

**A WEB-BASED APPLICATION FOR PUBLIC PARTICIPATION IN
GOVERNANCE FOR MURANG'A COUNTY, KENYA.**

BY

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DECLARATION

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DEDICATION

I wish to dedicate this thesis to my wife Lucy and sons Caleb and Brayden for their ever growing support and inspiration in my life especially during the duration of my studies at Moi University.

ABSTRACT

Information and Communication Technology holds great potential to transform public participation and service delivery and influence government decision-making. Mobility of accessibility is being regarded as a new paradigm in computing. ICT can help bypass the need for traditional networks of physical interaction and communication when seeking information. However, public participation in Murang'a County governance is through town hall meetings, budget validation forum and notice boards which are faced with problems like lack of awareness, a large number of people not having time to attend public meetings, and inability to reach large number of people. The aim of the study was to investigate how public participation in governance can be enhanced by ICTs in Murang'a County and develop a web-based application towards this enhanced participation. The study objectives were to: assess how the public participate in governance in Murang'a County; establish the challenges faced in the current methods of public participation; investigate how ICT can be used to enhance public participation; identify and analyze requirements for an ICT solution and to design and develop a web-based application to support public participation in governance for Murang'a County. The study was informed by Direct theory and Technology-organization-Environment framework that guided the development and implementation of public participation processes. Qualitative research design was used for requirements gathering and analysis. This study used both interviews and observation for data collection which led to in-depth knowledge of the requirements. The population of the study consisted of 942,581 residents of Murang'a County. Using purposive sampling a sample of 30 respondents was drawn from Murang'a town. The main goal of purposive sampling was to focus on particular characteristics of a population which would enable researcher to answer research questions. This study found out that there existed various methods and techniques used for public participation in Murang'a County which included workshops and public meetings. The study identified both functional and non-functional requirements for an ICT solution. This study adopted agile software development methodology in developing the system while unified modeling language was used for system modeling. A web-based application that supports public participation was developed. It is recommended that the system be adopted for effective and efficient participation by residents in decision making. It is further recommended that citizens of Murang'a County be sensitized about its use.

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ABBREVIATION AND ACRONYMS

CMS	Content Management Section
CSIL	Client Side Interface Layer
CSS	Cascading Styles Sheets
HTML	Hyper Text Markup language
ICT	Information Communication Technology
IDE	Integrated Development Environment
KICTANet	Kenya ICT Action Network
PDA's	Personal Digital Assistants
UML	Unified Modeling Language
SSAL	Server Side Application Layer
TOE	Technology-Organization-Environment

CHAPTER ONE

INTRODUCTION

1.1 Background Information

With governance high on the agenda in Africa, many governments are using information and communications technologies (ICTs) to introduce innovations in their structures, practices and capacities as well as in the ways they use human capital and deliver services to the public; but the potential for e-governance in Africa remains largely unexploited (Adera & Waema, 2011). According to Adera & Waema (2011), ICT can enable county governments to engage the public to participate in democratic processes and to engage in public sector management so creating socio-economic developments at local and national levels. The availability of ICT infrastructure accelerates the run towards the achievement of an information society status (ITU-WTD, 2003).

Participation is considered the cornerstone of good governance. Participation can be either direct by the public or through legitimate intermediate institutions or representatives. This means that participation needs to be informed and organized (Andre et al., 2006). This implies freedom of association and expression on the one hand and an organized civil society on the other hand. Fair legal frameworks that are enforced impartially and information freely available and directly accessible to those who will be affected by policy decisions and their enforcement (transparency) are additional requirements for participation and good governance. It also means that enough information is provided and that it is provided in easily understandable forms and media (UNESCAP, 2005).

Participation has been instrumental in guarding against abuse of office by public servants and political leaders. It has also provided control against excessive discretion being vested in civil servants in public procedures. Participation has provided checks and balances against unnecessary political interference in service delivery and disregard for professionalism and meritocracy in the public sector amongst others (Odhiambo & Taifa, 2009).

Participation is thought to generate embracement and ownership, which contribute to social sustainability, community building and harmonious society. Mobile governance or m-governance is the latest progress in e-governance with the increasing popularity of advanced mobile technology such as mobile phones, internet-enabled devices, laptops, palmtops, Bluetooth, Wi-Fi and wireless networks (Praveen, 2012). According to Praveen(2012), delivering timely and accurate information to the public and an established system of two-way communication between the government and people is one of the keys to strengthening democracy by facilitating enhanced utilization of public services, participation and empowerment of the public.

1.1.1 Participation in governance in Kenya

Kenyans participate in governance through civil society movements and organizations which have epitomized various avenues to include: Public hearings, lobby groups, citizen report cards, social audits and citizen action groups. According to Kairu & Maneno (2012 b), civil society organizations often initiate the formation of watchdog committees and citizen advisory groups and facilitate their activities. Civil society organizations have

for long played a significant role in enhancing a culture of participation across the world. The main problem with current participation is that very few people normally participate.

1.1.2 Public Participation Under Kenya Constitution

Public participation is a political principle, which has now been underpinned in the constitution and recognized as an important right. Various provisions in the constitution provide for it as follows:

- *Article 35 of the Constitution: The right to information is a fundamental right necessary for the enjoyment of all other rights. When fully actualized, it will enable Kenyans to know about their development rights and projects from which they are supposed to be benefiting like CDF.*
- *Article 196 (1) (b) – It requires that the county assembly facilitates public participation in the legislative and other business of the assembly. (GoK, 2010)*

Currently Kenyans participates in governance through town hall meetings; budget validation fora and public meetings. These methods of participatory pose a lot of problem in that they lock out many people from participating in governance.

According to Dhanaraj (2009), ICTs can augment participatory initiatives at the community level in four broad ways: widen the range and increase the number of participants; facilitate participation through a mix of technologies that cater for the diverse needs and backgrounds of the target group; provide relevant and understandable information and knowledge to and from the target group; and allow community groups to have a voice in local and other levels of decision-making.

Public participation in local governance involves ordinary citizens assessing their own needs and participating in local project planning and budget monitoring. It is important for improving public resource management and reducing corruption, by making public servants and political leaders accountable to the people. For public participation to work, transparency of government information is needed, as well as the inclusion of members into decision-making from groups whose concerns are being addressed. Excluding the weak and powerless from decision-making is a cause of poverty because it denies them rights and creates unequal power relationships (Sowmya, 2008).

According to Sowmya (2008), engaging public in local governance improves accountability and the ability of local authorities to solve problems, creates more inclusive and cohesive communities, and increases the number and quality of initiatives made by communities. One way to increase awareness and to empower public to have a voice is through increased access to technology and in particular social media.

1.2 Statement of the Problem

Public participate in Murang'a County governance through town hall meetings; budget validation fora and public meetings. These methods of public participation are faced with problems which include lack of awareness for example dates when town hall meeting are held; a large number of people do not have time to attend public meetings, and they do not reach large number of people because of physical interaction and communication.

Public participation creates a balance between governing for the people, and governing by the people. The concept emphasizes the need to enhance further inclusion and

meaningful participation of the public in the process of decision making within governance structures (Kairu & Maneno, 2012 a). Public participation in governance can be enhanced through use of ICT-enabled channels. According to Kairu & Maneno (2012 a), information and communication technologies hold great potential to transform public participation and service delivery tracking and influence government decision-making and execution.

Enhancement of public participation through use of ICT will increase the number of participants; help bypass the need for traditional networks of physical interaction and communication when seeking information from Murang'a County; increase the number and quality of initiatives made by community and improve service delivery in terms of efficiency and effectiveness.

Owing to the above concern, there was need to investigate how public participate in governance so as to develop appropriate systems to enhance their participation in governance of counties in Kenya, with specific reference to Murang'a County.

1.3 Aim of the Study

The aim of the study was to investigate how public participation in governance can be enhanced by ICTs in Murang'a County and develop a web-based application towards this enhanced participation.

1.4 Specific Objectives

The study was guided by the following objectives:

1. To assess how the public participate in governance in Murang'a County.

2. To establish the challenges faced in the current methods of public participation.
3. To investigate how ICT can be used to enhance public participation
4. To identify and analyze requirements for an ICT solution.
5. To design and develop a web-based application to support public participation in governance for Murang'a County.

1.5 Research Questions

The following research questions guided the study:

1. How do people in Murang'a County participate in governance?
2. What are the challenges faced in the current methods of public participation?
3. How do people in Murang'a County currently use ICT in public participation?
4. What are the requirements for an ICT solution for public participation?
5. How can ICTs be used to enhance public participation in governance in Murang'a County?

1.6 Significance of the Study

It is hoped that the findings of the study can assist Murang'a County in particular and county governments in Kenya in implementing ICT-enabled public participation platforms. Findings will help the Murang'a County in identifying the challenges people face currently in public participation. Also using the findings of this study, policy makers will be informed on structuring of policies to create an enabling environment for public participation in governance. Finally the developed web-based application will support public participation in governance for Murang'a County.

1.7 Scope and Limitation

The research was confined to Murang'a town where the county offices are located. The research centered on public participation in governance because the study sought to find out how people in Murang'a County participate in governance. Another limitation was that the entire Murang'a could not be covered and data collection was done from central business area of Murang'a town. However the collected data was considered sufficient for this study and for gathering sufficient data for requirements analysis and specifications.

1.8 Definitions of Terms

E-governance is all about making available conventional Government services to the public through Internet portals, through Internet connected computers (Praveen, 2012).

