

**UNIVERSITY OF NAIROBI**



**THE NICHE FOR PUBLIC PARTICIPATION GIS IN ICT DEVELOPMENT FOR  
LOCAL E-GOVERNANCE**

***CASE STUDY: MUNICIPAL COUNCIL OF RUIRU***

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**A project report submitted in partial fulfillment for the Degree of *Masters of Science in  
Geographical Information Systems (GIS)* in the Department of Geospatial and Space  
Technology in the University of Nairobi.**

**Department of Geospatial and Space Technology, School of Engineering**

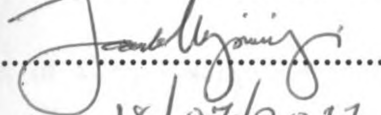
July, 2011.

## DECLARATION/APPROVAL

### *Declaration:*

This project report is my original work and has not been presented for a degree in any other university.

*Candidate:* **Mr. JOAKIM NYARANGI**


  
.....

*Date:* .....18/07/2011.....

### *Approval:*

This project report has been submitted for examination with my approval as university supervisor.

*Supervisor:* **Mr. D.K MACOCO**

  
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*Date:* .....18/07/2011.....

## ABSTRACT

The objective of this study was to propose a new model of public participation in planning and development of local governments using a web based GIS application supported by local authority's ICT development. It espoused Geographic Information System (GIS) implementation, through Public Participation GIS (PPGIS) for supporting decision-making in local government. In this report, the ICT development venture in the Municipal Council of Ruiru, Kenya, was used as a case study to bring out the need for enhancing active public participation in local development through a web-based GIS application.

The concepts of GIS, PPGIS and e-governance were defined and the role of PPGIS in complementing e-governance examined. This involved examining the public view of the ICT development for promoting e-governance implementation strategy in a local government as a base for further discussion. Special attention was given to analyzing the variables that influence the public perception of the development of the local authority's website, considering the needed input to promote public active utilisation of the site. .

It was concluded that PPGIS holds many opportunities to enhance active public participation and legitimize planning and development, thus promoting better local governance.

## **DEDICATION**

I dedicate this project report to the Almighty God for the strength and knowledge he has put in me.

I also dedicate it to my parents, my brother Duke Michieka and my adorable sister Stephanie Kerubo for the motivation they give me daily.

## ACKNOWLEDGEMENT

My first acknowledgment is to my supervisor, Mr. D.K. Macoco. His understanding, patience and commentary played a crucial role in the completion of this project report. May the Almighty give him more strength.

I am overwhelmingly grateful to James Waweru of Geospatial Synthesis limited, for modifying his web GIS application to create the *Par-Moja* PPGIS application which is the core of this project report.

I would like to thank Mr. Edwin Wamukaya for his support and review of the GIS technical aspects of the project report.

I would like to thank Ipasha InfoTech and the Centre for Sustainable Development-CSUD (Columbia University), for allowing me to use the data they collected in Ruiru Municipality as a basis for this project report. I particularly mention Daniel Kirui (Ipasha) and Jackie Klopp (CSUD) for their facilitation.

Finally I want to thank my uncle Frank Nyarangi, for the IT tutorials and assistance throughout my studies. May the Lord reward him for the generosity and facilitation he has accorded me.

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## DEFINITION OF KEY TERMS

The following terms have been thus defined for purposes of this study.

1. ***e-Governance*** – The on-line delivery of information and services related to a government entity, through the Internet or another digital outlet (West, 2000).
2. ***GIS*** – A computer hardware and software system designed to collect, store, manage, analyse and present spatially referenced information and its associated attribute data (USGS).
3. ***PPGIS*** – A GIS application to strengthen public participation in decision making, to promote community objectives, and to help communicate some location-based problems (Kingston and Smith, 2007; Sieber, 2006).

## ACRONYMS

<b>ASCII</b>	American Standard Code for Information Interchange
<b>CGI</b>	Common Gateway Interface
<b>CTG</b>	Center for Technology in Government
<b>EMS</b>	Electronic Meeting Software
<b>GIS</b>	Geographical Information Systems
<b>GIT&amp;S</b>	Geographic Information Technologies and Systems
<b>GPRS</b>	General Packet Radio Service
<b>HTTP</b>	HyperText Transfer Protocol
<b>ICT</b>	Information and Communication Technology
<b>IT</b>	Information Technology
<b>PGIS</b>	Participatory Geographical Information Systems
<b>PPGIS</b>	Public Participation Geographical Information Systems
<b>PSS</b>	Planning Support Systems
<b>SMS</b>	Short Messaging Service
<b>WFS</b>	Web Feature Server
<b>WMS</b>	Web Map Service
<b>WWW</b>	World Wide Web

# 1. INTRODUCTION

## 1.1 BACKGROUND

### **GIS and Public Participation in Decision Making**

Public participation legitimizes decision making, helps achieve higher effectiveness levels for the planning, and improves the quality of the content since each person has a different view (Bugs, 2009).

A growing body of research called Public Participation Geographic Information Systems (PPGIS) has emerged in the use of GIS and web-based mapping and analysis systems in participatory planning processes (Zhao, *et al.*, 2007).

PPGIS pertains to the use of GIS to broaden public involvement in policymaking as well as to the value of GIS to promote the goals of non-governmental organizations, civil groups, grassroots groups, community-based organizations and the general public.

PPGIS provides a virtual space for spatial analyses during municipal planning and development with public input (Wong and Chua, 2001).

Municipal planning and development is an important and complex decision making practice for every local (municipal) government. By-laws, public participation in planning and development related issues, are major concerns nowadays. These issues may be partially resolved with Web-based participatory planning approach. Holding public meetings or establishing online public information centers, with the help of Geographic Information System (GIS) and Web technology has been recognized as one effective way of gathering public input for the planning of municipal development projects (Tang, 2006).

## **ICT Development for Local Governance**

The social demand for participation in the planning process is on the rise and advancements in ICT enable citizens have a more active role in public service delivery. ICT development at local government level can be used to make the most of this demand through the emerging concept of e-governance.

Electronic governance (e-governance) is the use of ICTs to promote more efficient and effective government, facilitate more accessible government services, allowing greater public access to information, and making government more accountable to its citizens. This involves delivering services to the public via the Internet, telephone, public access centers, wireless devices or other communications and information systems.

Local municipalities are fertile grounds for the application of ICTs and e-governance. They are at the front lines of government in their service-oriented interaction with the public and business, often in transaction based systems with many, interlinked components. As such, municipalities have considerable potential to assist in the process of integration of ICTs into the daily lives of its citizens.

### **Project Context**

The Municipal Council of Ruiru (hereafter referred to as Council) with support from Ipasha (an ICT firm based at Nairobi), Department of Urban and Regional Planning (University of Nairobi) and Centre for Sustainable Development-CSUD (Columbia University), is currently carrying out a process of developing the Council's ICT system to enhance efficient governance of its area of jurisdiction.

The highlight target of the ICT system is creating a modern e-governance system which will be a tool for future better management, communication and decision making process to improve

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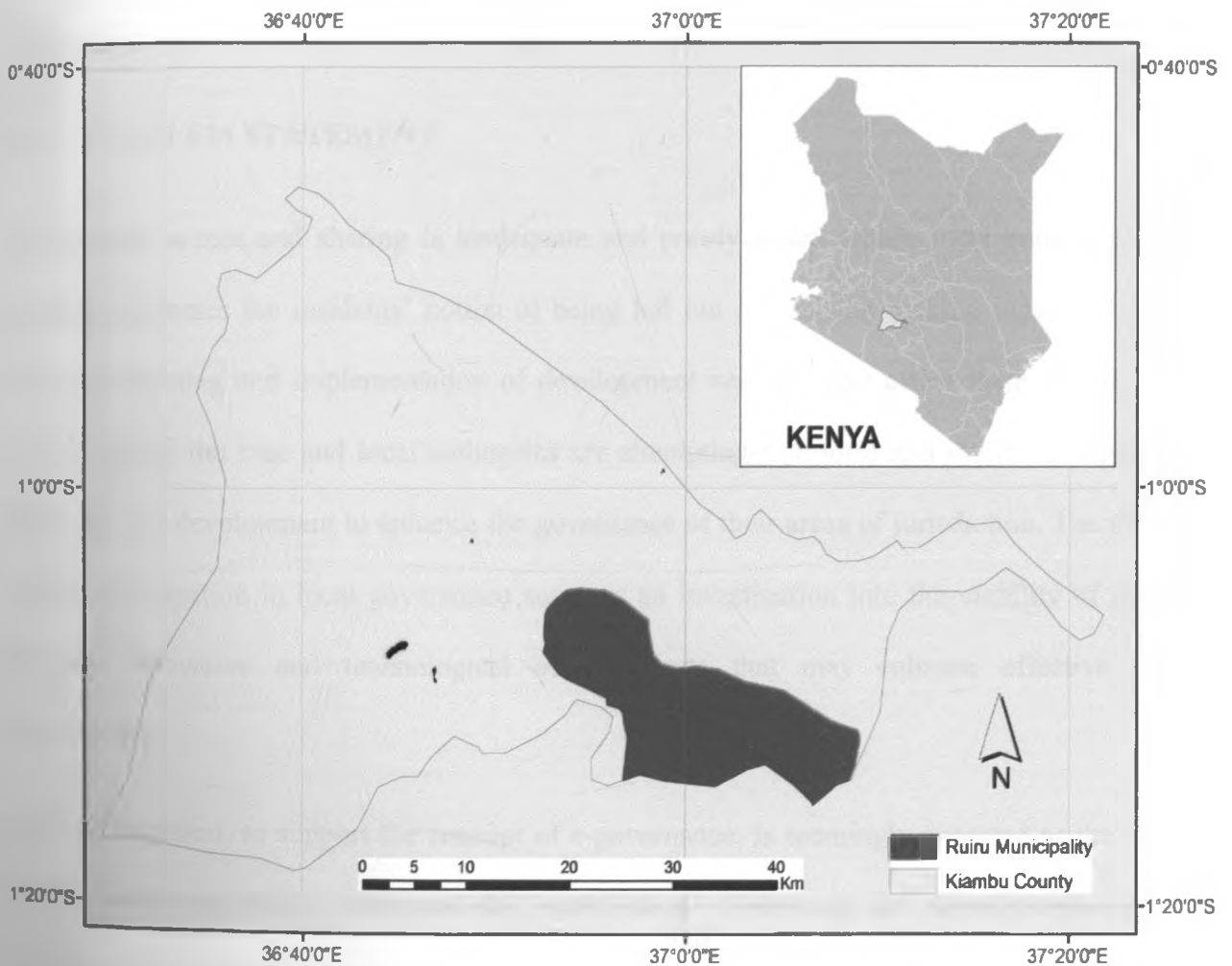
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The highlight target of the ICT system is creating a modern e-governance system which will be a tool for future better management, communication and decision making process to improve

services, reduce costs and facilitate professional customer's services while ensuring environmental protection.

This study aims at complementing the noble endeavour of the Council and supporting institutions by assessing the viability of a PPGIS, web-based GIS application and integration in the ICT development project. This assessment is important as PPGIS, which gives a public-owned impression of spatially referenced data, may enhance ownership, comprehensibility and usability of the proposed ICT system to both users and clients, more so for the local authority.



