial perspective. They discuss about how land information plays a role in urban and rural setting for economic development. Land information is described as information about land tenure, land value

and land use mostly found in land records, cadastre and in land administration systems(I. P. Williamson, 2001). They refer to land and properties transactions that are processes through using land information systems for revenue collection. Eertink (2010) cited progress of EULIS initiative by European countries that are contributing to the establishment of European Land Information system (EULIS) to promote access to land and properties information nationally and cross boundaries. One article by Hallebro (2006) titled *Stakeholder cooperation in Swedish land administration and land information Sweden* has addressed the role of land information system in Sweden whereby land information is on mapshop ,customers can at anytime order maps and cds about land information. These publications describe that efficient land information utilization especially in urban areas is good for revenue generation and for national development. Another article has mentioned about Eurographic vision 2012, which has a focus to provide state of art service to real property and land information market within the e-government framework. These publications categories are concerned about the establishment of better land information systems that can facilitate property markets and accessibility to land information by citizens. They underline the role of cadastre and modern land administration systems that can link together land information (textual and graphic) and land registration systems.

14 publications discuss land information utilization from a technology development perspective. Land information term in the technology development perspective is' associated to 'geospatial information'. The development of geo ICT has transformed the availability and accessibility of geo spatial information, for example, Nedovic et al., (2004)emphasize that access and using spatial information through ICT infrastructure is a primary input to the planning and implementation of various projects, policies, and programs and is a key prerequisite for its effective use.

Sutanta et al., (2010)refer to the role of ICT as a platform that enable on line transaction of land information such as maps and planning regulations in countries like Indonesia. Cutter (2003) claims that through technological advancements, GI Science tools and techniques have improved identification of hazard events, especially in real or near-real time. Carsjens & Ligtenberg (2007) state that the development of a GIS based Strategic Tool for integrating Environmental aspects in Planning Procedures (STEPP) contributed to the use of land information especially land use data in defining the types of sensitive areas. They also stresses that spatial planners and designers now have access to much large volumes of geo- data and the use of GIS focuses on spatial queries and generating thematic maps

12 publications discuses land information utilization as a law enforcement tool in land administration. Pettit & Pullar (1999) states that land information is used in the form of parcel layers for spatial planning in urban settings so as land use zone plans, structure plans ,regulations. Shi et al.,(2011) refer to land information used for determining patterns of soil properties in agricultural areas to enable the appropriate allocation of land uses to right land units in farming areas. Onoma (2008) also describes that and information is used in decision making process as evidence in land disputes cases and in countries that are in transition period from war crises to peace to determine who owned what parcel, property and the extend of boundaries Georgiadou & Stoter (2010) refer to land information (geo information , map sketches, geo-databases) used as a base during deliberate spatial policy making practices, in the Netherlands. Another article titled *"Framing the use of geo-information in government: a tale of two perspectives"* by

Georgiadou (2009) informs that land information was used in the form of maps to visualize spatial problems and policies in the European spatial Development Perspective process. The other article titled *"The Use of Land to Generate Political Support"* by Onoma (2008) pointed out that land information is used in implementing land reform policies especially in countries like South Africa, Namibia and Zimbabwe that are still struggling with resettlement programs due to unequal land distribution after revolution.

16 publications discuss land information utilization in a manner that qualifies it to be a monitoring tool. Li et al.,(2009) Qureshi & Rajabifard (2009) and Van Western (2007) describe that the availability, accessibility, and utilization of land information by the land practitioners is good for monitoring land value increment, land use and land cover changes, monitor landslides hazards and risk areas, as well as for preparation to respond to global warming, floods and other potential disasters.

They pointed out that access to land information by citizens promote trust and reduce corrupt land transactions. They refer to land information used to monitor the development of towns and cities in terms of urban expansion due to urbanization and environmental impacts by new urban spatial development that needs impact assessment. Land information has also been used to communicate to the public about what is and what is not allowed on specific land parcels.