Governance is the process of decision-making by which decisions are implemented

M-governance is defined as the strategy and implementation involving the utilization of all kinds of wireless and mobile technology services, applications and devices for improving benefits for public, business and all Government units (Praveen, 2012)

Methods are tools, structures and ways of participation

Participation is the process through which stakeholders' input and share control over development initiatives, decisions and resources which affect them (Odhiambo & Taifa, 2009).

Public participation refers to the interaction between government and civil society through different mechanisms to design, evaluate, and implement development policies, projects and programs.

1.9 Summary

This chapter has tackled the fundamental aspects of the study ranging from background information, statement of the problem, aim, objectives, research questions and significance to the scope of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses theories relevant to the study. The concept of the study was also developed under the conceptual framework section and finally reviews empirical studies that have previously been conducted on the area of public participation and governance.

2.2 Theoretical Review

According to UNDP (2006), the effect of ICT on local governments is still an under-researched area especially in Africa. The participation revolution has held a great promise in creating a more just and transparent society as emphasized by the UNDP (2006). Timothy & Edith (2011), assert that ICT cannot replace human governance but can complement the later. Thus the research sought to establish the efficiency of ICT in empowering public participation in governance especially at the county government level. There are two broad dimensions of public participation namely; indirect involvement and direct involvement. Indirect involvement acknowledges that electoral officials and professional administrators should act on behalf of the public in a representative democracy. Direct involvement suggests that public is the owners of the government and should be involved in the decisions of the state (Yang and Callahan, 2005).

According to Barber (2003), public participation can be defined as self-government by public rather than representative government in the name of public. Active public govern

themselves directly here, not necessarily at every level and in every instance, but frequently enough and in particular when basic policies are being decided and when significant power is being deployed.

Public participation is seen as a form of empowerment and is a vital part of democratic governance. It is part of a 'people first' or 'people centered' methods of management, which avoids centralized, hierarchical decision-making (Lam, 2011).

Part 1 of chapter 13 [of the Constitution] on "The Public Service" sets out the values and principles for public participation in the public service. Specifically, section 232(1) provides that the national values and principles of public service include, "... (d) Involvement of the people in the process of policy making...and (f) transparency and provision to the public of timely, accurate information" (GoK, 2010).

A secondary, but related concept to direct public participation is the issue of transparency. Article 35 of the Constitution guarantees access to state information. The right to know is an important guarantee of accountability in institutional activities. The fundamental aspects of public participation are the promotion of credibility and integrity in public institutions.

Generally speaking, then, public participation is recognized as a vital aspect of good governance.

Kenya's constitution has laid a foundation for public involvement and participation in governance. The main stipulations being:

- a. *Article 1 (4), that Sovereign power of the people is exercised at the (a) National level and (b) the county level.*
- b. *Article 6 (2), the governments at the national and county levels are distinct and inter-dependent and shall conduct their mutual relations on the basis of consultation and cooperation.*
- c. *Article 174, the objects of devolution are to (c) give powers of self-governance to the people and enhance their participation in the exercise of the powers of the State and in making decisions affecting them (d) recognize the rights of communities to manage their own affairs and to further their development.*
- d. *Article 184 (1), which states that National Legislation shall provide for the governance and management of urban areas and cities and shall in particular (c) provide for participation by residents in the governance of urban areas and cities.*
- e. *Article 196 (1), which states that a county assembly shall conduct its business in an open manner and hold its sittings and those of committees in public, and facilitate public participation and involvement in the legislative and other business of the assembly and its committees.*
- f. *Article 232 (1) on the values and principles of public service which include:
(d) Involvement of the people in the process of policy making and: (e) accountability for administrative acts and (f) transparency and provision to the public of timely and accurate information.*
- g. *Fourth Schedule Part 2 (14) which specifies that the functions and powers of the county are to ensure and coordinate the participation of communities and*

locations in governance at the local level. Counties are also to assist communities to develop the administrative capacity for the effective exercise of the functions and powers and participation in governance at the local level.
(Gok, 2010)

This implies that there is need to investigate how public participation in governance could be enhanced using ICTs and develop a web-based application for public participation.

According to Mudavadi (2012), public Participation in county governments should be based upon the following principle:

- (a) Timely access to information, data, documents, and information relevant or sated to policy formulation and implementation;
- (b) reasonable access to the process of formulating and implementing policies, laws, and regulations, including the approval of development proposals, projects and budgets, the granting of permits and the establishment of specific performance standards.

2.3 Theoretical Framework

According to Norris (2003), there are three broad theoretical perspectives that guide the development and implementation of public participation processes: representation, pluralist, and direct.

Representative Theory

Representative theory (Mill, 1965) assumes that the public has a limited but important role in governance: that is, to make informed decisions about whom they would like to

represent them. The level of participation in elections is generally low (Macedo, 2005) with some exceptions, such as in high-profile and competitive presidential elections. The extent and quality of representation provided is the central concern in representation theory (Pitkin, 1967).

Pluralist Theory

Pluralist theory (Schumpeter 1952; Dahl 1981) assumes a role for citizens, or at least organized interest groups, beyond the election process. Competing interests negotiate political and policy making processes to achieve benefits or limit hardships for their constituencies. In this environment, the public is sidelined in the most important matters of policy making and quality of life, and elite and professional rule makers and policymakers work in place of public. From a pluralist perspective, this is problematic as the average citizen may not have access to the interest groups that also claim some form of representative legitimacy. County Web sites can provide a wide range of information that is available any time to anyone with Internet access and a Web browser. The Web also facilitates the networking and “many-to-many” communications on which, according to pluralist theories democracy depends.

Direct Theory

According to Barber (2003), direct theory assumes that the public, and society, are best served by allowing individual and collective involvement in policymaking, implementation, and evaluation. The public ought to be given channels for direct engagement with their elected representatives and public administrators, rather than limiting their sovereignty to the occasional election (Wolin, 2008).

The public would be vested with authority in direct forms of participation, thus going beyond the consultative or advisory functions of public hearings or town hall meetings. New technologies, such as personalized e-mail alerts, user profiling, and portal software, allow users to filter information that they find of greatest interest or importance. Other software applications can support and analyze online discussion forums that no longer require people to be in the same place or time.

The study utilized direct theory in order to bring many people on board to ensure majority are involved in running and monitoring the welfare of the county. By coming up with a web application for public participation challenges of time, physical interaction and communication barriers will be overcome thus allowing the public to contribute to the issues affecting their community.

Table 1: Theories and Indicators of Web-based Public Involvement

	Representative Theory	Pluralist Theory	Direct theory
Chief proponents	Mill(1965)	Schumpeter(1952) and Dahl (1981)	Barber (2003)
Key attributes	Democratic governance occurs through public representatives. Elections are the key to accountability and legitimacy.	Although elections are an important mechanism for accountability and legitimacy of government democracy is preserved primarily through elite-level	People are directly involved in policy debate, decisions and actions. Government needs to create new mechanisms, policies and programs to engage

		competition and bargaining of interest groups from all social sectors.	public in authentic deliberation on public issues
	New technologies can improve representation by helping the public to evaluate the records of government elected officials and by providing means for public to interact directly with officials	New technologies reduce the cost of information and facilitate the multiplication of interest groups	New technologies can reengage public that are disenchanted and disengaged. E-democracy can overcome space and time constraints on public involvements
Website public involvement indicators	<ul style="list-style-type: none"> • Information about and communication with elected officials • Direct access to official government notices and records 	<ul style="list-style-type: none"> • All indicators from column to the left • service to multiple constituencies • Personalized content available • E-comment forms • Links to other local civic organizations 	<ul style="list-style-type: none"> • All indicators from column to the left • Voluntary service opportunities • Social networking software • Online issue chat rooms or discussion forums • E-consultations

Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) framework developed by Tornatzky & Fleischer (1990) states that the decision to adopt a technological innovation by a firm is based not only on the technology, but also on the related organizational and environmental contexts. Technological context describes the relevant technologies available to the firm. Organizational context depicts some organizational characteristics or resources, such as the quality of human resource and amount of resources among others. The environmental context explains the environmental conditions in which the firm conducts its business. These three contextual factors together influence a firm's innovation adoption decision, which eventually impacts on its performance.

This theory is relevant to this study as it draws to our attention the following;

i) Technological Context

The extent to which the interactive features of the World Wide Web are used to enhance public participation is possible only when a sound ICT infrastructure is in place to support government's interaction with the public. ICT infrastructure is thus imperative for public participation web application.

ii) Organizational Context

Past studies using the TOE framework have used various organizational factors for describing the organizational context. These factors include both tangible and intangible firm resources such as size, global reach, market resources, financial resources, and human resources (Zhu et al 2004). According to Zhu et al (2004), citizens' knowledge has been identified as a vital resource. Thus better quality of human capital in terms of

citizens' education and training should facilitate e-participation development in the nation.

iii) Environmental Context

TOE studies have examined the impacts of diverse environmental factors on the adoption of technology (Kuan & Chau, 2001; Zhu et al, 2004). For example, an organization's accesses to resources, and its dealings with government, are some of the environmental contexts that have been researched (Tornatzky and Fleischer, 1990).