**Figure 1.1: Context Map of Ruiru Municipality (Source: Author, 2011)**

This would promote local authority governance in terms of enhancing the ability of the Council to create, change and implement public policy, by-laws and development programs and projects as well as enhancing mechanisms by which Ruiru Town residents and civil groups participate, define their interests and interact with the Council and with each other.

Kenya is becoming more literate and fundamentally embracing ICT even in public governance. Simultaneously, GIS is becoming increasingly important, globally, in enhancing communication, interaction and participation. It is also a relevant tool in governance, project monitoring and even marketing.

## **1.2 PROBLEM STATEMENT**

Information access and sharing is inadequate and poorly timed within local authorities. This situation endorses the residents' notion of being left out of decision making processes that go into the planning and implementation of development ventures that affect them directly. This should not be the case and local authorities are attempting to inform and involve the public in planning and development to enhance the governance of their areas of jurisdiction. The need for public participation in local governance supports an investigation into the viability of utilising modern innovative and technological advancements that may enhance effective public participation.

ICT development, to support the concept of e-governance, is seemingly accepted as the way to go in facilitating public awareness and participation in planning and development by local authorities. Supported by increasing knowledge and utilization of information technology by the public, rapid computer technology advancements and reducing costs of computer hardware and software, ICT development within local authorities is the fast, acceptable and affordable means



to enhance public participation. Participatory GIS attempts to utilise GIS technology in the context of the needs and capabilities of communities that will be involved with, and affected by, development projects and programmes (Abbot, *et al.*, 1998).

There is need to gauge, within the unanimous acceptance of ICT development for local governance, the acceptance of local governance stakeholders to the use of PPGIS in complementing ICT development ventures of a local authority and enhancing inclusive decision-making.

Though just making GIS available does not ensure participation, it is necessary to capacitate public to deal with GIS (Bugs, 2009). Technical GIS uptake has been hindered, majorly within local authorities, due to the expensive nature of GIS implementation, long duration to achieve tangible beneficial outputs after implementation and the concern that GIS reinforces top-down development planning. This is because GIS hardware, software, and data are expensive, require a high level of technical expertise, and are usually seen as 'expert' systems.

PPGIS uptake may be the paradigm shift in efforts to popularize knowledge and utilization of technical GIS especially in within local authorities of developing countries.

### 1.3 OBJECTIVES

The overall objective of this study was to develop and demonstrate a PPGIS web application, which facilitates public participation, to the key stakeholders of Ruiru Municipality. The application is to be tagged on the developed Ruiru Municipality website.

#### Specific Objectives included

- a) To explore the potential, constraints and the acceptance of the application of PPGIS technology to complement the Ruiru Municipality ICT development ventures for local e-governance.
- b) To evaluate if the public know, how well they understand and to what extent the application of PPGIS interests them and if it could strengthen public participation for decision making.

Table 1.1 gives an indication of the research questions that needed to be answered to achieve the objectives of the study.

**Table 1.1: Research Questions**

<b>OBJECTIVE</b>	<b>RESEARCH QUESTION</b>
<b>1. To develop and demonstrate a PPGIS web application, which facilitates public participation, to be tagged on the Ruiru Municipality website.</b>	<i>i. Will the application run?</i> <i>ii. Will the application support interaction between Municipal Council of Ruiru and the public?</i>

OBJECTIVE	RESEARCH QUESTION
<p><b>2. To explore the potential, constraints and the acceptance of the application of PPGIS technology to complement the Ruiru Municipality ICT development ventures for local e-governance.</b></p>	<p><i>i. Is the PPGIS application acceptable to both Ruiru Municipality and the public?</i></p> <p><i>ii. What aspects of the PPGIS application can and should be improved?</i></p>
<p><b>3. To evaluate if the public know, how well they understand, to what extent the application of PPGIS interests them and if it could strengthen public participation for decision making.</b></p>	<p><i>i. What technological means does the public use to access information and report issues the Municipal Council of Ruiru?</i></p> <p><i>ii. Would the public support an online, computer-based mechanism of accessing information and reporting issues to the Municipal Council of Ruiru?</i></p>

*Source: Author*

## **1.4 SIGNIFICANCE OF THE STUDY**

This research is timely in the sense that its findings will provide useful indications as to whether PPGIS and ICT development are complementary for the local governance of developing nations. The research comes at a time when Kenya is currently undergoing a change in governance structures attributed to the country's new constitutional dispensation. The current Constitution espouses a change in governance structure from the former centralised system of governance to the current devolved County governments. Though the scope is of a local authority, much smaller than a county, findings from this research may inform PPGIS uptake and its role in the overall ICT development of the highly competitive county governments.

At the start of this study, the Municipal Council of Ruiru ICT-development project was at its initial phases where the project team met the public and stakeholders to gauge and advocate for the acceptance of ICT at the Council. The same fora used to interact with the stakeholders were used objectively to assess PPGIS input, acceptance and integration to the project. This eliminated duplication of effort and methodology by filling in a gap that may give direction to the ICT project implementation.

## **1.5 LIMITATIONS OF THE STUDY**

The study was limited to the literacy levels, computer and internet knowledge and access of the Municipal Council of Ruiru civic leaders, staff and the public as well as to the level of cohesion between the two.

Methods from numerous disciplines have been adopted in the research, including, but not limited to, programming, geographical information science, system administration, and web design.

Obviously, there is no possible way to include a detailed description of each task that has been

performed during the project. Consequently, several topics have been left out that are beyond the scope of the study.

There is lack of case studies in PPGIS implementation in developing countries from which to make comparisons. The study will therefore utilize cases in the developed world despite the difference in the scenarios.

The PPGIS application demonstration and feedback was limited to participants from Municipal Council of Ruiru as well as to attendants of Focus-Group Discussions. However, an analysis of a business survey undertaken by Ipasha will be used in the study.

The survey is limited to a single geographic location. However, the findings do match extremely well in a number of key areas with broader surveys of other local e-government initiatives.

### **Outline of the Project Report**

Chapter one gives a foreword to the study, introducing the concepts of GIS, PPGIS and e-governance. The study context is given here. It also states the problem and sets out the objectives and significance of the study. Chapter two is a literature review of the concepts and Chapter three gives the conceptual framework that enabled the development of a web based PPGIS application.

Chapter four explains the materials and methodology used to collect information and give demonstrations to stakeholders of Ruiru municipality as Chapter five analyses the results and discusses the analysis. The thesis then concludes and gives recommendations for further research.

Table 1.2 gives an overview of the project report in form of a matrix.

**Table 1.2: Research Matrix**

<b>OBJECTIVE</b>	<b>RESEARCH QUESTION</b>	<b>RESEARCH INSTRUMENT</b>	<b>DATA SOURCE</b>
<b>1. To develop and demonstrate a PPGIS web application, which facilitates public participation, to be tagged on the Ruiru Municipality website.</b>	<i>i. Will the application run?</i>	<b>Literature Review</b>	<i>University Library Publications</i>
	<i>ii. Will the application support interaction between Municipal Council of Ruiru and the public?</i>	<b>Observation and Noting of Test runs</b>  <b>Close-Ended Questionnaire</b> <b>Video Recording</b>	<i>In-house Trial and error test runs</i>  <i>Stakeholder Workshops</i> <i>Focus Group Discussions</i>
<b>2. To explore the potential, constraints and the acceptance of the application of PPGIS technology to complement the Ruiru Municipality ICT development ventures for local e-governance.</b>	<i>iii. Is the PPGIS application acceptable to both Ruiru Municipality and the public?</i>	<b>Literature Review</b>  <b>Interview Schedule</b>	<i>University Library Publications</i>  <i>Interview with MCR heads of Department and committee chairpersons</i>
	<i>iv. What aspects of the PPGIS application can and should be improved?</i>	<b>Close-Ended Questionnaire</b>  <b>Video Recording</b>	<i>Stakeholder Workshops</i>
		<b>Observation and Noting</b>	<i>Focus Group Discussions</i>
<b>3. To evaluate if the public know, how well they understand, to what extent the application of PPGIS interests them and if it could strengthen public participation for decision making.</b>	<i>iii. What technological means does the public use to access information and report issues the Municipal Council of Ruiru?</i>	<b>Interview Schedule</b>  <b>Close-Ended Questionnaire</b>	<i>Interview with MCR heads of Department and committee chairpersons</i>  <i>Stakeholder Workshops</i>
	<i>iv. Would the public support an online, computer-based mechanism of accessing information and reporting issues to the Municipal Council of Ruiru?</i>	<b>Video Recording</b>  <b>Observation and Noting</b>	<i>Focus Group Discussions</i>

Source: Author

## 2. LITERATURE REVIEW

### 2.1 ICT DEVELOPMENT FOR E-GOVERNANCE

Government data are a public good and sharing the data is legitimate. It is, therefore, important to create an environment that facilitates that cause. This would be the first step toward minimizing the gap between technocracy and democracy (Haque, 2004). Drastic developments in ICT facilitate digital data and knowledge sharing of varied sizes over long distances. ICT may be effective in lowering at least some barriers involved in data and knowledge sharing.

Ruggles (1997) in his approach to identify ICT for knowledge transfer discerned three types of barriers that ICT overcomes: temporal distance, physical distance and social distance. Overcoming constraints because of temporal distance may refer to preserving knowledge over time. ICT may prove useful here in several forms, e.g. a knowledge base, thesaurus, or dictionary or when temporal distance refers to barriers in the present (e.g. problems in coordinating schedules) ICT may prove helpful in the form of Internet-based discussion groups or electronic meeting software (EMS). For instance, an electronic meeting concerning specific topics may be scheduled to run for a preset period. Participants may contribute to the discussion at a time when their schedule allows or their inspiration suggests.

By leveling temporal and spatial barriers, ICT may also facilitate new organizational forms for knowledge sharing, such as virtual knowledge teams. Overcoming social barriers, the third subclass discerned by Ruggles (1997), ICT may be of assistance here too, for instance, in the form of tools facilitating social translation (e.g. learning maps)

ICT is continually growing and increasingly being utilized by local authorities to enhance local governance. This ICT intensification can be attributed but not limited to reduced cost of

computer hardware and software, technological advances in computer hardware and software, user friendliness of software and availability of trained manpower. Trustworthiness of ICT, ease to update, saving of time and money despite initial high set up costs has also promoted ICT intensification (Haque, 2004).

Many of Municipal operations benefit considerably from the use of ICT, and indeed many of the large city municipalities in Africa already have substantial ICT systems in place. However there is almost no use of ICT in the interaction of local government with the public (Jensen, 2002).

It is probably this premise, coupled with increasing ICT utilisation, especially in urban areas, that is motivating local authorities of developing nations to develop ICT to facilitate e-governance.

The e-government is the use of ICT to promote more efficient and effective government by facilitating more accessible government services and allowing greater public access to information, thus making government more accountable to citizens (Malkia, *et al.*, 2004). This would involve delivering services to the public via the Internet, telephone, public access centers, wireless devices or other communications and information systems (Jensen, 2002). Melitski (2004) described e-governance as consisting of internet-driven innovations that improve citizen access to government information, services and ultimately equitable participation in government, a PPGIS application would espouse<sup>1</sup>this description.

The e-governance is part of a bigger movement toward public sector reform, which is driven by technology and information systems. Technology has the potential to take government to new directions and transform governance (Malkia, *et al.*, 2004). In their view, Goings, *et al.* (2003) see e-governance as growing in importance for providing government services, while reducing the delivered costs of those services. It enables agencies to lower their operating costs, provide faster service to clients, and eliminate redundant IT development across agencies.