4.4. Conclusions

The chapter has come to the conclusion whereby two types of land information and four groups of land information utilization types are identifiable and summarized. There are two types of land information which are the graphical part and textual part. The graphical part of land information represents information in the form of vector and raster for example land use maps , cadastral maps while the o the textual part represents information like land use policies, regulations, .land values and land use rights. These land information have been used in parallel and interchangeably in four main groups of land information utilization perspectives namely social perspective, economic/commercial perspective, technological perspective and political perspectives depending on the society needs in implementing various activities by various practitioners. The content of this information enabled the researcher to obtain the answer to the third research question.

The answer to research question 3. Which groups of land information utilization types can be derived from the literature? Is that land information utilization can be presented in four groups. 1, social utilization perspective whereby land information is utilised by planners as a law enforcement tool in spatial planning and management of urban and rural areas for better and conducive environment where people can live together in harmony , 2, economic or commercial utilization perspective whereby land information is utilized by land valuers and economists, other users such as local farmers in activities such as determining land and property value and tax rates , and land and property trading ,obtaining mortgages as collateral between buyers and sellers. 3, technological utilization perspective whereby land information is utilized by cadastral surveyors, technology experts, and systems designers in designing and building land information systems, databases and infrastructures for information accessibility, sharing and exchanging as well as for monitoring spatial development and monitor events impact in terms of buildings , and properties location , land uses and land cover changes.4 political

utilization perspective whereby land information utilized by decision makers in land policies formulation and in solving land disputes and conflicts among land owners.

Chapter 5: Results Interpretation

5.1. Introduction

This chapter addresses research question 4: what influences the utilization of land information? The main purpose of this chapter is to interpret the research results of chapter 4 and seek possible relations, associations, correlations and patterns between the results after quantitative and qualitative values analysis. Section 5.2 discusses the statistical correlation of variables discussed in chapter 4 such as authors' origin by affiliation in relation to cases presented, public sector activities associated to various stakeholders and type of study approaches, then methods of scientific research studies as well as public sector activities in relation to geo-ICT., 5.3.Interpretation of land information utilization and, section 5.4. Trend overtime about land information concepts and land information utilization.

A first step of the analysis was to find if there would be any correlation between the quantitative values in the article database. The correlation calculation used the spearman's Rho correlation index which defines the correlation coefficient as a value between +1 or -1. The stronger the correlation is between two variables the closer the value is to 1. If the correlation is 0 or very close to 0, then there is no association between the two variables involved in the correlation. If the correlation is positive, the two variables have a positive relationship, which means as one variable increase, the other increase as well while if the correlation is negative, and then the two variables have negative relationship which means that as one increase, the other decreases.

5.2. Correlation and comparison of variables quantitatively and qualitatively.

The comparison and correlation was done on the following variables to find out the degree of relationships or association of various columns of values against other columns of value in the database in terms of land information utilization; 3 columns of values were statistically correlated against other 3 three columns of values which are; the public sector activities versus geoICT, authors origin by affiliation versus research methods and public sector activities versus stakeholders. Then visual comparison of various columns of values in the database was also done to see the patterns of values and commonalities across the contents of publications. The comparison was done specifically on the public sector activities values against type of research approach methods used, authors who wrote more than one article versus stakeholders' referred to in the same articles, stakeholders against the type of research methods used in the publications, then type of data versus land information definitions.

5.2.1. Correlations of activities versus geoICT

The correlation testing of the above variables, is applicable here in order for the researcher to accept or reject the hypotheses that were described in chapter 1, subsection 1.6, hypothesis: number 1: There is no correlation between land professionals' activities and geoICT tools in terms of land information utilization.Two variables were involved in the correlation testing in order to prove the research hypotheses statements above. The variables are land professionals activities and geoICT tools. The significance threshold value was set to 0.05. The correlation input table is found in chapter 3, subsection 3.2, and table 4. Table 8, below shows the correlation output. The correlation output shows that

the significant value of 0.391 (two tailed) and significant value of 0.391/2 (one tailed). Since 0.391 is closer to 1, that means there is a strong association between the two variables (land professionals' activities versus geoICT tools) in terms of land information utilization. This means that land information utilization correlates on both land professionals' activities and geoICT tools. Therefore with this positive output which is greater than the significant threshold 0.05, I am obliged to reject my null hypothesis statement in favor of the alternative hypothesis statement. This statistical output seems to go positive with the sample data results in chapter 4, subsection 4.2.7, and figure 7, where three main factors identified to be influencing land information utilization.