2.4 Conceptual framework

According to Kombo & Tromp (2009), a concept is an abstract or general idea inferred or derived from specific instances. A conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation. Mugenda & Mugenda (2003), define a conceptual framework as hypothesized model identifying the model under study and the relationship between the dependent and independent variables. Kothari, (2004), defines an independent variable also known as the explanatory variable as the presumed cause of the changes of the dependent variable, while a dependent variable refers to the variable which the researcher wishes to explain. The goal of a conceptual framework is to categorize and describe concepts relevant to the study and map relationships among them. Such a framework would help researchers define the concept, map the research terrain or conceptual scope and systematize relations among concepts (Creswell, 2009).

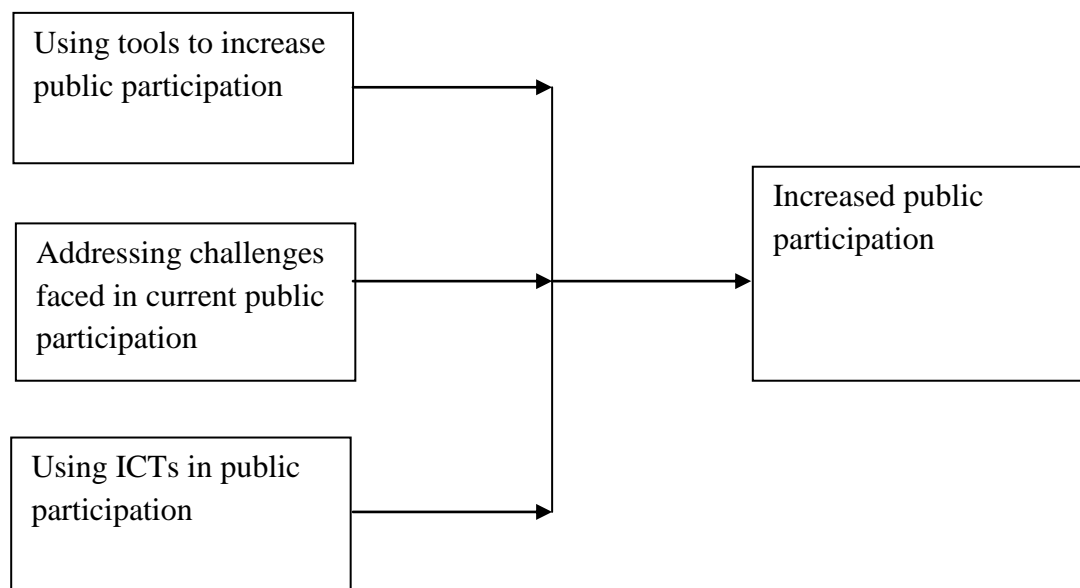


Figure 1: The Conceptual Framework for improving public participation

2.5 Empirical Review

This section reviews studies previously done on public participation in governance.

2.5.1 Public Participation in Governance

The annual budgeting process conducted by the Ministry of Finance has mechanisms for public consultation. There have also been wide public consultations in recent policy making processes, including the constitutional review process and the development of the Draft National Policy and Action Plan on Human Rights (Lam, 2011).

According to Munyua & Mureithi (2007), Kenya ICT Action Network (KICTANet) mobilized groups from various stakeholders for workshops, seminars, electronic mailing lists, roundtable discussions, and constituency-level fora, which aimed at collecting and consolidating substantive comments on the ICT policy.

A variety of public participation procedures exist that aim to consult and involve the public, ranging from the public hearing to the consensus conference. Traditional forms of public participation include voting, forming interest groups, demonstrating, lobbying and advocacy, filing lawsuits to contest actions, establishing partnerships with government agencies or mobilizing attention to issues through artistic expression (Ecological economics, 2010). Productive public participation helps improve policy outcomes. As more voices are heard, a broader perspective is shared and trust is built in the community. Participatory democracy provides opportunities to overcome the shortcomings of representative democracy by combining it with elements of direct democracy. Today, innovative online tools make managing the public input easier while expanding engagement to a wider base (Granicus Inc, 2013). Using online engagement tools, it's easy for more people to contribute ideas for community improvement and provide feedback on current initiatives. These tools are a convenient way for the public to stay engaged in the governing process and in turn, help the county government collect timely and actionable input from public.

2.5.2 Tools Used by Public in Participatory Governance

According to Mudavadi (2012), the county governments shall facilitate the establishment of structures for public participation including;

- (a) Information communication technology based platforms;*
- (b) Town hall meetings;*
- (c) Budget validation fora;*
- (d) Development project sites; or*

(e) Avenues for the participation of peoples' representatives including but not limited to members of the national Assembly and Senate.

According to Ministry of Information Communications and Technology (2013), Kenya is at a take-off stage where access to ICT and a groundswell of talent and economic opportunities from ICT products and services have come together this means that ICT infrastructure is in place.

2.5.3 Challenges Faced Using The Traditional Methods Of Public Participation

According to Lam (2011), public participation is seen as a form of empowerment and is a vital part of democratic governance. It is part of a 'people first' or 'people centered' methods of management, which avoids centralized, hierarchical decision-making. There are administrative challenges to public participation associated with traditional methods of public participation, for example, there are geographical, financial and time limitations associated with engaging public participation in rural communities. Lack of awareness on the process of participation is another hindrance (Lam, 2011).

According to McCullough & Noch (2013), people do not participate when: they are not aware of a meeting taking place; they have other commitments; they have a negative perception of the sponsoring agency; public comments are not taken seriously; decisions have already been made behind closed doors; meetings are too time-consuming or boring; and meeting sites are too far away, inconvenient, or inaccessible.

According to Ki-Moon (2009), most citizens, especially in the rural areas, are less aware of their rights and responsibilities of the government. According to Lam(2011), public

involvement is largely predicated on how well they are informed about processes and how they can access information. In Kenya, the digital gap is widening as the ICT policy does not have a specific mechanism to ensure inclusion and equal access (UN, 2010)

2.5.4 Use of ICT in Public Participation

According to Archmann & Guiffart (2011), ICTs have supported the emergence of online public communities and non-institutional actors involved in politics, who have shaped public opinion on a number of issues. The new possibilities offered by the internet enable the ordinary public or civil society stakeholders to voice their opinions, to organize and mobilize themselves as well as to interact with public officials (Archmann & Guiffart, 2011).

ICT can be used for organizing face-to-face dialogue and debate, consultation techniques based on interviews or questionnaires and, increasingly, the deployment of customized ICT platforms and web based applications. More inclusive modes of public participation have widespread implications for the design and deployment of appropriate tools to support the process (Parson & Clark, 1995).

The involvement of the public in decision processes through ICT necessitates skilled design of interfaces which can connect issues with intended audiences. ICT tools can potentially improve inclusiveness by providing a shared ground where exchange of knowledge is possible. Technology is already expanding peer-to-peer information-seeking behavior through computer-mediated communication (CMC) in remarkable ways through community websites, email, broadcast texting, and other media (British

Informatics Society Ltd., 2010). Through ICT, county governments can tap the knowledge of their fellow residents to make critical decisions. Through reuse of computer-mediated communications that are publicly available (such as those on community websites, personal blogs, public texting systems like Twitter, social networking sites and mapping sites among others), to derive applications and services for use by the public that integrate those original communications with information that helps public assess context, validity, and timeliness to make the best decisions for their highly localized, changing conditions. (British Informatics Society Ltd., 2010).

According to the GoK (2006), the public services provided by the Kenyan e-government include: applying for public jobs, tracking exam results, tracking student loan repayment, tracking status of passports, submitting tax returns, and reporting corruption. Users can download forms provided on the websites, complete them by hand, and physically present them to government offices for action. However, a report by the UN (2010), noted that due to the slow rate of innovation diffusion, the Kenyan government is yet to fully adopt the Internet enabled operations to optimize public service delivery and increase public participation in the public policy process.

According to Meier & Brodock (2008), development work to build upon ICT-supported public activity is gaining ground. Work in the area of humanitarian crisis, specifically the Kenyan post-election violence in January 2008, was the basis for the creation of a “crowd sourcing” environment, “Ushahidi”, where people could warn others and report violence. Initial findings on an analysis of the use of the system show that citizen journalism had a greater geographical reach than traditional sources (Meier & Brodock 2008).

Information communication technology, by reason of its networking and linkage capacity is a crucial factor in strengthening civic engagement and ensuring a link between governmental organizations and grassroots (Archmann & Guiffart, 2011).

2.5.5 Requirements for an ICT Solution

According to U.S. Department of Health & Human services (2014), website requirements are a list of necessary functions, capabilities, or characteristics related to website and the plans for creating it. These types of requirements documentation include user requirements, functional requirements and implementation requirements.

The county government practicing mobile government systems need to provide more accessibility to quality information and services to stakeholders. Accessibility to information helps to enhance the transparency and accountability because government officials perform their responsibilities with easiness and responsibility.

Mobile Technology Culture

Technology presents unprecedented levels of efficiency, and it is the key driver of new forms of participation. Despite higher cost of procuring mobile devices and their management, many people in both urban and rural areas have mobile devices especially cellphones. Culturally, every sector of the country has embraced the use of mobile technologies. This means that national, organizational and individual cultures have no negative impact on the technological devices and applications (Tornatzky & Fleischer, 1990).

The review of literature on public participation in governance shows that public participate mostly using traditional methods which are faced with challenges like physical interaction, financial and time limitation. Hence county government need to create new mechanisms and programs to engage public in authentic deliberation on public issues.