A principle in e-government efforts is that government services should be citizen centered, not bureaucracy centered (Goings, *et al.*, 2003). Center for Technology in Government (CTG), 2003, observes that e-government increases accountability of agencies to citizens and improves access to data. Pascual (2003) states that e-government aims to enhance access and delivery of government services to benefit citizens while strengthening government's drive toward effective governance and increased transparency.

The concept of e-governance also, not only, increases citizen contact with elected officials, but also increases demands on the staff of government agencies (ICMA, 2002). The aspect of e-democracy is a distinct function of e-governance. It is defined as the use of technology for increasing citizen participation in government decision making. However, it is the least practised but one of the most prominently discussed in the literature (Carrizales, 2008).

The Working Group on e-government in the Developing World (2002) argues that the broad e-government vision stems from societal concerns, with priority areas depending "upon the specific conditions and ambitions of a society." To become most effective, e-government web sites, therefore, need to be organized around specific topics of consumer interest, they must include personalization features for repeat visitors, and they must provide cross-agency connections (Leigh and Atkinson, 2001). Americans use government Web sites to research public policy, e-mail public officials, investigate voting records, and participate in electronic lobbying (Greenspan, 2002).

In Africa, even in the larger municipalities, access to computers by staff is still not widespread and is usually confined to IT, secretarial and accounting personnel. As a result general use of email and the Internet for intergovernmental communications, decision-support, distance education/training and interaction with the public is still virtually unknown (Jensen, 2002).

African municipalities, generally, are under-resourced technically due to the low pay scales of IT staff, who presently are over-stretched. Training modules aimed at the executive in local authorities should be provided which focus on the institutional development required for the incorporation of ICTs across broader aspects of municipal work in the area of e-governance. This would include addressing the need for existing IT staff to have greater autonomy and broader job descriptions, in order to become less of an extension of accounting and financial services (Jensen, 2002).

## 2.2 GIS ROLE IN COMPLEMENTING E-GOVERNANCE

Spatial information plays an important role in decision making in different sectors, such as economic, environmental, political, and social aspects (McDougall, *et al.*, 2005). The collection of accurate and timely relevant spatial information has significant relevance in facilitating better-informed decision making process (Sutanta, 2010). Most government decisions and actions at local level which account for approximately 80% of local government activities according to O'Looney (2001) have a spatial component and thus would benefit from decision making evaluations that analyse phenomena spatially.

GIS is a decision support system involving the integration of spatially referenced data in a problem solving environment (Raju, 2006). Its technology is used to manipulate objects in geographic space, and to acquire knowledge from spatial facts. Raju (2006) sees one objective of a GIS as being to maximize the efficiency of planning and decision making. Zhao (2002) acknowledges that GIS has the capability to handle both spatial data and descriptive data of the spatial objects. Thus generating map and information management are two major functions of a GIS.

Geographic Information Systems have far-reaching implications in democratic societies. GIS has the power to show a snapshot of real life through maps to provide a sense of where you are and whom you are, compared to surrounding neighbours, communities, cities and other areas (Ventura, 1995). To get public services, schools, disaster management, transport, health services, clean water, you need to be on the map (Abbot Jo, *et al.*, 1998). Tereshenkov (2009) figures GIS affects nearly every aspect of modern local government work and helps provide a foundation for integrating municipal services. Ventura (1995) considered GIS as largely a public-sector technology.

Whether it is effective utilization of natural resources or sustainable development or natural disaster management, selecting the best site for waste disposal or optimum route alignment, all local problems have a geographical component (Raju, 2006). Thus GIS technology is explicitly employed in the development and implementation of public policy, in redistribution of funds, and in identifying communities for target-based intervention (Abbot Jo, *et al.*, 1998).

As GIS becomes widely used in spatial decision-making, there is concern that top-down development planning will be reinforced. This is because GIS hardware, software, and data are expensive, require a high level of technical expertise, and are usually seen as 'expert' systems. However, for GIS to become a "common person" technology that could be understood by ordinary citizens, including elected officials, users must limit the technocratising of GIS (Haque, 2001). There is need, as observed by Abbot Jo, *et al.* (1998) to attempt to utilise GIS technology in the context of the needs and capabilities of communities that will be involved with, and affected by, development projects and programmes.

There is also need to attempt to utilize technological advancements that enable higher access of the public to utilize GIS. This brings the concept of Web-based GIS.

## 2.3 WEB-BASED GIS

The development of GIS technology depends on the advances of computer technology. Thus, the advancement in the Internet and WWW technology brings new chance for the evolution of GIS (Chou, 2008). The Web, as it stands today, has allowed global interpersonal exchange on a scale unprecedented in human history. People separated by vast distances, or even large amounts of time, can use the Web to exchange or even mutually develop their most intimate and extensive thoughts and sometimes their most casual attitudes and spirits.

The Internet has some GIS functionality which can be executed online, allowing users to interact with maps and retrieve required spatial information from the underlying databases. This makes using WWW an efficient way to distribute geographic data to the public. Anyone who is interested in using the GIS resource can access it if one has connected to the Internet and knows the address of the useful websites (Zhao, 2002).

The introduction of Google Earth and Google Maps in 2005 had a significant influence on the public use and understanding of spatial information. These were followed by Microsoft Virtual Earth, Open Street Map and NASA World Wind. All of these online maps have created a critical mass of people who are aware of the use and power of spatial information in everyday activities. They can use online mapping application for various applications, such as looking for directions, finding addresses of restaurant or government building, and exploring environmentally interesting features, and much more (Sutanta, 2010). These developments enhanced the reality of Web-based GIS.

Web-based GIS can distribute GIS data and geo-processing tools to a broader range of potential users that the conventional GIS implementation may never reach. Furthermore, the flexibility of the Web-based GIS can create more user-oriented application to encourage the use of GIS

resources. The objective here is not only to use maps as tools for searching locations, but also to use them to look for various other types of information (Chou, 2008).

The purpose of Web-based GIS is not to translate conventional GIS functions into the website. Instead, it is the user's operation that is translated into the website to make an easily understood and used interface for the user to utilise the GIS resources (Zhao, 2002). Therefore, using Web-based GIS can improve the utility of GIS technology and GIS data to support decision-making in local government (Zhao, 2002).

Web-based GIS implementation in local government has the following advantages. First, the geographic data can be distributed to both government agencies and the public if the system is running on a server connected to the Internet. Second, centralized GIS database reduces the data redundancy and discrepancy. In case of updating the information, only one update on the central database is necessary thus no need for duplicated work. Third, flexible and user-oriented applications can be developed to improve the utility of the GIS resource and this is the essential part of the Web-based GIS (Zhao, 2002).

Using web-based GIS and communication tools for public participation, citizens and municipalities benefit from a more efficient "24/7" service, GIS-enabled communication and information-sharing platform (Sharma, *et al.*, 2009). With a web-based system, the public is at the end of an Internet connection that enables them to make comments and express their views in a relatively anonymous and non-confrontational manner when compared with the traditional method of making a point verbally in front of a group of relative strangers (Carver, *et al.*, 2001).

The concept of Web-based GIS is not so complex. On the server side resides the GIS database and applications to process the user's request. On the client side is a user interface within a web browser. Whenever a user submits a request, the server processes the request with the GIS

application program and returns the result to user's computer (Zhao, 2002). This concept is expounded more under the topic PPGIS Application Development.

## 2.4 PPGIS TO ENHANCE PARTICIPATORY LOCAL E-GOVERNANCE

Public participation should be a permanent part of the governance and development of communities. So the community can check constantly the planning, the municipality can avoid problems of unpopular policy with community and unnecessary costs, and planners can evaluate proposals on the way (Brink, *et al.*, 2007). The objective of the public participation is to enable the citizens to achieve a large number of benefits by becoming more actively engaged in their community with the objective of improving the local services of the city (Kingston, *et al.*, 2000). Kingston *et al.* (2000) further contends that, encouraging public participation is not easy. They observe that the traditional approach of public participation is to involve citizens in attending meetings or hearings. The potential problems of the traditional approach are that: (1) it tends to be dominated by vocal individuals who may have extreme views; and (2) it often takes place at specific times and locations which may pre-exclude certain people to participate

Public participation is required in many local development activities, not only because it will affect their living space, but it is mandated by government laws and regulations. As an example, Physical Planning Act, 1996 (Cap. 286) requires that information relating to physical planning should be made available to the public. It will ensure public understanding of spatial planning, encouraging active participation and minimizing potential law-breaching activities (Sutanta, 2010).

The key to new methods of delivering access to many public services are maps. Provision of full access to spatial and aspatial data, along with the appropriate tools with which to use it, may

greatly empower the general public. This gives the public greater opportunities of engagement, at a more equal level, with those bodies legally entrusted with decision making powers at local, regional, and national scales (Carver, *et al.*, 2001). Visualization and simulation tools have a long history in planning and public participation efforts, often used as part of larger "Planning Support Systems" (PSS) (Brail and Klosterman, 2001). PSS embrace the use of computers to aid planning efforts which go beyond geographical information systems.

GIS has become crucial to public policy making because of its facility to combine and then analyze geographic data from diverse sources. Geographic information systems (GIS) and geographic information technologies (GIT) are increasingly employed in research and development projects that incorporate community participation. PPGIS explicitly situates GIS within participatory research and planning and, as a result, local knowledge is incorporated into GIS production and use (Weiner, *et al.*, 2002).

Public Participation GIS (PPGIS) is the GIS application to strengthen public participation in decision making, to promote community objectives, and to help communicate some location-based problems (Kingston and Smith, 2007; Sieber, 2006). It may serve as a social tool, not only for specific participatory planning, but for e-governance or any spatially related issue involving community. PPGIS uses online interactive mapping as a new method for a specific focus on how citizens can register their complaints of basic public amenities.

PPGIS have been suggested as one effective technology to encourage public involvement in environmental planning (Ball, 2002). Essentially, PPGIS is a bottom-up approach through which local citizens' concerns and knowledge can be presented by utilizing GIS as a tool (Harris, *et al.*, 1995). It incorporates end users, research subjects, and researchers into a collaborative environment where GIS are structured under the guidance of both the expert and the novice. One

intended result is that are GIS appropriate to the needs and uses of a given community, with specific attention to the cultural underpinnings of that community (Kemp, 2008).

The idea behind PPGIS is empowerment and inclusion of marginalized populations, who have little voice in the public arena, through geographic technology education and participation. The potential outcomes of PPGIS uses can be applied from community and neighbourhood development to environmental and natural resource management (Sharma, *et al.*, 2009). The system generates a geo-referenced database which allows local bodies to monitor the types of complaints being reported. This allows the city's local governing body council to map and monitor the spatial location of the different types of service enquiry in real time allowing them to investigate persistent problems and target resources to appropriate parts of the city.

PPGIS has evolved as an intersection of participatory planning and Geographic Information Technologies and Systems (GIT&S). It makes use of increasingly sophisticated approaches.