Table 8: Correlation between land professional activities and geo-ICT tools.

Correlations

			Land_ professional_ activities	geoICT_ tools_ techniques
Spearman's rho	Land_professional_ activities	Correlation Coefficient	1,000	,500
		Sig. (2-tailed)	.	,391
		N	6	5
	geoICT_tools_techniques	Correlation Coefficient	,500	1,000
		Sig. (2-tailed)	,391	.
		N	5	5

5.2.2. Correlations of authors origin by affiliation and research methods

According to the sample results in chapter 4 sub section 4.2.2., figure 4, authors from different continents in terms of association and affiliations used two methods of research studies. The empirical research study was dominantly used by all continents opposing the literature study approach. However in comparison with the statistical correlation results between the two methods against various continents table 9 below shows that there is a fair association between the two variables hence the significant value is 0.4 (2 tailed) which means both two methods derived information about how land information is referred and defined by various authors despite that empirical case studies method was dominantly used than the other.

Table 9: Correlation between authors' origin & research methods

Correlations

			Emprical case study	Theoritical study
Spearman's rho	Emprical case study	Correlation Coefficient	1,000	,600
		Sig. (2-tailed)	.	,400
		N	4	4
	Theoritical study	Correlation Coefficient	,600	1,000
		Sig. (2-tailed)	,400	.
		N	4	4

5.2.3. Correlation of type of activities versus type of stakeholders

The correlation testing of the above variables was to enable the researcher to accept or reject the hypotheses statement number 2, which was defined in chapter 1, subsection 1.6: there is no significant correlation between the activities and the type of stakeholders. The

significant threshold is still set to 0.05. The table below show the correlation significant value of 0.188 (2 tailed). Based on spearman rho interpretation there is a positive relationship between the activities and various stakeholders, because the p -value is closer to +1. Since the significant value is greater than the correlation threshold 0.05, I have no option to reject the null hypotheses statement in favour of the alternative hypothesis statement which states that there is a significant correlation between the activities and the type of stakeholders. This means the more the variety of activities the more various stakeholders partake in land information utilization.

Table 10: Correlation of type of activities versus type of stakeholders

Correlations

			Activities that influence land infomation utlization	Stakeholders that utilize land information
Spearman's rho	Activities that influence land infomation utlization	Correlation Coefficient	1,000	,700
		Sig. (2-tailed)	.	,188
		N	5	5
	Stakeholders that utilize land information	Correlation Coefficient	,700	1,000
		Sig. (2-tailed)	,188	.
		N	5	5

5.2.4. Comparison of type of activities versus type of research approach

The comparison of between various activities and type of research approach methods was done to determine which research method was dominantly referred to in publications against which activities. The visual comparison found that the descriptive approach was more used than other approaches in about 45 publications giving detailed account of the situation about the spatial planning and management, land and property value determination and land administration.

5.2.5. Comparison of type of stakeholders versus type of cases method

The comparison has shown that in publications where empirical cases method was used various stakeholders were mentioned with their specialization names like cadastral surveyor, spatial planner and GIS- expert while in publications where the literature study was used ,the stakeholders were mentioned in a sort of a group name like municipal officials, land professionals, government officials and land administrators.

5.2.6. Comparison of frequent main authors versus type of stakeholders

The comparison of frequent authors in publications has found that Williamson Ian has consistently referred to stakeholders in land information utilization like planners, land administrators, and cadastral surveyors. Georgiadou has mainly referred to stakeholders like politicians and policy makers in relation to land information utilization. Victor Bekkers referred to the stakeholders in land information as land professional and public managers while Murat Meha referred to various stakeholders such as cadastral surveyors, spatial planners GIS experts and land administrators

5.2.7. Comparison of type of data versus land information definitions

Two types of data were compared based on their definitions in the publication. Cadastral data is defined as information about parcels and it has two parts graphical and textual.