According to (Istiyanto et al, 2011) literatures survey shows that e-Participation is an emerging research area. According to Mudavadi (2012), county governments shall establish mechanisms to facilitate public communication and access to information in the form of media with the widest public outreach in the county, which may include:

- (a) Television stations;*
- (b) Information communication technology centres;*
- (c) Websites;*
- (d) Community radio stations;*

According to Creati (2006), a website is a low cost, effective way to reach the widest possible market. In addition a website does not have a page or time constraint, so there is no rush to get the required information across unlike Television and radio stations (Creati, 2006).

Websites offer instantaneous publishing of materials and gives the opportunity to correct any mistakes even after publishing; public have access 24/7 until you decide to take them down (Taylor, 2009). Taylor further noted that a website does not limit the volume of content you can present. Other promotional media like print, radio and television, charge

you by the word or second. According to Potters Online (2008), websites provide more interaction avenues for example visitors can send e-mail directly from a website and also have online forms that allow visitors to request more information, and provide feedback. Owing to the benefits of the websites the researcher aimed at reaching wider public through developing web based application for public participation which can be used to engage the public on issues affecting their community

2.6 Summary

The chapter has tackled theoretical framework, Technology-Organization –Environment framework, conceptual framework and empirical review.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter covers the methods that were employed to structure the research process in gathering and analyzing information to address the research objectives. It covers; study area, research design, study population, sample and sampling technique, data collection instruments, software development methodology, software development tools and ethical consideration.

3.2 Study Area

The study was carried out in Murang'a County. This is because Murang'a County is sub-urban i.e. residential district located on the outskirts of a city and is selected purposively so as to reflect both rural and urban setup. Murang'a County is composed of seven sub counties namely *Kiharu, Kangema, Gatanga, Mathioya, Kigumo, Kandara, and Murang'a South*.

3.3 Research Design

According to Upagade & Shende (2012), research design is the arrangement of condition from collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. A qualitative research design was selected because it allows for the in-depth exploration of a human or social problem and the meanings that have been constructed by those involved (Creswell 2009). Qualitative research design was used in the study because it leads to in-depth knowledge that leads to

quality requirements gathering. This was done through the use of both interviews and observation data collection techniques.

3.4 Study Population

The population of this study consisted of 942,581 residents of Murang'a County (Kenya National Bureau of Statistics, 2009). This was obtained during preliminary study. The study population comprised of Murang'a county government officials, Murang'a county ICT staff and residents of Murang'a town. Due to time, logistical and budgetary constraints, the accessible population was located in Murang'a town. The rationale of choosing accessible population of Murang'a town was because it is the headquarters of Murang'a County sub-counties and senior management are based there.

3.5 Sample and Sampling Technique

The whole of Murang'a population could not be interviewed so the researcher collected data from sample groups. The following presents sample and sampling technique used.

3.5.1 Sample

A sample of thirty (30) respondents for the study was drawn from Murang'a county government officials, Murang'a county ICT staff and residents of Murang'a town. The sample was obtained after reaching data saturation level at twenty five when respondents started repeating themselves and no new themes were emerging. Data saturation is reached when there is enough information to replicate the study (O'Reilly & Parker, 2012; Walker, 2012), when the ability to obtain additional new information has been attained (Guest et al., 2006). Purposive sampling was used to select the respondents.

Table 2: Sample Data

Category	Population	Sample	% for sample
Murang'a county government officials	300	8	26.7
Murang'a county ICT staffs	7	4	13.3
Murang'a town residents	28,775	18	60
Total		30	100

3.5.2 Sampling Technique

Purposive sampling was used in this study. The main goal of purposive sampling was to focus on particular characteristics of a population that were of interest, which would best enable the researcher to answer his research questions. Purposive sampling was very useful since the researcher needed to reach a targeted sample quickly and sampling for proportionality was not the main concern.

3.6 Data Collection Instruments

Data was gathered by use of semi-structured interviews (appendix I & II) and observation checklist (appendix III) to address the research objectives. Walker (2012), did a related study on community participation in strategic environmental assessment: an exploration of process and learning outcomes in Kenya used semi- structured and observation as data collection instruments.

3.6.1 Semi-Structured Interviews

Semi-structured interviews served as a primary method for this research and were utilized to collect data related to all five research questions. This method gave this study a uniform approach to issues given that, the researcher, was the only interviewer. This method offered the ability to sense when the question had not been fully answered. In such a case, the researcher was able to introduce a follow-up question on the spot. This type of interview was ideal for exploring a topic in depth and allowing for the elicitation of participants' experiences and perspectives in their own words (Merriam, 1998; Esterberg, 2002). Semi-structured interview questions are open-ended and flexible, with the interviewer showing attentiveness to the responses of the interviewee and following up on emerging ideas and information (Merriam 1998).

In this research, county government officials, ICT staff and residents of Murang'a town were interviewed in order to gain a more in-depth understanding of how the public participate in governance. Two distinct groups were identified to ensure adequate coverage of all research objectives. The first group consisted of county government officials and residents who were interviewed about how the public participate in governance in Murang'a County especially in reference to the opportunities for public participation. The second group comprised of ICT staffs who were interviewed about the opportunities for participation and technology enabled public participation.

3.6.2 Observation

Narayanasamy (2009) defines observation as "a systematic viewing of specific phenomenon in its proper setting for the specific purpose of gathering data for a

particular study.” This method was valuable in collecting data related to specific objective 1, as the researcher was afforded the opportunity to develop a greater understanding of how the public participate in governance in Murang’a County. The selection of these instruments was guided by the nature of data being collected, and the aim of the study.

3.7 Pilot Study

According to Kothari (2004), pilot study for testing the instruments is conducted to reveal the weaknesses, if any, of the instruments. A pilot study was conducted on five respondents (two ICT staff, one county government official and two residents) who did not take part in the main study. The process was repeated using the same respondents after an interval of one week for reliability check. Content validity of the instruments was determined through piloting, where the responses of the subjects were checked, against the research objectives.

3.8 Software Development Methodology

The study involved the delivery of a software based prototype. Agile software development methodology was chosen as the methodology for the development of the software. According to Zolyak (2013), agile software methodology supports an interactive and incremental approach to software development with requirements and solutions. The agile cycle is thus made up of iterations each of which is related to the traditional phases of software development. According to Impacttechnology (2015), agile development methodology follows the principles of developing and testing in iterations rather than as a whole product and this process helps minimize overall risk and allows the

project to adapt to changes quickly. The choice of agile methodology was based on the fact that a unique software prototype was to be delivered within a short time frame and in an environment in which adaptation to changing delivery and usability requirements was desired. Further details of prototype development are presented in Chapter 5.

The data obtained from the interviews and observation was used for the user requirement assessment which guided the design of the first prototype.

3.9 Software Development Tools

The software prototype development needed programming design, database design and server software as indicated in table 3

Table 3 : Web Technology Software

Web Page Construction & Interface Design	HTML, CSS, PHP coding with Adobe Dreamweaver
Server Side Scripting	PHP coding with Adobe Dreamweaver
Program design	HTML,Java Script, PHP, CSS, Adobe Dreamweaver
Database design software & Server	MYSQL server & Navicat for MySQL
Web Server	Apache Server with Uniform Server

Server Side Application Layer (SSAL): Application layer is built using PHP. PHP provided the web developer with a framework to create dynamic content on the server using HTML which is secure, fast and independent of server platform. PHP was used to send the data submitted by system users on HTML forms into the MySQL database. This data included comments, survey data and blog contributions. PHP script collects and submits the information into the main system database. The database is hosted on Apache Server provided by the UniServer application, during development. In the implemented state, a web server is used to host the database. PHP is also used to send text messages from the SMS server to the recipient's mobile phones this is achieved through the aid of a third party SMS gateway service. MySQL is the platform used to design the system database. All tables into which the system data is held are hosted in a single database held either on the Local host during development or Web server when deployed. The database was built with the use of Navi-Cat, a database construction GUI application. It is easier and friendly to work with compared to other GUIs.

Client Side Interface Layer (CSIL): It was implemented using Hyper Text Markup language (HTML), CSS and JavaScript. The CSIL consists of forms for accepting information from the user and validation of those forms using JavaScript. These software are open source and are readily available in the market. HTML was used in the design of web page structure elements including forms, tables, lists, titles, paragraphs and framesets. These elements provide for a way to arrange and display information on the webpage. JavaScript was used to achieve interactivity with the system user such interactivity includes response to prompts. The system prompts the client to login in order

to allow it access their geographic location. JavaScript, together with a jQuery, Google map API were used to achieve this functionality.

Cascading Styles Sheets (CSS) was used to enhance the appearance of HTML elements on the system interface. CSS together with jQuery was also used to make the system interface responsive, so that users of smartphones, tablets and other devices that are not computers can comfortably view a resized interface that suits the size and dimensions of their devices. Adobe Dreamweaver was used as the main IDE. It was suitable in this case because it provides for all the mentioned languages and platforms, other than MySQL. All the interface development and server side coding was achieved with the aid of Adobe Dreamweaver.

3.10 Ethical Consideration

This thesis contains no material written or published by other people except where due reference is made and author duly acknowledged. Anonymity for the interview respondents was maintained. The respondents interviewed were given coded names such as Interview 1 to avoid revealing their names and positions. Permission was also sought from individuals and organizations involved in the study.

3.11 Summary

This chapter has described the research design, sample and sampling technique, data collection instruments, software development methodology and development tools.

CHAPTER FOUR

SYSTEM ANALYSIS AND MODELING

4.1 Introduction

This chapter covers the requirement analysis and data modeling. It covers; requirement analysis, functional and non-functional requirements, and use case model.