In inner cities and indigenous communities where technical competency and cost have been barriers to GIS implementation, PPGIS applications occur within several organizational arrangements including: community, university partnerships with inner city communities (Ghose 2001; Craig and Elwood, 1998); grassroots social organisations (Sieber, 2001); and Internet-based PPGIS (Carver, *et al.*, 2001; Craig, *et al.*, 2002). These organisations combine GIS with a host of modern communication technologies to facilitate dialogue and data usage among local groups. Equity issues are frequently addressed, particularly the spatial implications of 'environmental justice', usually closely associated with discriminatory zoning of ethnic groups (Rambaldi, *et al.*, 2005).



## 2.5 CASE STUDY

McCall and Minang (2005) in their research to assess participatory GIS for community-based forestry management in Tinto, Cameroon, found that PGIS/participatory mapping processes contributed positively, though not comprehensively to good governance, by improving dialogue, redistributing resource access and control rights, though not always equitably, legitimizing and using local knowledge, exposing local stakeholders to geospatial analysis, and creating some actor empowerment through training. PGIS promoted empowerment by supporting community members' participation in decision making and actions, and by enabling land use planning decisions beyond the community forestry itself.

When participatory mapping and PGIS interventions are aimed at mediation and empowerment purposes, the outcome from combining insider and outsider knowledge of the problems and potential solutions should be expected to lead to greater competence, fewer wasted efforts and increased efficiency.

They identified that articulating PGIS at the local level is more effective than relying on conventional mapping and GIS. PGIS is believed to have the capacity to simultaneously meet the content needs, answer the questions asked of the geo-information, and address and satisfy the local stakeholders' underlying interests.

The study found that the PGIS and participatory mapping processes contributed – positively, though not comprehensively – to good governance, by improving dialogue, legitimizing and using local knowledge, generating some redistribution of resource, access and control rights, and enabling local community groups by means of new skills training in geospatial analysis. PGIS further empowered people by supporting community members' participation in decision-making and mapping actions, and by enabling land use planning decisions beyond community forestry

itself. There were, however, only slightly progressive impacts on equity within the community, either in terms of differential resource access rights, or of full ownership of digital GIS outputs.

The community felt empowered by the PGIS usage and deep consultations to protect a sacred area of the forest, demonstrating the capacity of 'working with maps' for engaging debate on sensitive issues and enhancing accountability. The study demonstrates that, when it is the good governance criterion, chiefly participation, which is recognized as the primary concern and goal, both underlying and overriding the specific objectives of producing precise or detailed maps and GIS products, then participatory mapping and PGIS are acceptable, productive, reliable and effective tools to support and strengthen participatory spatial planning and management.

The key point of PPGIS is public participation so that the PPGIS application should basically provide comfortable and easy interface to users which is accomplished by visualising the GIS data and customize the GIS services (Sharma, 2009). Here, GIS serves only as a means to enable and enhance public participation; its technical part will not be stressed.

To achieve this objective, a PPGIS application is developed to be tested in Ruiru Municipality.

### 3. CONCEPTUAL FRAMEWORK

#### 3.1 DEPEDENT VARIABLE

##### **Effective ICT for Participatory e-governance**

Positive public participation in local governance should be enhanced so as to complement planning and development of local authorities, as well as facilitate more effective service delivery by the local authorities. According to Prasannakumar (2007), effective public service delivery is one of the parameters to measure the goodness of governance.

E-governance facilitates the delivery of government services to the masses through procedural simplicity, speed and convenience. Its goals for service delivery enhancements embrace a commonsense approach that replaces an organizational perspective with customer orientation, providing access, convenience, and choice to citizens and businesses seeking information or services from government (Dawes, 2008).

As the ultimate goal of good governance is the betterment of the lives of the citizens, the advancement in the technological fields are useful for good governance if people could be provided with prompt adequate and timely services through information technology (Prasannakumar, 2007).

ICT is a tool of efficient public service delivery as it offers new possibilities for establishing all kinds of links between people and organization. This is mainly because for communication by means of information technology time, place and physical presence are no longer essential. It increases the quality and quantity of interaction with people. It enhances the transparency and access to organization.

## 3.2 INDEPEDENT VARIABLES

### Internet Access

Technology has a leading role to play in the way the public participates in the everyday running of their communities. The internet is central to this vision and will generate a new public sphere supporting interaction, debate, new forms of democracy and 'cyber cultures' which feed back to support a renaissance in the social and cultural life of cities (Carver, *et al.*, 2001).

Developments in computer and internet technology, especially web 2.0, over the years have also created an online environment that facilitates two-way communication through the web (Carver, *et al.*, 2001). Internet web 2.0 offers dynamic and two-way communications between data providers and their users. Users can provide input to the published spatial information. This marks the era of social networking and community participation (Sutanta, 2010).

The proliferation of the internet as a communications medium over the last decade has provided many new opportunities to disseminate public information. Using the internet to transact with government has a significantly positive impact on trust and external political efficacy (Parent, *et al.*, 2004). Through the internet, government agencies can be integrated and well as be consulted making it possible to share information. It makes boundaries of a government agency become electronically permeable (Prasannakumar, 2007).

ICT, in concept, distributes processed information on a global scale, as compared to IT which is localized and is used for processing information for decision-makers and clients (Elahi, *et al.*, 2011). Thus internet access is directly proportional to effective ICT; this is in aspects of internet spread, cost and connection speeds.

## **Public Engagement in Development Processes**

Citizen engagement in development processes, according to Dawes (2008), includes accessibility and usability of technologies and information content, public interaction with government, public discourse on political topics, and public consultation, or the processes of engaging people in the agenda-setting process.

Positive public engagement requires reform, with an emphasis on accountability, transparency, and trust, on the structures and processes of government. Dawes (2008) also views reform to the roles and responsibilities government delegates to the private and non-profit sectors for carrying out public functions so as to enhance public engagement. This would address the culture of government and the way the public service perceives its role with respect to governance, citizens, and society (Dawes, 2008).

To facilitate public engagement in development, within the context of e-governance, there is need for the capability-building of ICT personnel and mindset-building of the public. Strong multi-stakeholder participation, which includes the citizenry, is also necessary to strengthen support (Elahi, *et. al.*, 2011). Since type of information to be shared on a government agency website affects public engagement in development processes, this would enable adequate and relevant web content development.

Elahi, *et. al.*, (2011) views e-governance as pertaining to integrating ICT systems into the activities of government agencies that would make them more transparent, participative, predictive, and accountable. This shows that public engagement in development processes has a directly proportional relationship with effective ICT for e-governance.

## Application Software

The application software is the heart of an e-government project. More often the e-government projects tend to be hardware driven rather than software driven. This is to show physical and financial progress ignoring the functional progress (Prasannakumar, 2007).

Humans must communicate with the computer via a user interface. Application software, therefore, needs to have suitable interfaces depending upon the activity and the degree of technical ability of the user. Software applications need to provide a user friendly interface to the users. User friendliness of application software is also necessary such that a user does not have to remember all commands. A software application needs to be easy to learn with minimum training and suitable for users with lower IT skills (Ogmore School AS ICT Theory Notes).

It is significant that application software designing complements easy usage of the software by mostly low skilled IT users. The fundamental principle behind design of application software is that it should use existing services and technology, while allowing the end user to enjoy as much value associated with the service as possible. (Van de Kar & Verbraeck, 2007).

According to Ochieng, *et. al.*, (2011), to enhance the effectiveness of ICT for e-governance, application software needs to provide the following service

- Services through which users can *compose* online service request,
- Services for *submission* and *communication* of requests among the users and stakeholders,
- Services for *processing* online service requests,
- Services through which users can *query* and *report* service results,
- Services for *user authentication*; services for *audit trail*;

- Services through which users and stakeholders can engage in *secure transaction*;

Close attention to software development and application to meet the design of the ICT system, is an integral part of the success factor in promoting ICT development for enhancing e-governance, Elahi, *et. al.*, (2011). One should start with e-governance applications offering win-win option for both the employee and the government agency.

## **4. METHODOLOGY**

### **4.1 STUDY AREA**

The study area chosen as a research site for this study was Ruiru Municipality in, Kiambu County, Kenya. It was selected because of the currently on-going project by the Municipal Council of Ruiru to enhance its ICT to facilitate e-governance. The proximity of the Municipality to Kenya's capital, Nairobi, also made it ideal for this study. This was at the assumption it may have similar or access to similar ICT prowess as the city. The ICT development project aimed to consult the people of Ruiru Municipality on ICT development at the Council to enhance e-governance. This attribute made the Council ideal as this created an opportunity to assess if GIS can be incorporated in local authority as part of ICT development for e-governance. It also presented an opportunity to find out if PPGIS has space in e-governance development especially for a developing nation.

Although the generalising of the findings is limited, this study nevertheless contributes to GIS uptake for e-government research because it differs methodologically from previous studies.

### **4.2 DATA SOURCES AND TOOLS**

#### **Data Sources**

The study employed both primary and secondary data collection methods.

Literature review espoused the secondary source of data. It looked into secondary data in terms of case studies and literature on PPGIS applications in other areas aimed at either promoting e-governance or public participation in planning and development. Learning on PPGIS research and applications elsewhere gave direction to how the study was conducted.



The Jomo Kenyatta Memorial Library (JKML), at the University of Nairobi and the World Wide Web (WWW) were sources of secondary data.

Primary data utilised in the study was collected through surveys, interviews and group discussions conducted within Ruiru Municipality. This was done by Ipasha InfoTech Group on behalf of the Centre for Sustainable Development-CSUD (Columbia University). The data was collected in form of filled questionnaires and reports of Focus Group Discussions.

### **Tools**

The Jomo Kenyatta Memorial Library search engine and a laptop with wifi connection capability were utilised in collecting secondary data.

Survey methods utilised centered on the use of qualitative and quantitative data collection approaches. Focus Group Discussions, a form of qualitative research method, was used in eliciting the opinion of public through interest groups on the various subjects of discussion. This solicited key stakeholders' opinions and knowledge on e-governance and public participation in governance as well as evaluating public knowledge, understanding, interest to the application of PPGIS and its potential to strengthen public participation for decision making, through the use of questionnaires and focus group discussions. In-depth discussion with industries and other key stakeholders were also carried out.

Focus group discussions, unlike individual interviews, provide the added dimension of the open and free interactions among participants. The method was used as key in promoting open expressions from the public on the ICT tools in discussion and bringing out the opinion of the participating groups on use of the tools for enhancing planning and active participation in the development of the municipality.

The structure of the discussions ensured that the expectation of the participating groups on the council was captured. The targeted groups participating in the focus discussions included:

- Community Based organizations and Civil Society Groups
- Businesses – enterprises (whole and retail shops, kiosks and other form of small scale businesses), and industries such as Brookside, Spinners and Spinners
- Resident Associations
- Council – council administrative staff (departmental level) and the civic leaders

Survey questionnaires were employed during a survey of the business community in Ruiru Municipality in defining the needs for e-governance, gauging knowledge and utilisation of ICT and GIS and evaluating public knowledge, understanding, interest to the application of PPGIS and its potential to strengthen public participation for decision making.

An observational evaluation assessed the behaviour and reactions of stakeholders and participants when giving views on ICT development for e-governance within Ruiru Municipality.

A formal presentation of a PPGIS application was made to the Town Clerk and technical staff of the Council to assess how Council intends to use ICT as well as how well they understand it and to what extent the application of PPGIS interests them and if it could strengthen public participation for decision making.