This information is comprised of only information about land ownership, land values and land use. This data type is mostly associated to land administration domain. While the other type of data referred to as spatial or geospatial data, is associated to various public administration domains. This type of data is comprised of all type of surface and underground information about land. It is mostly found in areas of land administration, natural resource management, marine administration, transportation, national defense, communications and utility services.

5.3. Interpretation of land information utilization

There are some main factors that influence the type of utilization of land information in the public sector. Some of the factors are as follows;

- Physical planning and infrastructure development of rural and urban lands influence utilization of land information when thematic maps and topographic maps are used by planners to crosscheck the current land use zones with the proposed future spatial development if are in coherent with the land use policies and regulations and this results into law enforcement and development monitoring by utilizing spatial land information.
- Land market economic development and property transactions influence land information utilization in such a way that land and property owners market their properties indicating their properties location ,current land uses and land values for transactions to take place for example in acquiring loans and using their properties as collaterals commercial banks demands spatial information about these properties.
- Land ownership uncertainties and land boundaries conflicts between land owners influence land information utilization in such a way that politicians and decision makers to resolve the conflicts of lands between parties they have to get land information profiles of the cases in order to determine who owns what, when, how and to what extend for them to take appropriate and informed decisions that are not biased.
- Natural calamity and other disasters like the attack of September 11, 2001 as well as 2005 Hurricane Katrina and Tsunami in Asia influence land information utilization in such a way that emergence experts and rescuers prior to response they have to get and study spatial information for them to be able to decide where to start with rescuing and after events they rely on spatial information for reconstruction of the damage so in such situations land information is indispensable.
- Land management programmes and projects for land administration influence land information utilization in such a way that land administration systems are build through using land information for example databases of LIS can only exist if they are populated with information about land and this LIS facilitates access and easy utilization of land information in organizations that are dealing with land administration like municipalities and other spatial planning and land information management agencies such cadastre offices .
- Urban regulations enforcement and monitoring of land cover and land uses changes influence land information utilization when planners relies on the town planning schemes, land use plans, land policies and regulations for them to effect offences and do law enforcement inspection on lands and properties accordingly.

Williamson et al., (2006) refer to land information as a commodity that has a focus on security of tenure and simple land trading and it has the ability to transform the way government and private sector organizations do business. They refer to it as information about land parcels, land tenure land value and land use which is gathered by land professionals such as land surveyors, Land valuators and planners to build large scale, digital, cadastral databases data-bases. They defined it as information about basic land , property and cadastral information which is used by many different businesses in government for planning, taxization and land development . Some they refer to it as part of spatial information or geospatial information which plays a role during emergence planning and management duties for combating disasters and preventing losses. Those authors who use the term land information are those who are dealing with the issues about land tenure, land value , land use and management for land administration and are from land related institutions and organizations .,while those who use the term spatial information are those who deal with physical planning and management of infrastructures and those who use the term Geo- information are those who primarily deal with geo – ICT geographical information systems, remote sensing data etc.

According to Williamson (2001) there is an agreement between the functioning of land administration and land administration systems both depend on land information about land tenure, land value, land use and development and this forms the base for implementing land management policies. Thus land information regarded as a backbone for local authorities' revenue and better urban planning therefore in the absence of land information, the implementation of urban land management activities is highly hindered.
That alone could be a reason why land information utilization according to the sample data in Chapter 4, Subsection 4.2.5., and figure 8b appears mostly used at local levels of governments probably where public needs are enlarged and urgent. In most cases land information is referred be used for implementation of various public activities such as urban and rural physical planning, determination of land and property taxization, and is also used as evidence during tribunals of boundary uncertainty to facilitate decision making process and this type of uses make land information a key commodity to land administration as a discipline.