4.2 Requirement Analysis & Presentation

Requirements analysis encompassed those tasks that went into determining the needs or conditions to meet for a new product. They were both functional and non-functional requirements. Requirements analysis included three types of activity:

- i. Requirements gathering: the task of communicating with customers and users to determine what their requirements are. This was done through interview and prototyping.
- ii. Analyzing requirements: involved determining whether the stated requirements are unclear, incomplete, ambiguous, or contradictory, and then resolving these issues.
- iii. Recording requirements: Requirements were documented using use cases.

4.3 Requirement Gathering

While in the field, I deliberately took comprehensive field notes to document data emerging from interviews. During the interview I took notes which easily summed up the overall impression immediately after the interview. I developed a coding scheme, starting with major themes in the order of public participation, challenges of public participation, ICT and governance, and requirements for an ICT solution.

Analysis was guided by the conceptual framework outlined in Table 4.

Table 4: Themes for Evaluation, and Corresponding Data Collection Methods

Theme for evaluation	Data collection methods
Effectiveness of public participation	Semi-structured interviews with <ul style="list-style-type: none"> • County government officials • ICT staff • Residents
Challenges associated with public participation	Semi-structured interviews with <ul style="list-style-type: none"> • County government officials • ICT staff • Residents Participant observation
ICT & governance	Semi-structured interviews with <ul style="list-style-type: none"> • County government officials • ICT staff • Residents Participant observation
requirements for an ICT solution	Semi-structured interviews with <ul style="list-style-type: none"> • ICT staff
web-based application to support public participation	Semi-structured interviews with <ul style="list-style-type: none"> • County officials • ICT staff • Residents

In order to maintain confidentiality and anonymity of respondents, the interviewees were given coded names such as *Interview1* to avoid revealing their names and positions.

4.3.1 Public Participation

Public participation has come to the centre of decentralization reforms as a result of what Cheema & Rondinelli (2007), term ‘the transition from government decentralization to decentralized governance’. Likewise, a staff member in the ICT department recognized that public participation is a consistently necessary element that must invariably be conducted with rigour (*Interview 2*). This section gives an overview of the current status of public participation in governance using data collected through interviews with county officials and residents.

According to (*Interview 4*), local authorities were used to invite people to an open public meeting by announcing the event during a national holiday ceremony. The method of participant selection and invitation seemed to vary depending on whether the consultation was open to the general public or focused on a targeted potentially affected population. County officials cited the importance of using previously established networks to access local participants and to add legitimacy to the process.

According to (*Interview 6*), information is sent ahead of time on the kind of participation, with the appropriate date and time and venue that will be applicable. Other means of raising awareness about public meetings included local radio broadcasts, local and national newspaper announcements, posters, and word-of-mouth. Technical experts and government agencies are usually invited for consultations via letter, email, or phone call (*Interview 2*).

4.3.2 Methods and Techniques for Participation

There are various methods and techniques used for stakeholder consultation in Murang'a County. Full participation, and consequently participant empowerment, may be realized through methods such as focus groups, workshops, and citizen juries.

According to (*Interview 5*) consultation techniques may include workshops, public meetings, interviews, and questionnaires. In these fora, facilitators not only inform participants, but also elicit their views and opinions. Feedback to the public is done through newspaper, radio announcements, and static website information. This is used purposely to inform the public of the strategic action the county government has taken. According to (*Interview 7*) the most commonly employed consultation methods for the technical expert and government stakeholder categories were workshops, formal meetings, and interviews, while workshops, surveys, and site visits were most frequently used to involve the public.

The Value of Public participation

All interviewees acknowledged the significance of public participation in governance. Among them, the most commonly cited benefits of integrating public opinion and knowledge included gathering a broad range of views and opinions to reduce future conflict, and creating relationships amongst groups and categories of stakeholders.

4.3.3 Challenges Associated with Public Participation

According to (*Interview 7*), county government may be hesitant to open their policy, plan, and programs to public scrutiny because of the introduction of financial and time requirements.

”At the local level because of the rigorous stakeholder engagement processes, it is costly and if it is done the way it should be done, it is costly. The immediately affected people down there - it will be quite an expensive exercise if you take care of all of their traveling allowances and all the livelihood issues. When the cost of the public consultations is too high, obviously there will be a compromise” (*Interview 4*).

In spite of the apparent benefits of public engagement in governance, there remain significant barriers to ensuring meaningful participant contribution to the process. Several of the challenges acknowledged by interviewees in this research, include the prevailing top-down nature of the process, the problematic nature of engaging inexperienced members of the public, and the potential lengthiness of the process. According to Lam (2011), there are administrative challenges to public participation associated with traditional methods of public participation, for example, there are geographical, financial and time limitations associated with engaging public participation in rural communities. Lam (2011), further argues that lack of awareness on the process of participation is another hindrance.

According to McCullough & Noch (2013), people do not participate when: they are not aware of a meeting taking place; they receive inadequate notice; they have other

commitments; they have a negative perception of the sponsoring agency; public comments are not taken seriously; decisions have already been made behind closed doors; meetings are too time-consuming or boring; and meeting sites are too far away, inconvenient, or inaccessible.

4.3.4 ICT and Governance

According to (*Interview 3*), participation is fine involving people in planning what affects them. The respondent felt that the only issue was the time it takes between talking to participators who are geographically scattered and the actual time of implementation. But thought ICT could be used to enhance participation since it's easy to involve many people and get feedback within a short period of time.

According to (*interview 7*) “*one needs to know what he/she wants from the public involvement, what can and cannot be negotiated, define in advance the segments of the public to be involved and select the appropriate involvement technique, such as public meetings or citizen surveys*” The respondent further argues that public participation is most likely to be successful when its costs are low and benefits are high.

4.3.5 Requirements for an ICT Solution

The ICT section identified both functional and non-functional requirements for an ICT solution during the interview.

Functional Requirements

ICT staff identified the following functional requirements for the software prototype.

- i. Should be able to support public participation using mobile phones

- ii. Should be able to support public participation via web portal
- iii. Should be able to receive data sent through SMS
- iv. Should be able to transfer the data to the database
- v. Should be able to analyze responses arising from public participation
- vi. Should be able to represent the data in graphical format for visualization.

Non-Functional Requirements

After interviewing ICT staffs the following were identified as non-functional requirements for the software prototype.

1. Product requirements – Requirements which specify that the delivered product must behave in a particular way for instance:-
 - Performance – data throughput, speed and accuracy of the server processing public participation data be as fast as possible. Response time for client-side application requests should also be fast.
 - Efficiency – error rates be minimized as much as possible with high speeds of system operation.
 - Reliability – the system should produce correct outputs by processing data accurately and efficiently.
 - Compatibility with the Windows operating system while the client-side application should be browser independent.
2. Organizational requirements – Requirements which are a consequence of organizational policies and procedures e.g. process standards used, and implementation requirements.

3. External requirements – Requirements which arise from factors which are external to the system and its development process e.g. interoperability requirements, and legislative requirements.

4.4 Data Modeling

Unified Modeling Language (UML) was used to model the data. UML allows software to be visualized in multiple dimensions, so that a computer system can be completely understood before construction begins (Mitchell, 2003). According to Mitchell (2003), each UML diagram is designed to let developers and customers view a software system from a different perspective and in varying degrees of abstraction.

4.4.1 Use Cases Model

According to Stevens & Pooley (2003), for a system to be seen having high quality, it must meet the needs of its users. User-oriented approach to system analysis was taken to identify the users of the system and the tasks they must undertake with the system.

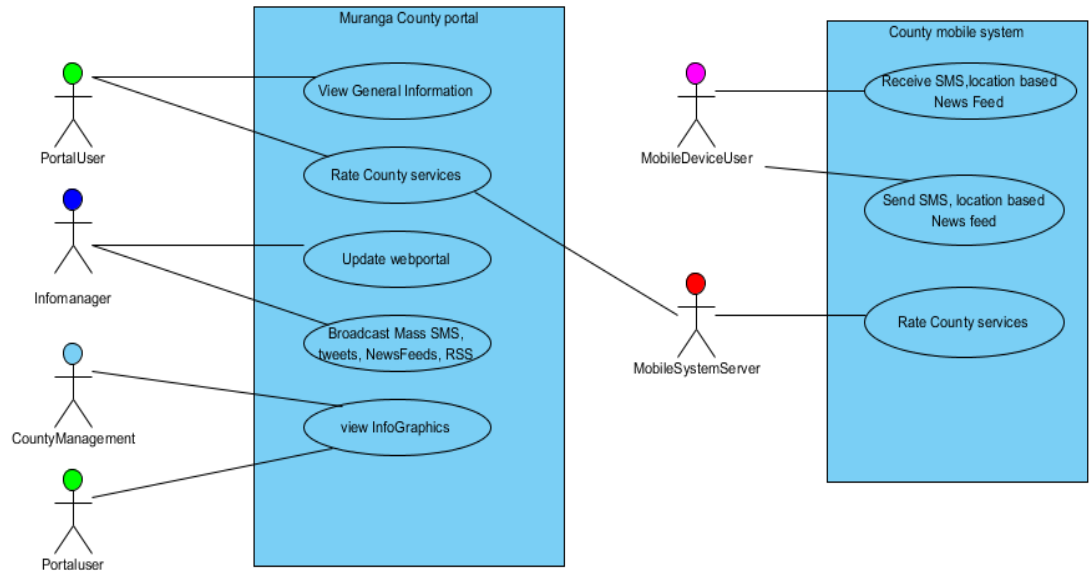


Figure 2: Use Case Diagram

4.4.2 Sequence Diagram

A sequence diagram shows the objects and actors which take part in collaboration at the top of dashed lines. The line represents time as seen by the object. It is the object’s lifeline (Stevens & Pooley, 2003).