Data capture methods for this testing included observation of users during the simulation and feedback sessions, video-recording of participant interactions, audio recording of participant during interaction, participants' post-hoc comments and participants' feedback and rating scale.

### **4.3 DATA PREPARATION**

The collected data was screened for accuracy. Errors identified were clarified based on the reports of the discussion forums. The preparation process followed involved:

#### **Questionnaire Checking**

This verified that all important questions answered. Unacceptable questionnaires were eliminated. These questionnaires were either incomplete, missed pages or had instructions not followed.

#### **Editing**

Here illegible, incomplete, inconsistent and ambiguous answers were corrected. Missing contextual information was added to questionnaires that lacked the information

#### **Coding**

Responses were coded to facilitate application of statistical techniques.

#### **Cleaning**

The data was reviewed for consistencies.

#### **Analysis Strategy**

Data was prepared and analysed using the Statistical Package for Social Sciences (SPSS) and presented in form of graphs.

Observation and comments and unanimous agreements made during Focus Group Discussions were noted down and are presented within the context of prepared graph to compliment the findings.

#### 4.4 PAR-MOJA PPGIS APPLICATION DEVELOPMENT

The PPGIS concept is to incorporate the notion of “participation” in geographic information systems and then develop the interactive platform for people to deliver information. Using advanced techniques, all necessary spatial information can be clearly displayed on an electronic map (Tsai, 2006).

This *raison d'être* enabled the development of the “*Par-Moja PPGIS*” prototype application. Its name is coined from the Swahili word *Pamoja* which means oneness. It is, however, a-prefixed and pronounced with the word “Par” which means equality. Thus the prototype application is developed to postulate equality and oneness between the authorities and the public in local government development and management.

An electronic map with interaction capabilities demonstrates the ultimate objective of Public Participation GIS. Thus, PPGIS is defined as a system to create an electronic map based on GIS for public use. Along lines of the Web 2.0 technologies, web users can create POI (Point of Interest) on an electronic map, add corresponding description, and even include photos sharing personal experiences (Chou, *et al.*, 2008). The electronic map platform enables people to write comments, upload pictures, and share data with others. As the map platform receives continual contribution from the public, the information on the platform has a high probability to remain up-to-date. More importantly, public participation and the ultimate contribution to the platform result in high interactivity of the map (Figure 3.5). Thus, the platform based on the concept of PPGIS serves as an effective community platform as well as a communication tool, hence changing the way location have hitherto been searched (Liao, 2006). The public can provide comments on published maps and returning new thematic information.



**Figure 4.1: The Concept of PPGIS** (Source: Liao, 2006)

The PPGIS system is based on the Open Geospatial Consortium compliant Web Map Server (WMS) technology and supports a range of spatial data formats including ESRI Shape files, MapInfo and various raster data format such as geoTIFF. It also has functions for the inclusion of further geospatial layers to show relevant spatial policy data and information, etc. It makes use of Common Gateway Interface (CGI) executable files for the processing and management of user comments and feedback using the PHP scripting language. (Sharma, *et al.*, 2009).

#### 4.5 EVALUATION OF THE PAR-MOJA PPGIS APPLICATION ON WWW

The key point of PPGIS is public participation so that the PPGIS application should basically provide comfortable and easy interface to users which is accomplished by visualising the GIS data and customize the GIS services. A web page is used as a form to collect the user's request. Then the web server processes the user's request and returns the result to user's web browser.

For example, on the website for path finding, user types the address into the request form, the server processes user's request and returns the description of the path and a map to user's computer.

What are essential to the WWW are network protocol, hyperlink, and Uniform Resource Locator (URL). Generally, each website has a unique address on the Internet. It is called as Uniform Resource Locator (URL). The Internet user can reach the website by using this unique address. Each website is made up with a number of web pages that are interconnected with hyperlink. Desktop applications can connect either through Hyper Text Transfer Protocol (HTTP) to GIS web services running in the web server, or connect directly to the GIS server over a LAN or WAN. The network protocols allow the Internet user to move from one web page to another with the hyperlink in the web page (Zhao, 2002).

However, there is a more technical process through which GIS web mapping goes through and this is best summarized in a flow diagram of a working system (Figure 3.6) expounded below.

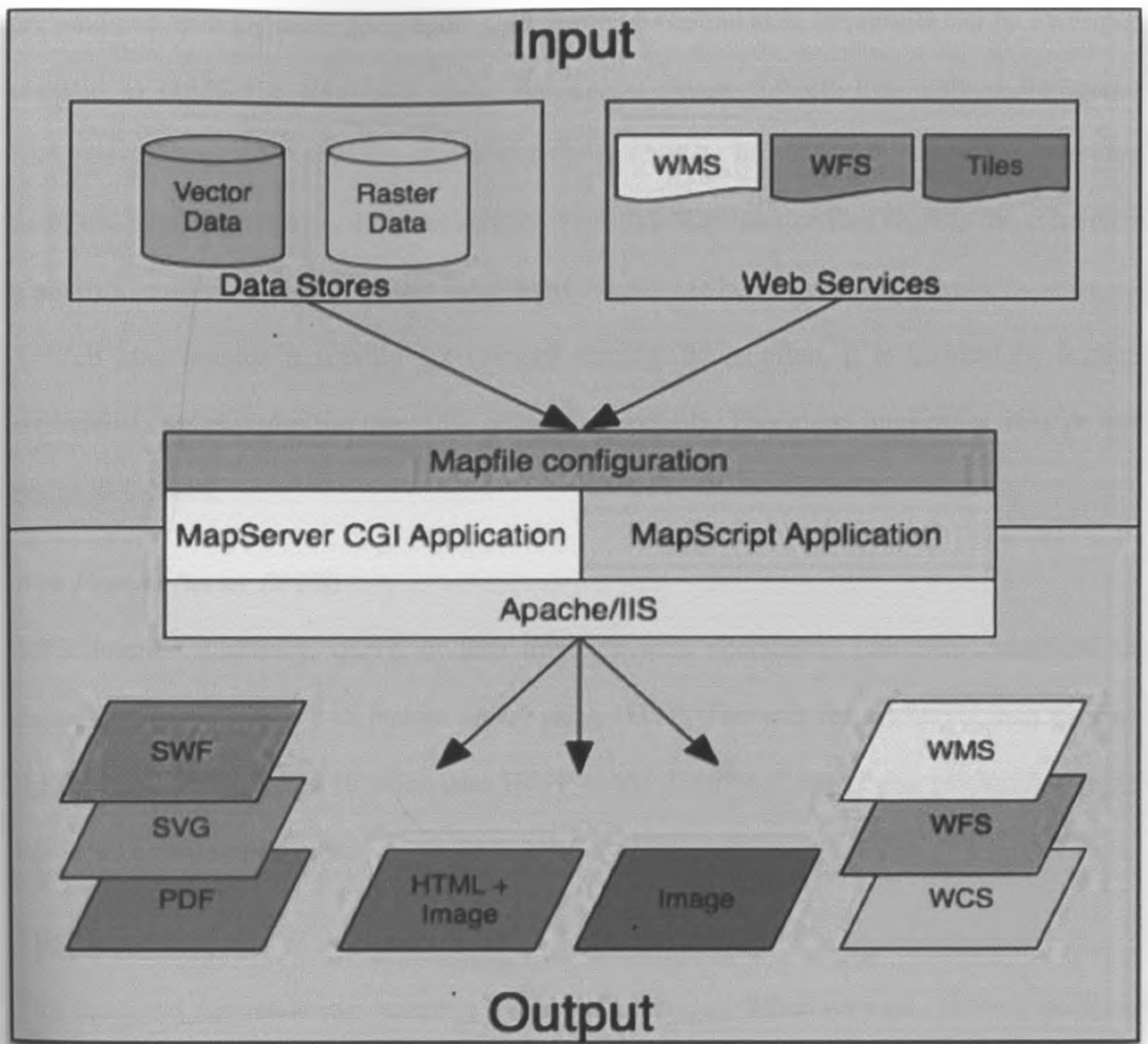


Figure 4.2: Flow Diagram of Working System (Source: Sharma, et. al., 2009.)

### Web Map Service (WMS)

Web Map Service operations can be invoked using a standard web browser by submitting requests in the form of Uniform Resource Locators (URLs). The content of such URLs depends on which operation is requested. In particular, when requesting a map the URL indicates what information is to be shown on the map, what portion of the earth is to be mapped, the desired coordinate reference system, and the output image's width and height. When two or more maps

are produced with the same geographic parameters and output size, the results can be accurately overlaid to produce a composite map. The use of image formats that support transparent backgrounds (e.g., GIF or PNG) allows underlying maps to be visible. Furthermore, individual maps can be requested from different servers. The Web Map Service thus enables the creation of a network of distributed map servers from which clients can build customized maps.

A Web Map Service is usually not invoked directly. More often, it is invoked by a client application that provides the user with interactive controls. This client application may or may not be web-based.

### ***Web Feature Server (WFS)***

WFS describe discovery, query, or data transformation operations. The client generates the request and posts it to a web feature server using HTTP. The web feature server then executes the request. The WFS specification uses HTTP as the distributed computing platform, although this is not a hard requirement.

### **Tile**

This facilitates fast rendering, zooming in and out of images. When we zoom in some particular area of map then whole map will not zoom but that particular area will get zoomed only.

### **Map File**

The .map file (or map file) is the basic configuration file for data access and styling for Map Server. The file is made up of different objects. Each object has a variety of parameters available for it. All .map file parameters are documented in the map file reference. A simple map file example displaying only one layer follows, as well as the map image output:

A map file is a text file that contains the following information about the program being linked:



- The module name, which is the base name of the file
- The timestamp from the program file header (not from the file system)
- A list of groups in the program, with each group's start address (as section: offset), length, group name, and class
- A list of public symbols, with each address (as section: offset), symbol name, flat address, and .obj file where the symbol is defined
- The entry point (as section: offset)

## Map Script

This is language agnostic documentation for the MapScript interface. This document is intended for developers and to serve as a reference for writers of more extensive.

## Apache Tomcat:

It is a servlet container developed by the Apache Software Foundation (ASF). Tomcat implements the Java Servlet and the Java Server Pages (JSP) specifications from Sun Microsystems, and provides a "pure Java" HTTP web server environment for Java code to run. Tomcat should not be confused with the Apache web server, which is a C implementation of an HTTP web server; these two web servers are not bundled together. Apache Tomcat includes tools for configuration and management, but can also be configured by editing XML configuration files.