Murat et.al,.(2010) underscored the importance of land information utilization especially in countries that are in transition from conflicts to peace as in the case of Kosovo , cadastral data was used as the best record to define the border lines between the two countries Kosovo and Macedonia.
Land information is very useful in cases where stakeholders want to identify and mitigate risks to infrastructure and natural environment, to manage the build environment, to verify locations and to prepare for disaster, response and recovery.Implementation of most of public sector activities is highly depended on land information utilization to the fact that most of land professionals activities are implementable only through the use of land information, be it in rural or urban settings, despite that at local government levels land information is dominatey utilized than at other levels of governments because that is where many public activities are in demand for implementation by various stakeholders
With all type of land information utilization described I conclude that land information utilization is increasing time and again due to changes in society (market economics) and conditions of the world's cities and towns in terms of demand of services and resources that depend on land information .I am equally agreeing with the various authors who referred to the value of land information as key to wealthy.

In comparison to a theoretical argument by Akingbade et al., (2009) which stresses that geo –ICT generally advocated to contribute to the efficiency and effectiveness of organization of government as a way to improve public sector governance across developed and developing world, the argument seems to be matching with the current research findings. UN Initiatives conference on Global Geo- Information Management (2011) has as well noted that, new technologies have deeply transformed the availability and accessibility of geospatial information, therefore I find Geo-ICT to be a real influential partner of land information utilization and importantly for determining land information value in society. Most of the Authors especially from Europe and Asia are found to be in advocacy for the development of Geo- ICT infrastructures like SDIs, LII ,LIS and e-government because they believe that SDIs will change the way governments doing business in terms of managing land information for multiple purposes. Authors were awakened by the events of September 11 and Tsunami disasters when people were stuck of where to start with rescuing in the absence of land information through SDIs.

Now there is even a general agreement between planning communities, that open and easy access to current and reliable geospatial information is very crucial especially for local governments to be able to prepare, respond, mitigate, to global disasters. All the mentioned events make land information more crucial and usable in local authorities where events of mass destruction are prone to take place. Their focus is more on global context and influenced by the factor that the majority of Authors are affiliated to the Centre for Spatial Data Infrastructure and Land administration and FIG. Their concern is about the future development of land administration systems in highly developed countries with extensive experience in administration and capacity for good governance .They compare most successful cases in land management and administration for replication of models to less developed world. Thus most of research cases are cantered in Europe and Asia hence their countries are highly developed and feature more successful cases in land management and administration than other continents.

According to Anna (2008),states that the establishment of a digital cadastre system in Namibia has improved access, quality and usefulness of cadastral data .Therefore this proves the that geo -ICT influence land information utilization in public sector.
Land information utilization, appears at the grassroots levels as well where local land users like farmers, community leaders , financial institutions demand land information of any type for individual use and the degree of use differs from one geographic area to another due to diversity of the areas and environment.

Descriptive research approach and explanatory research approach were used than other approaches probably because of various interests of authors. 63 % of publications are giving the detailed account about land administration issues, and 21% how events occur and cause effects in relation to land information utilization types.Fifty five 55%) percent of 71 publications feature the use of land information in vector or raster formats which include land use and land cover maps, cadastral parcels, topographic maps, Orthophotos, Satellite images while forty five percent (45%) feature the use of land information in a text form which include spatial planning policies and regulations, building data, land use rights, restrictions and responsibilities and land registers. This means land information types are almost equally utilized despite that there is a slight disparity in use that could be related to the fact that most of the public sector activities that use land information are implementable mostly through using spatial data than non spatial data, the other reason

may be that of geo-ICT where land information is often accessed and used in graphical format than description. The overall sample results of the research study findings show that, there is land information utilization at all levels of government despite the differences in utilization in terms of utilization perspectives and who utilize it.

5.4. Trends over time

Land information concepts and utilization have been changing by the emerging of different activities and events that depend on land information more than before. The interest of the stakeholders in land matters has also increased through the years due to demands of technology and market economic developments. Enemark (2010) recommends that land information should be organised to combine cadastral and topographic data to link the built environment with the natural environment and it should be organised through SDIs at all government levels based on relevant policies for data sharing, cost recovery, access to data and standards. He further noted that in the 1980s the role of cadastral systems has evolved to be serving the need for comprehensive information regarding the combination of land use and property issues and in the course of information revolution, the concept cadastre received a new description as a parcel based and up to date land information system containing a record of interests in land (rights, restrictions and responsibilities). He stated that consolidation of land administration as a discipline in the 1990s reflected the introduction of computers and their capacity to reorganize land information.