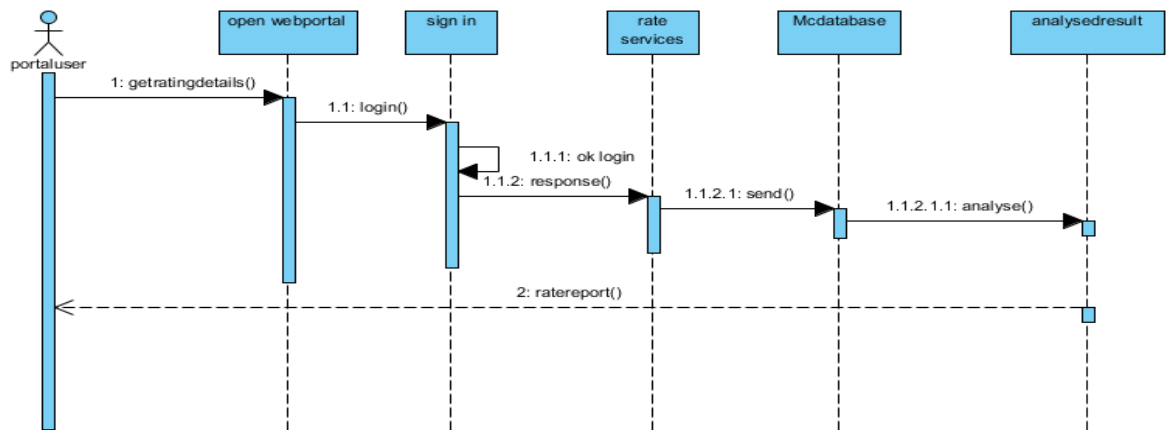


Figure 3: Web Portal Sequence Diagram

4.5 Summary

The chapter has discussed both functional and non-functional requirements of the web application. Use case diagram was used to show interaction between the system, people and systems/devices. The interaction can be described as a sequence of messages. The chapter presented the findings of the data collected. The data was analyzed thematically.

CHAPTER FIVE

SYSTEM DEVELOPMENT

5.1 Introduction

This chapter outlines the design process and implementation of the software prototype that was built for the purpose of experimentation in this study. The prototype was built based on the functional and non- functional requirements obtained during requirement gathering.

5.2 The System Design Process

According to *MITRE(2013)*, system design is the process of defining the components, modules, interfaces, and database for a system to satisfy specified requirements. At design phase components, database, modules, and interfaces for the web application were developed to suit interactive public participation.

5.2.1 Conceptual Design

According to ATA Engineering (2015), the conceptual design phase provides a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave, and look like, that will be understandable by the users in the manner intended. The conceptual design for the proposed software model is as shown below;

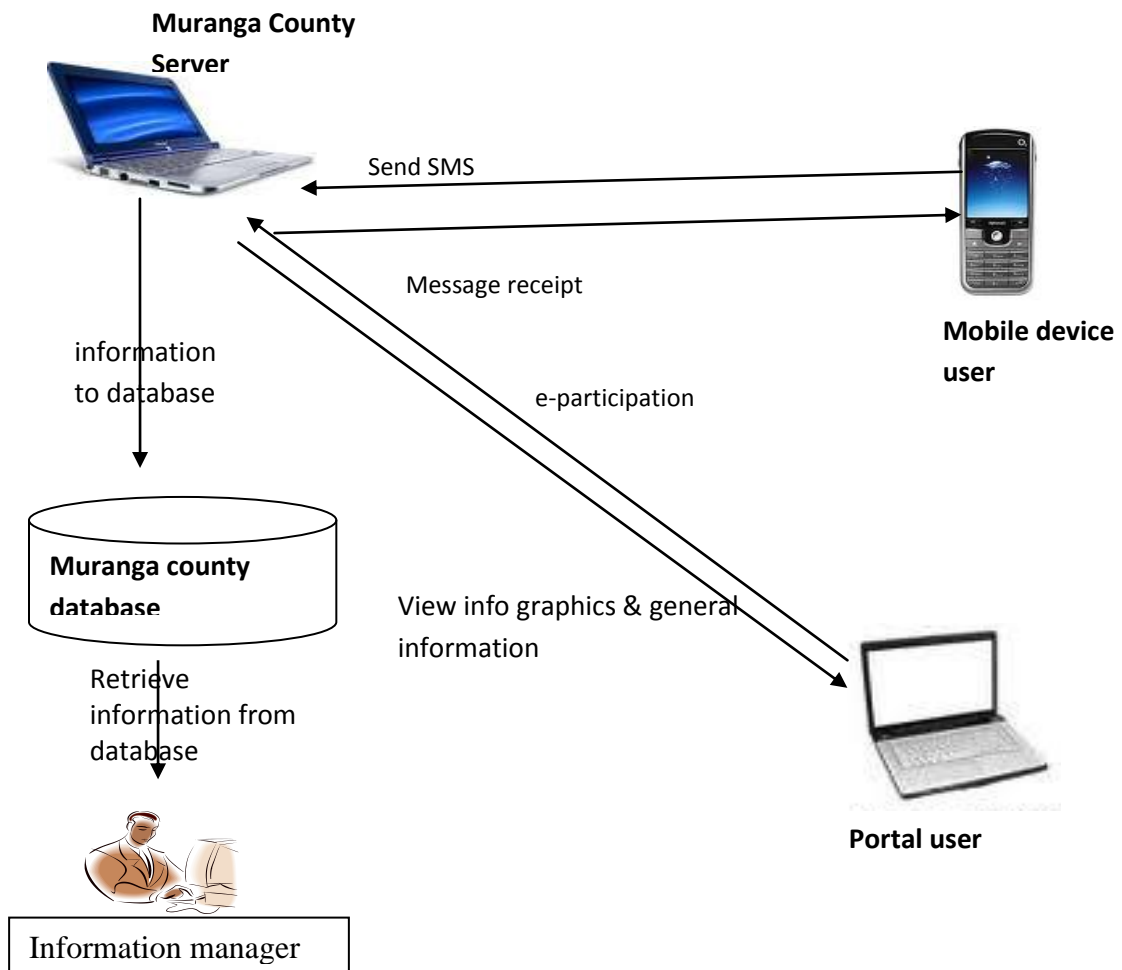


Figure 4: Conceptual Design

5.2.2 Database Design

The database was designed using the relational model where the data and relations between them were organized into tables. A list of tables and their corresponding attributes is as shown;

Tables

Users (id, username, email, password)

Userlevels (id, name, title, k_level, disabled)

Comments (id, tpl_id, page_id, user_id, name, email, link, ip_addr, date, data)

Survey_questions (id, surveyid, question)

Survey_answers (ans1, ans2, ans3, ans4, ans5, ans6, ans7, ans8, ans9, ans10)

Locations (id, longitude, latitude)

Table design

Users

Field	Type	Length
Id	Integer	11
Username	Text	20
Email	Text	20
Password	Text	20

User_levels

Field Name	Type	Length
Id	Int	11
Name	Varchar	100
Title	Varchar	100
k_level	Int	11
Disabled	Int	11

Comments

Field Name	Type	Length
Id	Int	11
tpl_id	Int	11
page_id	Int	11
user_id	Int	11
Name	Tinytext	0
Email	Varchar	128
Link	Varchar	255
ip_addr	Varchar	100
Date	Datetime	0
Data	Text	0

Survey_questions

Field Name	Type	Length
Id	Int	11
Surveyed	Int	11
Question	Text	0

Survey_answers

Field Name	Type	Length
ans1	Text	10
ans2	Text	10
ans3	Text	10
ans4	Text	10
ans5	Text	10
ans6	Text	10
ans7	Text	10
ans8	Text	10
ans9	Text	10
ans10	Text	10

Locations

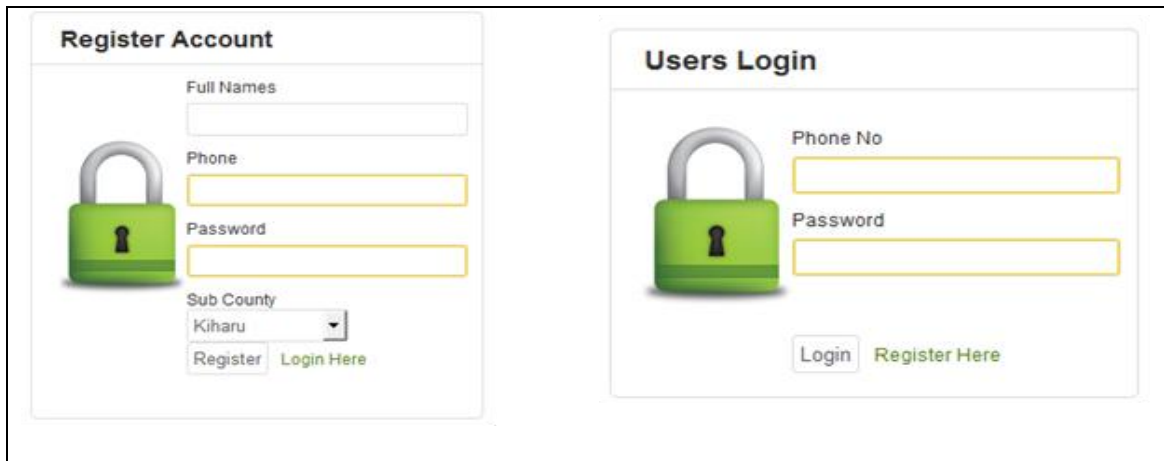
Field Name	Type	Length
Id	Int	11
Longitude	Double	0
Latitude	Double	0

5.3 Description of the Prototype Modules

The modules of the system are as described below and double up as an outline of the modeling process.

i) User Management Module

The user management module caters for the creation and management of user accounts. These user accounts are created with levels; each level has a corresponding scope of access to the system. County staff for instance can access analysis and participants location data. Public users can access the surveys and blogging sections of the system so that they can contribute their views on the various topics, news and surveys. The information manager adds and manages county staff accounts, while the public user accounts are self-registering.