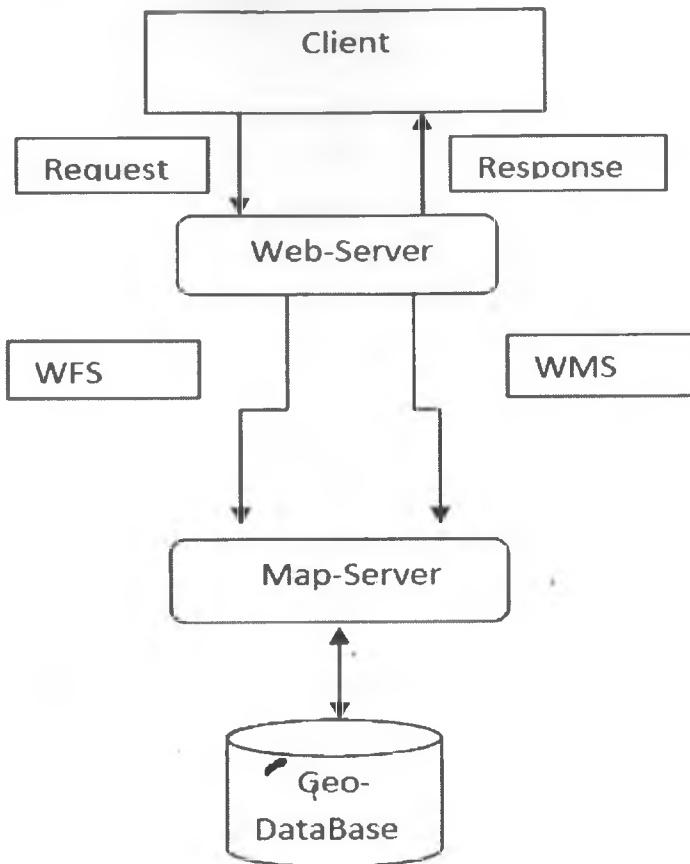
## Components of the Application

The major components of the application architecture can be summarized as:

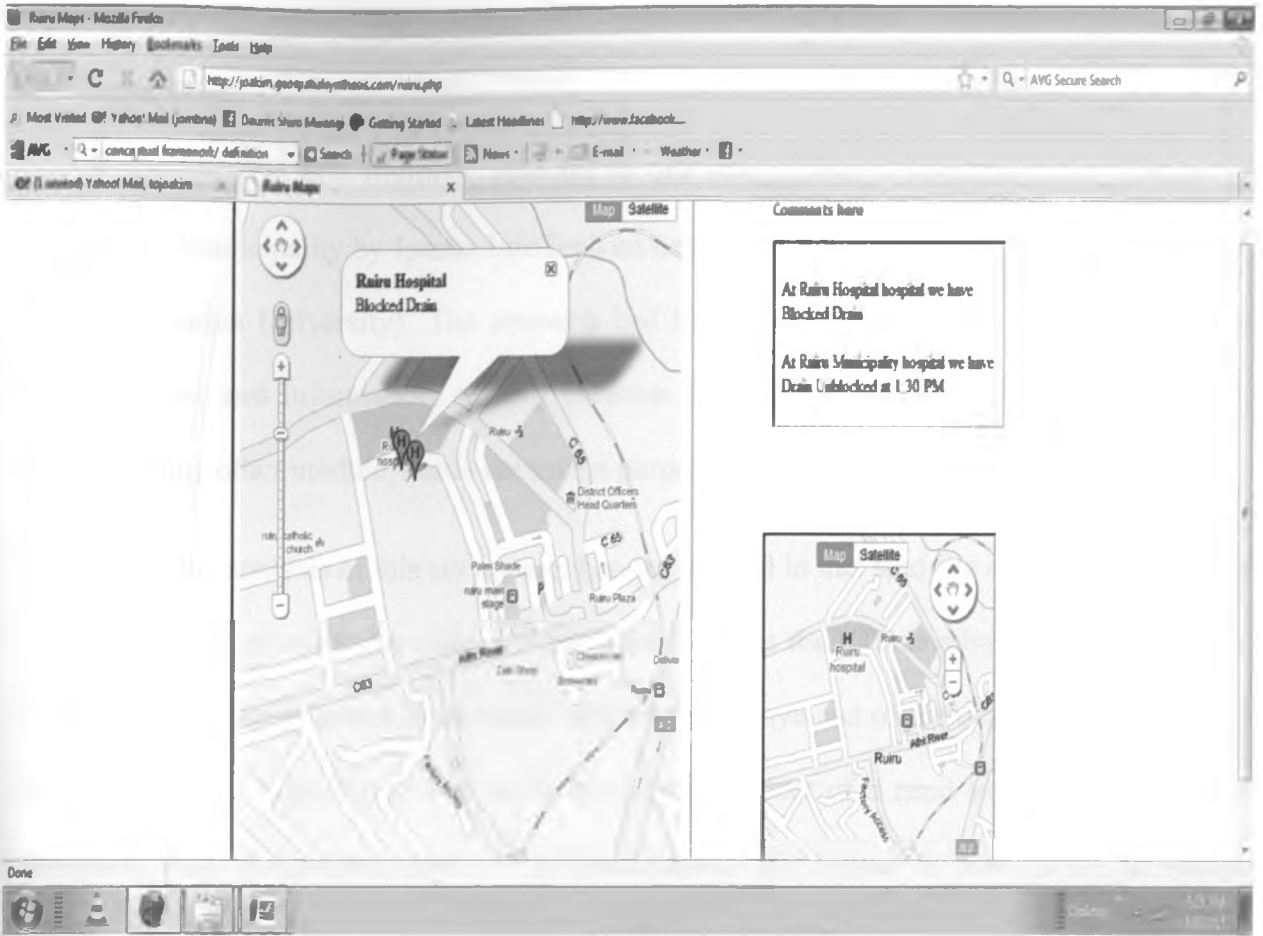
- Map Server—Hosts and runs services. The GIS server consists of a server object manager (SOM) and one or more server object containers (SOCs).

- Web Server—Hosts Web applications and Web services that use the objects running in the GIS server.
- Clients—Web browsers can be used to connect to Web applications running in the Web server. (Sharma, et al., 2009)

Figure 3.7 gives a principal flow of how these components are inter-related.



**Figure 4.3: Principal Flow Chart** (Source: Sharma, et al., 2009.)



**Figure 4.4: Browser View of the *Par-Moja* PPGIS Application (Source: <http://joakim.geospatialsynthesis.com/ruiru.php>, 2011.)**

The *Par-Moja* application (Figure 3.8) has two map views, the smaller windows allows input of data and query. One clicks on a point of interest on the map and a pop-up dialogue appears where one inputs the commentary or query and saves once done.

Once the comment is saved and the application refreshed, the comment given is displayed on to the larger map window and the blog spot to the right. Subsequent comments follow on the blog with respective query input and commentary.

Queries, comments and data are saved on a backend database that facilitates perpetual analysis of data given throughout the process.

## 5. RESULTS AND DISCUSSIONS

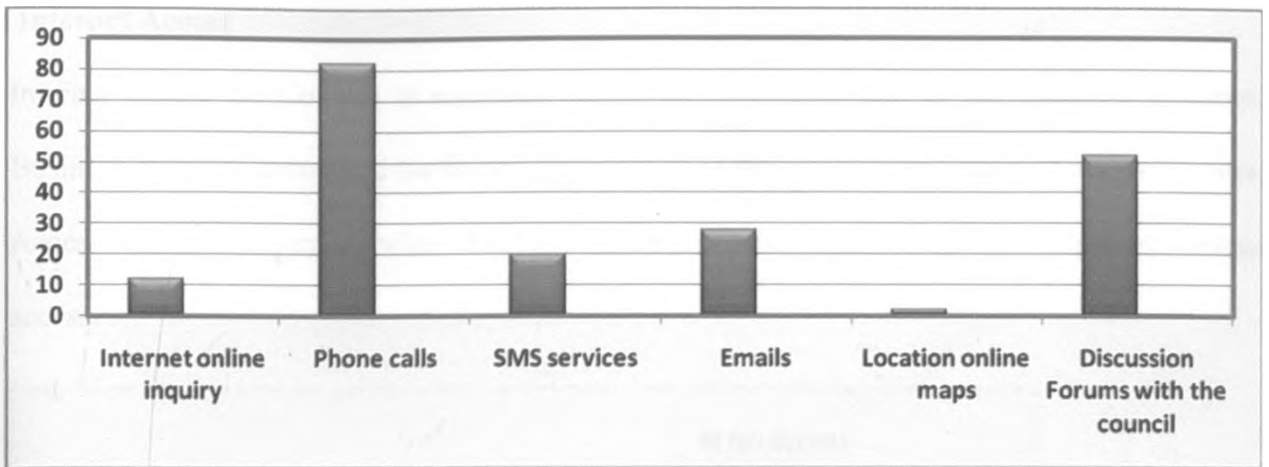
### 5.1 RESULTS

This section presents key findings, relevant to this study, from a research survey conducted within Ruiru Municipality by Ipasha InfoTech on behalf of Centre for Sustainable Development- CSUD (Columbia University). The research had the intention of finding ways of enhancing communication and information sharing between the council and the citizen using ICTs in general and any other module viable for such a purpose.

Results from the analysis of this survey are, hereby, utilised in this study as a basis to warrant the viable incorporation of the *Par-Moja* PPGIS application in the ICT development venture of the Council and can be replicated in any local authority in Kenya and of the developing countries at large. The analysis also brings out the overwhelming aspect of a need to enhance interactive discussion, open access and query of information of the Council by the public as well as inclusive decision making in the development of the municipality.

#### **Most Effective platform to enhance communication between the council and the citizens**

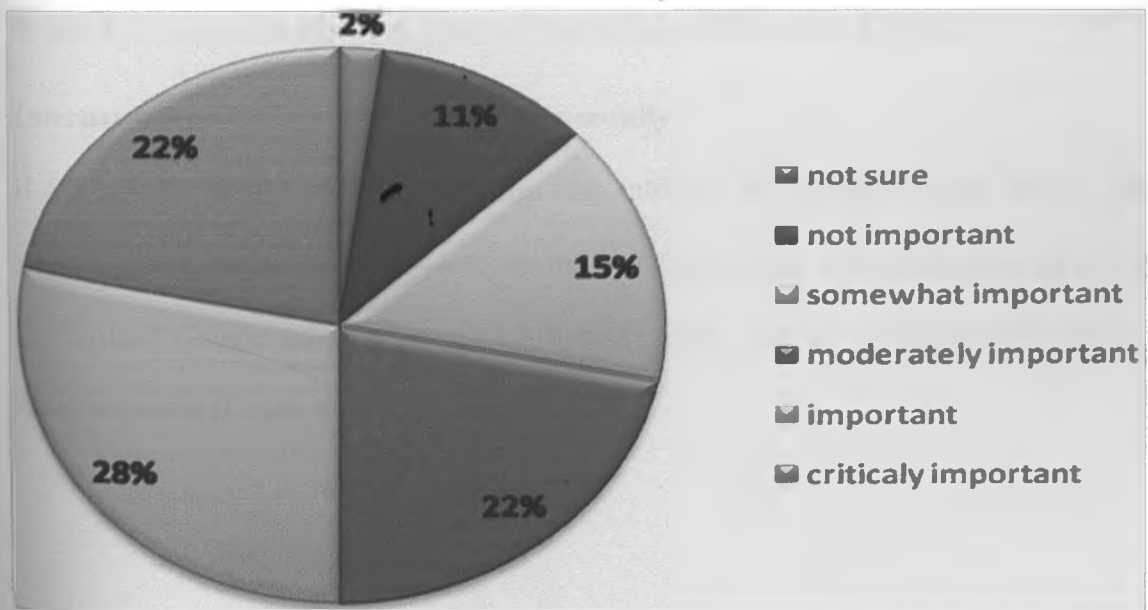
The mobile phone is the most effective platform for communication between the Council and the citizens using phone calls and SMS services. Phone calls are depicted as the best mode of communication with 90% (Figure 5.1) of respondents preferring it. Location online maps are the least preferred mode with less than 5%.