The development and installation of new technologies in organizations is now common for example GIS, LIS, SDIs, LIIs facilitate the provision of spatial information to more people and this situation increase land information utilization. Williamson et al.,(2006) agree to the point that spatially enabled government can only be realized once the infrastructure is build that will allow the spatial enablement government information, services and business transactions and community activities be linked to locations. They see the relationship between new innovations of technology and the potential use of land and cadastral data. With the introduction of new technology they see the value of cadastral data going up out striping its traditional value of supporting simple land trading and delivering security of tenure.

The term land information has advanced in use with synonyms over years to date from information about land, land information, cadastral data, parcel data, spatial information, geo-information, geospatial information, and spatially enabled and information. Today practitioners seem to agree to the point that spatially enabled society demands accurate and timely information about land through economic demands which require public access to information and utilization of it due to the increasing value of land as well as increasing complexity of land related commodities (Wallace, et al., 2011) However the basic aspects of land administration where land information is mostly referred and defined to, remain static as information about land tenure, land value and land use and development.

In the course of 1990-1999 and backward authors were more concerned about land information for land reforms , resettlements ,land use planning, land titling to increase land ownership to tenants and laborers, integrated land use plans and management ;Environmental Impact Assessment, Computerization of land records, LIS ,Geo information in land administration. In a period of 11 years (2000-2011) land information

concepts became increasingly confined and land information utilization increased gradually. In 2004 /2005 the Centre for spatial Data Infrastructure and Land administration realized the concern about the future development of land administration systems as by then these systems were unable to sufficiently support the management and decision making needed about fiscal, environment and social issues. in highly developed countries so the experts in collaborative efforts commissioned a project on incorporating Sustainable Development Objectives into ICT Enabled Land administration in Australia Around 2000 authors like Williamson et al.,(2006) started to write about new roles and initiatives for managing land information in public administration and reengineering of land administration for sustainable development and good governance. They were prompted by the changes in the world about improvement in technology and infrastructure available to support modern land and resource management.

The other remarkable change is the pressure on managers by the increase of populations, environmental degradation, and water shortage in urban and rural areas that require governments to have accurate and comprehensive information than before (I. Williamson, et al., 2006). (Anand & Feick, 2009) Anand & Feick (2009) focused more on issues like the value of public sector information including land information as a whole to access , use, share and trade for socio- economic development . the significance of spatial information in mitigating and managing emergencies, new development in Geo -ICT Science / systems applications, digital cadastral databases(DCDB, Geo-portals, clearing houses and spatial decision systems, Participatory GIS ,Digital pen in mapping, Remote sensing ,GPS and Mobile GIS, to assist in pre impact planning , and monitor land use, 3D maps ,multipurpose cadastre to serve complex property markets. GIS was being used primarily for querying databases and generating maps but later on it became a support tool in spatial planning and management of environments with PSS, and SDSS(Anand & Feick, 2009).

Overtime authors define land information in different contexts but it is just the same complex commodity as they refer to it. Williamson et al. (2006) define land information in the context of its traditional roles of supporting security of tenure and simple trading of land. They advanced further to refer to it in the context of new initiatives and visions like Land Management vision, SDI vision and Land information vision (iLand) while Anand et al., (2009) refer to it in the context of Emergence Planning and Management at local government levels. Authors are more concerned with spatially enabling governments with new vision for organizing land information based on three cross cutting themes,1.Designing land management systems for sustainable development, 2, Building new technical support in land administration,3, Moving into spatial enablement technology to retrieve the value from land and spatial information .In the past land professionals use land information alone primarily in the context of social economic development but now they use it for various activities with various stakeholders as it its shown in Chapter 4,Subsection,4.2.6, figure 6a & 6b. Today there is even new emerging initiatives to manage land information like Australian initiatives, European union initiative and US initiatives to enable land information be accessible, shared across agencies and throughout nations and facilitate the delivery of spatially enabled society for sustainable development and good governance.