The image displays two side-by-side web forms. The left form is titled 'Register Account' and features a green padlock icon. It includes input fields for 'Full Names', 'Phone', and 'Password', a dropdown menu for 'Sub County' with 'Kiharu' selected, and buttons for 'Register' and 'Login Here'. The right form is titled 'Users Login' and also features a green padlock icon. It includes input fields for 'Phone No' and 'Password', and buttons for 'Login' and 'Register Here'.

Figure 5: User Login Interface

ii) News Articles / Blogging Module

This module provides for the addition of topics related to county matters, ranging from services, opinion and news. This is done by the information manager from the back-end. Other system users can log in and contribute to such topics through the commenting interface or a Facebook API embedded in the system. This is to ensure that as many people as possible get the opportunity to air their views.



Figure 6: News Article Interface

iii) Short message text module

This module is used to send messages and receive responses from county members. It is used to help engage the rural county members who do not have access to internet and computer technology but can access any basic SMS-enabled mobile phone. The text messages may be used as part of a survey, requiring a response to a short query or they could just be informative texts about news or services that the county government has availed.

The screenshot shows the 'Send Text Messages' interface. It features a sidebar on the left with 'Dashboard' and 'Suggestions'. The main content area has a 'Survey Question' field, a 'Text Message Recipients' field containing the phone numbers '254729580958,254727979838', and a 'State' dropdown menu set to 'Active'. A 'Send' button is located at the bottom of the form. Three callout boxes with arrows point to these elements: 'Survey Question Goes Here' points to the survey question field, 'Phone Numbers retrieved automatically from registration table, others can be added.' points to the recipients field, and 'Commit Button' points to the 'Send' button.

Figure 7: Short Message Text Interface

iv) Geographic Information Module

This module collects the location details of participants in surveys. This helps in analyzing the disparities and variance in opinions by locations and any relations in the opinion trends to the participant's location. The locations are plotted on a Google Map to give a visual depiction for easier analysis. The module also specifies the location name of the plotted point.

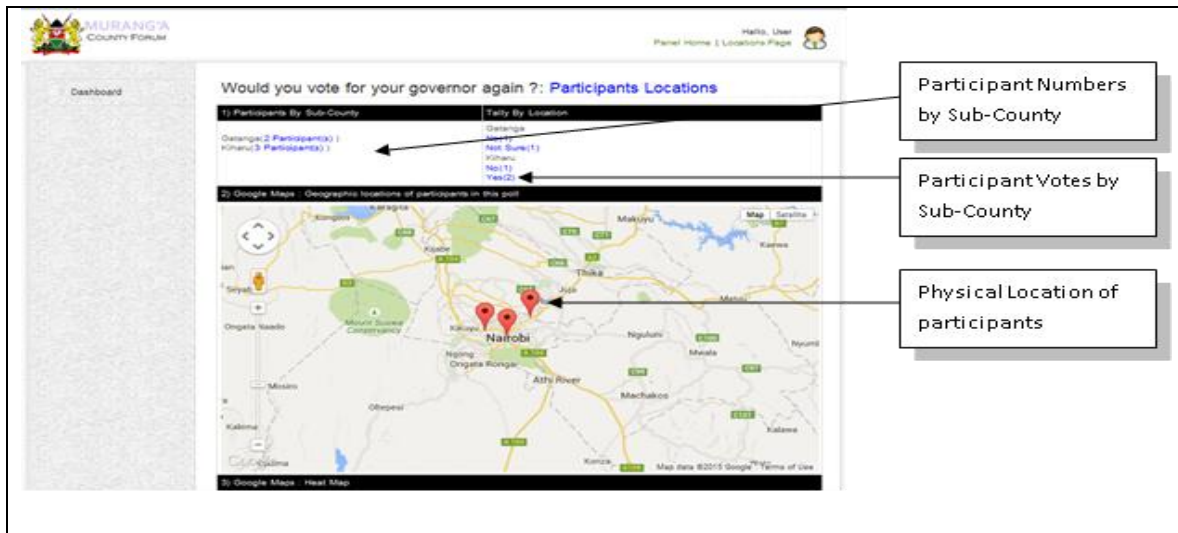


Figure 8: User Locations Plotted on a Google Map

v) Information Analysis Module

This Module provides graphical and statistical analysis to the participant information. The module lists the surveys conducted and their corresponding analysis data, which is in the form of bar chart, pie chart, line graph and corresponding comments for each survey.

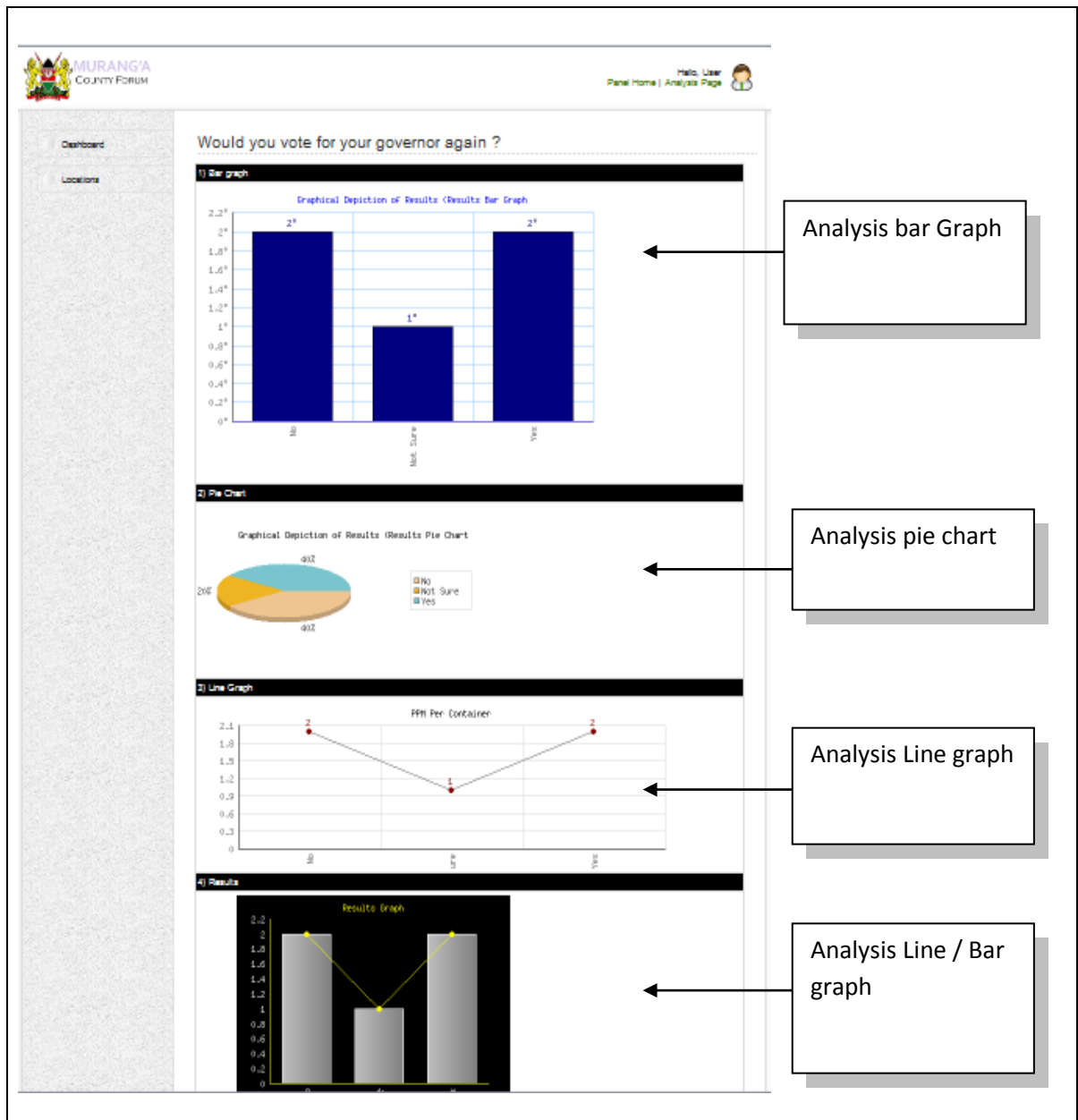


Figure 9: Information Analysis

vi) Admin (Information Manager) Module

This module is the main back-end of content management system. It enables the Information manager to create, edit, and delete topics, comments, add News items, access

the text messages module, manage users and system data. This is the central point of dictation on the system content.