**Figure 5.1: Effectiveness of Platforms for Communication with the Council** (Source: *Ipasha and CSUD, March 2011*)

### Importance of the Internet in Enhancing Communication with the Council

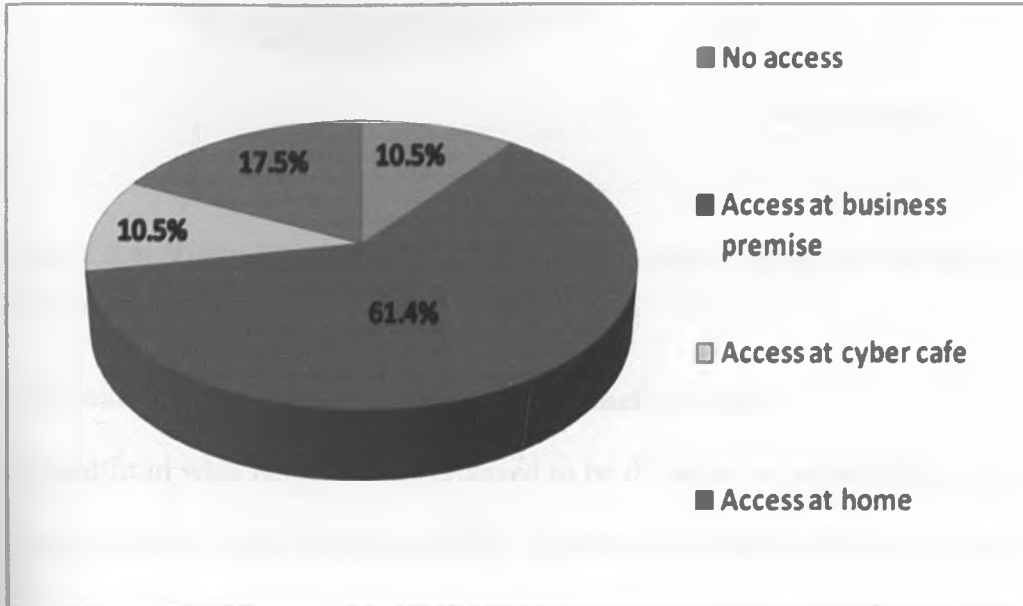
Ranging from ‘somewhat important’ to ‘critically important’, internet connectivity scored a high 87% (Figure 5.2). Respondents who viewed the internet as not being important accounted for 11% with 2% of the respondents not sure of the importance of internet in enhancing communication with the Council.



**Figure 5.2: Importance of the Internet in Facilitating Communication with the Council** (Source: *Ipasha and CSUD, March 2011*)

## Internet Access

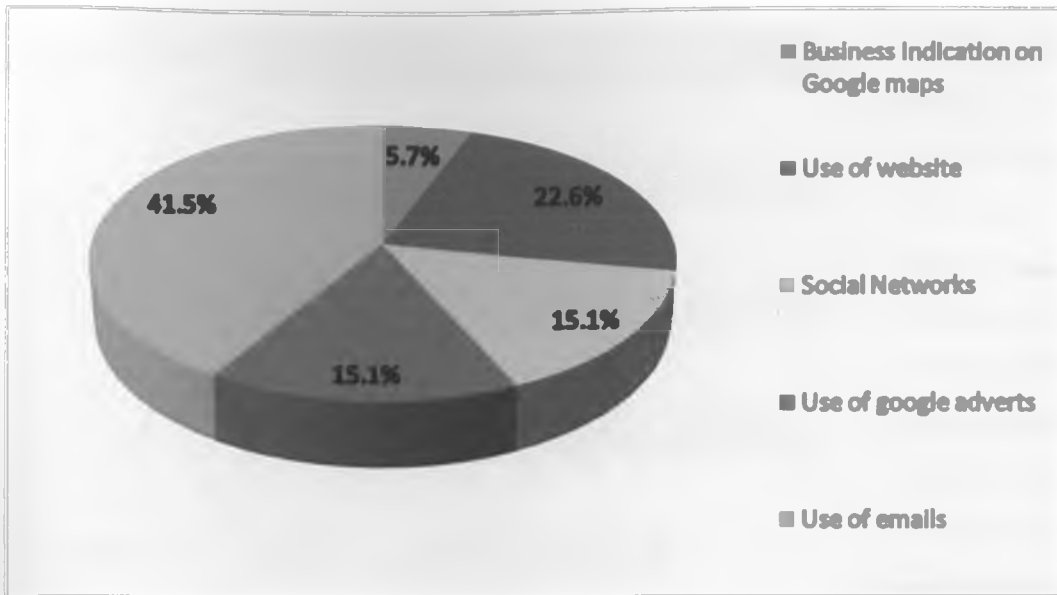
Internet within the Council is accessed mostly by businesses and at the business premises. Business premises accounted for 61.4% (Figure 5.3) of the respondents' point of internet access. Access was lowest at cyber cafes with 10.5%, an equal percentage of respondents had no internet access.



**Figure 5.3: Access to Internet** (Source: *Ipasha and CSUD, March 2011*)

## Internet Usage Among the Business Community

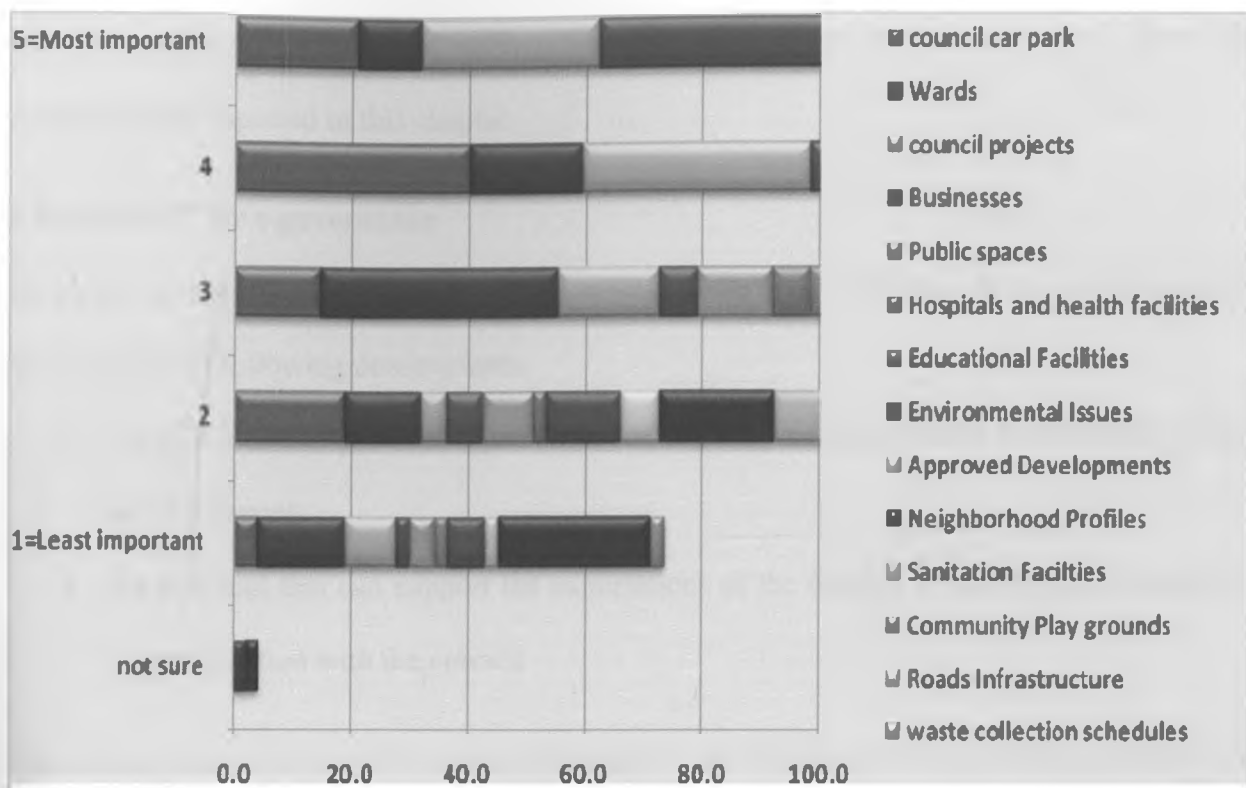
41.5% of the businesses surveyed use the internet for emails (Figure 5.4). The lowest percentages of businesses, 5.7%, use the internet for locating their businesses on Google maps. 15.1% used Google adverts to market their business and an equivalent percentage utilizing social networks (Figure 5.4).



**Figure 5.4: Ruiru Municipality Business Community Usage of Internet** (Source: *Ipasha and CSUD, March 2011* )

#### **Information Areas to be Shared on the Council Website**

Ranked from what respondents perceived to be the most important information area to be on the Council website to the least important, businesses, Council projects and wards ranked highest respectively. Sanitation facilities, Neighbourhood profiles and Educational Facilities ranked lowest respectively (Figure 5.5).



**Figure 5.5: Information Areas Needed on the Council Website** (Source: *Ipasha and CSUD, March 2011*)

## 5.2 DISCUSSIONS

The study had the objectives of identifying the expectation of the citizens on the Council along the line of information sharing and service delivery. It also scanned the market to identify the use of ICT tools in accessing and sharing of information as well as establishing the challenges and possible ways of overcoming any challenges in regard to two-way communication between Council and its citizens.

The investigation of these objectives is relevant to this study and the analysis thereof has been incorporated as part of the study. Moreover, a demonstration of the *Par-Moja* application was presented to the technical staff of the Council as well members of Ipasha InfoTech and Centre



for Sustainable Development-CSUD (Columbia University) and observations about the application are captured in this chapter.

### **Effective ICT for e-governance**

In trying to get what the respondents considered the most effective ICT tool, the survey investigated the following determinants:

- An ICT tool that provides interaction and two-way communication between the citizens and the council
- An ICT tool that can support the expectations of the citizens in information sharing and communication with the council

The survey conducted as a focus group discussion required participants to consider determinants of effectiveness of several tools to enhance communication with the council. Majority of the participants suggested that mobile phone would be the most effective ICT tool with discussion forums being the second rated effective tool (Figure 5.1).

However, they agreed that the mobile platform would inhibit the sharing of bulk information that would be expected of the Council. They consented that the mobile phone can be utilised to give metadata on bulk data held by the Council over a web platform.

The survey indicates that the public need more open, real time two-way communication and data sharing with council as phone calls and discussion forums rate highly as opposed to SMS and e-mailing which may take time to correspond. Online inquiries rate poorly though this can be attributed to poor knowledge on internet usage. However, with the advantages envisioned by the Council in promoting e-governance, online inquiries will be the efficient way of accessing information of the Council.

The need of the public to have more effective and interactive communication and data sharing with the Council brings the need for an online application, pegged on the website, which the public can alternatively utilise to access, comment and effectively participate in the Council's development proposals and approved projects. However, there is need to enhance internet utilisation within Ruiru Municipality for this potential to be fully realized and adopted.

This brings about the need to assess the potentiality of the internet in effectively promoting e-governance by facilitating interactive discussions and data sharing between the Council and the public.

### **Importance of the Internet**

The survey inquired about the importance of internet and its implications in promoting local governance in terms of effective communication and efficient information sharing. Most of the respondents to a survey question on this implied that internet connectivity is crucial in determining access to information more so from the Council website. A need to enhance capacity within the Council was appreciated, to facilitate adequate internet connectivity within individual departments and their respective sections.