It is very clear that land information utilization is highly recognized for its multipurpose as it can be used for land and property location, identification of land ownership and land value so as for physical planning, mitigating and predicting of risks for recovery in

disaster situations and for management of built environments. The sample results make me think that land information utilization is happening at all levels of government however its utilization is different from one locality to another thus now it is a challenge for land administrators and land professionals to design and build modern land administration systems that will enable spatially society, but the good thing is there is a vision (iland) for managing land information now which I believe if achieved by governments will take land information utilization at high level than now.

5.5. Conclusions

The chapter has started off with statistical correlation and visual comparison of various attributes values in the database, then observe the trends over time about land information to locate various factors that associate with land information utilization to enable a clear interpretation of land information utilization in public sector. The core objective of this chapter was to find the answer to research question 4: what influences the utilization of land information? The answer is that land information utilization is influenced by many factors manmade and natural. Some of the factors are; the emerging of land disputes and conflicts whereby decision makers need to access and use comprehensive land information about who owns what, where, and how in order to take unbiased decision in resolving this type of cases. The other factor is the spatial development of urban and rural lands whereby planners have to utilize land information to ensure that land units are used for suitable land uses according to land use zone plans and in line with the land use policies and regulations. Preparation and response to natural disasters like floods makes land information valuable as emergence managers and experts can only react if spatial information is available in order to decide where to start off with preparation and rescuing. Land market increase and the development of geoICT contributes to the influence of land information utilization whereby land valuers and land surveyors, technology experts so as the land owners partake in land information utilization based on their needs.

Chapter 6: Conclusion

6.1. Introduction

This is the last chapter which presents the conclusion about the final results of the entire research study and recommendations for practitioners and the potential future research studies about land information.

6.2. Conclusion

It is important to show that this research has finally reached its destination in the sense that all research questions were systematically answered in line with the research objectives and research questions.

The first research question was to find where and how do practitioners and scientists describe how they refer to land information and the utilization of land information ?This question was answered in chapter 2, subsections 2.2 and 2,3 where publications were selected from various databases and the relevant text was captured into the excel for content analysis. And the answer is: practitioners and scientists use three main journals as their platform to describe and refer to land information utilization in the form of ISI articles, peer review articles and in reports captured during international proceedings about land administration. Journals are Land use policy; Computers, environment & urban systems and international journal of geographical information science.They describe land information using four research approaches; descriptive approach, explanatory approach, exploratory approach and analytical approach.

The second research question was looking for which categories and typologies of authors, views and utilization types can be made on the bases of these descriptions? This question was answered in chapter 3, subsection 3.2 and 3.3 whereby various categories were constructed and attributes related to various authors where captured into the excel data base table. And the answer isvarious authors were placed in four sub-categories based on origin of affiliation such Europe, Africa, Asia & pacific and America versus research methods they used. Other categories that were made are, activities associated to land information, geo-ICT tools and techniques, types of land information, types of land information utilization and group of stakeholders.

Research question 3, was looking for which groups of land information utilization types can be derived from the publications? The answer to this question is found in chapter 4, subsections 4.2.5 and 4.2.6 whereby types of land information and land information utilization types found in the various publications are described. And the answer is: three major groups of land information utilization perspectives were found in the descriptions namely, social perspective utilization whereby planners utilize land information such as land use policies and regulations, land use zone plans during planning and monitoring the environment to keep it conducive for human living, economic perspective utilization whereby valuers utilize land information to determine the land and property values, taxes and rates., technological perspective utilization whereby technology experts utilize land information in building up land information systems and updating them.

The 4th and last research question was looking for factors that influence land information utilization. The answer to this question is found in chapter 5, subsections 5.2.1 and 5.3 whereby various factors that are associated with land information utilization are discussed.

The answer is that land information utilization is influenced by many factors manmade and natural such as, the emerging of land disputes / conflicts whereby decision makers need to access and use comprehensive land information about who owns what, where, and how in order to take unbiased decision in resolving this type of cases. The other factor is the spatial development of urban and rural lands whereby planners have to utilize land information to ensure that land units are used for suitable land uses according to land use zone plans and in line with the land use policies and regulations. Preparation and response to natural disasters like floods makes land information valuable as emergence managers and experts can only react if spatial information is available in order to decide where to start off with preparation and rescuing. Land market increase and the development of geoICT especially in land administration contributes to the influence of land information utilization whereby land valuers and land surveyors, technology experts so as the land owners partake in land information utilization based on their activities and needs.

Since both visual interpretation and statistical correlations outputs suggests the same direction of land information utilization at all levels of government despite the variations of utilization levels from one spatial location to another, when I compare these outputs against the research questions given earlier , I seem to be satisfied and equally convinced that land information utilization is influenced by a number of independent variables so as by its causal factors listed in chapter 5, subsection 5.2.2 for example; the more emergence cases emerge the more planners and risk experts use land information to mitigate and rescue. All in all this results suggest that there are determinants of land information in public sector although there is still a need for future research to consider testing, observing, and proving in reality at multiple locations against the theoretical suggestions obtained from the 71 sample of publications and compare the cases in order to advance further the knowledge on the understanding of land information utilization in public sector at large.

The results predict high future potential use of land information by governments organizations on condition that land management and land information practices are continuously implemented in accordance with the global guidelines and directives in support of various visions form the international federation of Surveyors and Centre of Spatial Data Infrastructure and Land Administration.Therefore based on that my overall conclusion is that unequal demands and intake of land information by different users in different localities with different context for diverse uses influence land utilization at all levels of governments be it in rural or urban settings.

6.3. Recommendations for further research

1. To the fact that this research was limited to the study of literature with the time frame of article of 2000-2011 to reduce the number of articles of the research interest, of-course there might be articles older than that which may contain prominent information about land information utilization, nevertheless there is a need for further research to investigate how, when and who utilize land information in reality. I therefore recommend the future research to use the comparative case study method in order to compare various cases on how land information is utilized in organizations that are associated with land information utilization.
2. The additional crucial areas of further research are the legal policies implication on how land information should be utilized and also the focus on land

information stakeholders needs analysis and land information utilization institutional needs analysis.

3. The future research should initially ensure that the research focus is fitted well with the time frame available for the research and the research methods to be used are appropriate and suitable to answer the research questions in a limited time frame to avoid the adjustment of the research focus and methods in the middle of the research which is real time consuming and hinders the progress of the research hence the researcher has to readjust the focus and methods time and again.

4. This research has answered almost all research questions, however the answer for the fourth research question is not completely conclusive because there is a need to confirm and crosscheck the answer in reality using the other methods like case studies whereby research techniques like interviews, Questioneers and focus group can be applied.

5. This research is mostly devoted to existing and upcoming land managers and decision makers and land professionals who may need to use land information to execute various activities, because their knowledge of land information utilization types may not be available or sufficient due to various reasons such as lack of access to relevant information sources.

6.4. Recommendations for Practitioners

1. Land information with new buddle of rights, restrictions and responsibilities has really became a valuable commodity in the land market of today than before that brings wealth to governments and to citizens , however without an enabling technology platforms like internet, SDIs and GIS to link it to its producers with customers it remains a challenge to land professionals and land administrators to handle the situation alone ,therefore they should lobby governments to advocate and invest in the development of spatial data infrastructures that will allow access and electronic spatial service to citizens at any point in time.

2. The future of managing land information foresees challenges, towards land administration practitioners if they do not prepare to design and build modern integrated land administration, cadastral and mapping systems that use land information to spatially enable land administration systems which would serve the whole society and government , therefore land administration practitioners need to research more in order to find best practices in the world and be able to adopt to appropriate land information systems that suits the context of their localities hence situation differs from one geographic location to another.

3. The current direction of land administration and management is seen going spatially in support of new visions for spatial information management ,the use of the term land information is gradually disappearing in publications, one can only frequently find terms that refer to land information such as cadastral information, spatial information, 3d spatial information, spatial data infrastructure and land information infrastructures therefore land information stakeholders should be aware and think spatially to catch up with the current direction of land information management which is chasing technology development to enable commercial land information products and services for the whole society.

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Appendix 1: Selected publications for content analysis

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