The Internet has enormous potential to facilitate positive communication between the Council and the public as well as to support efficient information sharing. Internet live chats, for example, can be applied as a tool of communication between the council and the citizens, enabling one to make inquiries directly to specific departments and receive real time feedback.

### **Potential Effectiveness of Internet**

The potential effectiveness of internet in enhancing local governance was discussed and assessed among participants of a focus group discussion. Participants observed that the Council website

should provide detail information about service provision and the state of different services and projects considered for development by the council. The internet, they discussed, is an avenue for doing detailed online inquiry without necessarily going to the council and its potential in facilitating remote access of Council information should be taken advantage of.

Internet access and usage is high among business owners in Ruiru town, with the major point of access being within the business premises (Figure 5.3). However, it was strongly observed that the use of internet is highly constrained by inadequate access among the public and low penetration within the council.

Access is limited to business premises and homes of the few who can afford computers and mobile phones with General Packet Radio Service (GPRS) (Figure 5.3). Most of the public however can only access the internet mostly at the cyber cafes within the municipality which are few and have slow internet connections. However, it came out strongly that.

Participants in appreciating the potential of the web, level of internet access within Ruiru and capacity within the Council, which has an ICT officer, envisioned that the Council website will provide a media to query and report relevant issues to the Council. They saw a need for inquiries made to be forwarded to relevant departments of the Council with need for direct response from the respective department.

The website it was envisioned would enable community based organizations and the select Ruiru Town Project Monitoring and Evaluation Team to enhance information sharing to support transparency and facilitate project monitoring to enforce accountability within the Council. However, during the discussions the overwhelming question was on the most effective tool that

that can bring the visions of the participants in the discussions. The *Par-Moja* application is the effective tool that may provide the answer posed by participants involved in the survey.

The business community in Ruiru is the most dominant user group in the utilisation of the internet and the services it has to offer. The survey inquired to find out if the business community uses the internet to advance their business ventures and if so in what ways (Figure 5.4). This is also in recognition that it is the business community is more in contact with the Council in terms of applying for, renewing and receiving licenses to operate and also reporting on Council's areas of weaknesses.

The Ruiru Municipality business community seems to use some aspects of interactive web based applications market their businesses, with 15.1% using Google adverts and an equivalent percentage utilizing social networks (Figure 5.4).

The smallest percentage, however, use Google maps. This can be attributed to low client-base knowledge on utilizing mapped information, however the potential to improve can be captured by incorporating the interactive discussion aspects of the more utilised social network sites. This postulate informed the development of the PPGIS application which combines an interactive map platform with an online discussion forum in form of a blog.

Moreover, the discussions revealed that blog spots were the most appropriate web based platform that could facilitate open sharing of information and positive communication between the Council and the general public. Such a blogging site could be coupled to the developed Council website free sharing of information especially about development ventures by both the public and the Council. If the blog site complements an online map media, it would enhance communication and quick comprehension of any given information or discussion and, therefore,

enable critical analysis of any respective development in question. This would facilitate better e-governance.

During the demonstration of the *Par-Moja* PPGIS application to the technical staff of the Council, its ability to enhance open information sharing and discussions was appreciated. It was also seen as an approach that will facilitate the access of information on the Council website by various user groups and members of the public that may visit the website.

### **Type of Information to be Shared on the Council Website**

Having seen the potential of the internet to enhance e-governance, there is need to assess the type of information if shared would promote better local governance. Thus, the survey assessed the type of information participants would want shared by the Council on the website which they felt actively concerned them.

Information on businesses, Council projects and wards rated highly (Figure 5.5). These are information areas that have strong spatial component and would better be rendered on a map for effective orientation and comprehension. Effectively, the *Par-Moja* PPGIS application would enhance the portrayal and utilisation of the given information on these aspects over the web.

### **Participation in Planning Processes within the Council**

Participants of the discussion forums complained of blatant disregard of the town planning standards and regulations in some quarters. It was observed that the Council's building codes, as an example, are not respected by some developers. Participants felt frustrated by the inadequate channels of reporting issues to the Council, most effective being calling on the town planner who

enable critical analysis of any respective development in question. This would facilitate better e-governance.

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is usually engrossed. This affected the time it took for the report to be adequately looked into and settled and some developers get away with their misdeeds, for a while at least.

The participants concurred on the need for a system through which the public can report and query information of the Council and be assured of confidentiality. This aspect of the discussion coupled by the need for an enhanced discussion forum advocates for the inclusion of the *Par-Moja* PPGIS on the Council website currently being developed.

## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 CONCLUSIONS

The study focused on the inclusion of a PPGIS application in the ICT implementation for an e-governance promotion strategy in a local government. It aimed at demonstrating a PPGIS application that would facilitate positive information sharing and effective communication between a local government and its citizenry. The objectives of the study were realised.

The study gives indications on the complementariness of PPGIS and ICT development, for the local governance and informs the development for ICT, for e-governance, of the newly created devolved County governments in Kenya. It is the study's assumption that the implementation of the application would also motivate and therefore hasten the need for GIS uptake in the Council and even in the emerging County governments in Kenya.

It was found that the public need an ICT based system that facilitates positive information exchange with the Council while allowing them to query the Council's information and even report issues confidentially. The discussions enforced support of the development of the Council website with infancies for it to be a more efficient media to promote public awareness and participation in the development of the municipality.

It seems as if there exists a gap between introducing a new web-based technique, such as a PPGIS application, into a newly developed local authority website, such as the Council's, and the technique being truly accepted and used by the authority and its citizenry.

The study concludes that PPGIS holds many opportunities to enhance active public participation and legitimize planning and development, thus promoting better local governance. It proposes



the implementation PPGIS in the ICT development strategy to enhance e-governance of the Council.

## 6.2 RECOMMENDATIONS

The following recommendations accrue from the study

- Enhanced public consultation and active involvement in the development of their local area.
- Research on enhancing capacity of CBOs in utilizing ICT tools to advocate for community consultation and involvement in the planning and development of local authorities.
- Research on ways of effectively enhancing public interest in the web thus advocating for improve public internet access.
- Training of the Council's staff on basic computer skills and navigation through the internet so as to better appreciate the Council Website, as well as the PPGIS application.
- Capacity building of the Council's ICT department so as to fully capture the potential of the PPGIS application in enhancing e-governance. Ideally an IT technician should be posted to each department of the Council.
- Research on designing and developing of more user friendly PPGIS application interface, which can be readily developed in Web-based GIS, to encourage local government employees to accept and use Web-based GIS in their operational decision-making.

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APPENDIX

A SURVEY QUESTIONNAIRE ON INTERNET IMPACT ON LOCAL GOVERNANCE  
IN RUIRU MUNICIPALITY

CAN THE INTERNET IMPROVE LOCAL GOVERNANCE?  
A SURVEY ON ICT USE BY BUSINESS COMMUNITY

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Thank you for willing to participate in this survey, which focuses on your experiences with use and opinions about information communication technologies within the Ruiru Municipal Council. The information you provide will be vital in informing the council in its effort to improved Council to Citizen Communication and Citizen to Council Communication. The primary goal of the study is to better understand the use of ICTs by the citizens and the business community.

Your answers are confidential and will be used to develop and communication strategy for the council.

For the purposes of this survey, Information Technology refers to “personal electronic devices such as laptops and handled computers, cell phones and your institution’s computers and associated devices

**Business Information**

Name of Business: .....

Type of business: .....

Title of Respondent: .....

Connection electricity: .....

1. Which of the following electronic devices do you own and use for your business operations (tick appropriate)?

- a) Personal desktop computer
- b) Personal laptop computer
- c) Personal digital assistant
- d) Smart phone
- e) Cell or mobile phone
- f) Electronic Tax Register Machine
- g) Wireless adapter

2. What electronic device do you use to access internet?

- a) Do not access
- b) Personal desktop computers
- c) Personal laptop
- d) Mobile phone
- e) Smart phone
- f) Modem
- g) Wireless adapter

3. From where do you access internet?
- a) Do not access
  - b) Business premise
  - c) Cyber café
  - d) Home
4. How many hours do you usually spend on internet
- a) Do not access
  - b) Less than an hour
  - c) More than an hour
5. Does your business have any of the following?
- a) Website
  - b) Email address
  - c) Blog
  - d) Telephone contact
6. Have you ever used the internet to market your business?
- a) yes
  - b) no
7. If yes, what did you use?
- a) Google maps
  - b) Websites
  - c) Social networks i.e. facebook
  - d) Google adverts
  - e) Emails
8. If no, why?
- a) Lack of knowledge on internet use
  - b) Lack of internet
  - c) Cost is high
  - d) Not concerned
9. Does your business employ any of the following services?
- a) Mobile payment service i.e. M-pesa, zap
  - b) Mobile banking service i.e. M-kesho, Pesa Pap, EAZZY
  - c) Mobile billing services i.e. paying of KPLC bills and water bills
  - d) VISA cards
  - e) PayPal
10. On a scale of 1 to 5, kindly rank in order of most used to least used payment service where 1 denotes the least and 5 the most)
- a) Mobile payment service i.e. M-pesa, zap
  - b) Mobile banking service i.e. M-kesho, Pesa Pap, EAZZY
  - c) Mobile billing services i.e. paying of KPLC bills and water bills
  - d) VISA cards
  - e) PayPal
11. What kind of payments do you make to the council?  
 .....
12. In your opinion, would you use mobile payment services such as M-pesa to make your payments to the council?
- a) Yes
  - b) No

3. From where do you access internet?
- a) Do not access
  - b) Business premise
  - c) Cyber café
  - d) Home
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  - d) VISA cards
  - e) PayPal
11. What kind of payments do you make to the council?  
 .....
12. In your opinion, would you use mobile payment services such as M-pesa to make your payments to the council?
- a) Yes
  - b) No

13. What electronic modes do you use to report issue and communicate with the council?

- a) Internet online inquiry
- b) Phone calls
- c) sms service
- d) Emails
- e) Location online maps
- f) Discussion forums with council

14. In a scale of 1 to 6, rank from the most reliable to the least reliable mode of reporting and communication with the council (1 being the least and 6 being the most reliable)?

- a) Internet online inquiry
- b) Phone calls
- c) sms alerts
- d) Emails
- e) Location online maps
- f) Discussion forums with council

15. To what extent do you consider the following components important in enhancing communication and service delivery by the council? Kindly tick as appropriate; 0 denotes 'not sure' 1= not important, 2 = somewhat important, 3 = moderately important, 4 = important while 5 = critical.

	0	1	2	3	4	5
<b>ICT Components/Tools</b>						
Internet connectivity						
websites						
Mobile payment system for rates and bills						
Council literacy on ICT use						
SMS alert and inquiry services						
Information resource centers						
Online interactive location maps						
Discussion forums with council						

16. In a scale of 1 to 5, rank components you would like to see in the Ruiru Municipal Council Online interactive map (with 1 being the least and 5 being the most)

	0	1	2	3	4	5
<b>Service Components</b>						
Council car parks						
Wards						
Council Projects						
Businesses						
Public spaces						
Hospitals and health facilities						
Educational facilities						
Environmental sensitive areas						
Approved developments						
Neighborhoods						
Community toilets						

Community play grounds						
Roads						
Waste collection schedules						
Waste disposal points						

**Thank you for participating!**