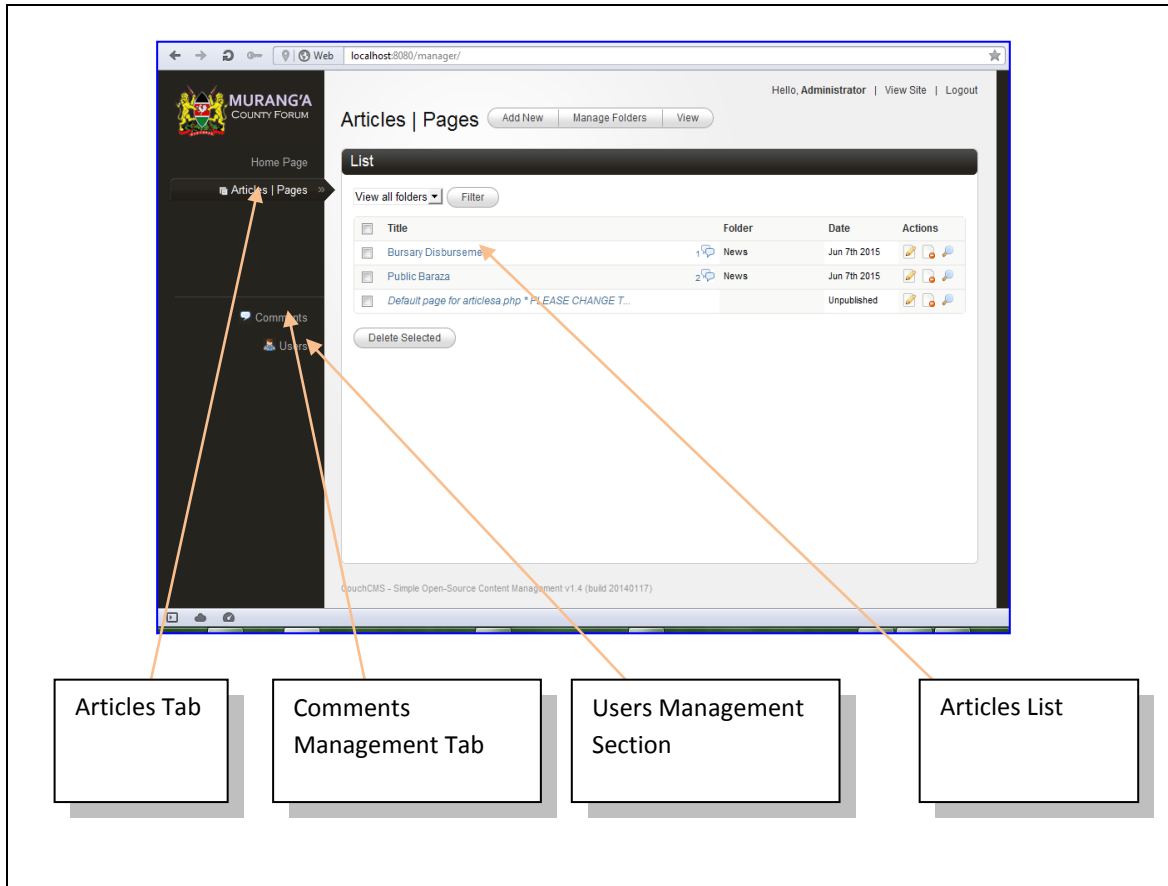


Figure 10: System Back End

vii) Polls module

In the polls section, respondents need to be registered members on the forum to be able to participate. If not registered, they have to provide full names, phone number, password, and sub county to be able to participate. On survey page, active surveys are listed with their descriptions and purposes clearly detailed. The respondent clicks on a survey, reads the question and is also able to see available answers. He/she can participate once for a given survey.

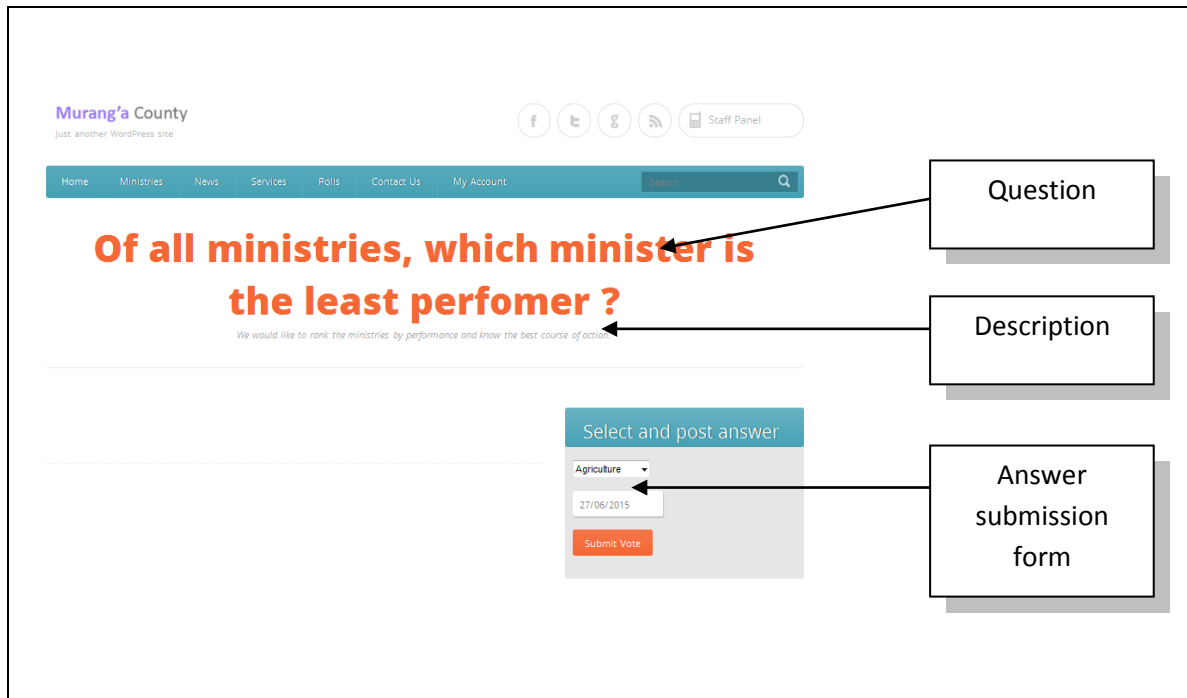


Figure 11: Polls Interface

viii) Mobile Surveys Module

The system also allows for surveys to be done via mobile phones by sending a question with options to reply to a given number. This is to allow for participation of a cross section of society. The mobile messages can be sent to as many respondents as possible and responses collected from them via the online inbox. The recipient's numbers are fed into the "TO" textbox. They can also be loaded from MySQL table rows into the interface. The message is written into the message textbox and sent. The messages are textual and all mobile phones are supported irrespective of the platform.

Figure 12: Mobile Survey Interface

ix) Blog module

The blog allows registered members to create topics and discussions. Other members can participate by leaving comments to be read and analyzed by the county staff. Integration with Facebook has been implemented to allow for members to comment with their Facebook accounts. The mobile end participants can be sent texts with answers to reply with to a central number. Their replies can be listed on the blog roll so that all

participants can participate in the discussions. This is considering the fact that Murang'a County is a rural county and a larger section of the county communicates using mobile phones.

Murang'a County
County Administration System

Home Ministries News Services Polls Contact Us My Account

Bursary Disbursement

2015-06-07 03:15:56

Following the reading of the budget, the county government intends to plan for the disbursement of bursary to needy students

1 Comments

administrator Says:
June 24, 2015 at 02:16am
Been looking forward to this announcement for a while

Post a comment
Logged in as administrator. Logout »

Recent Articles

- Bursary Disbursement
2015-06-07 03:15:56
- Public Baraza
2015-06-07 00:26:31

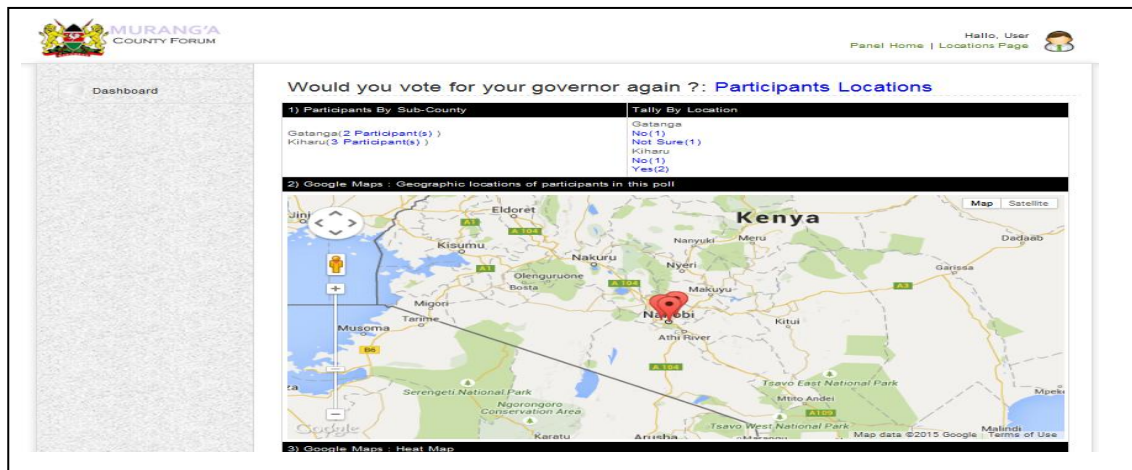
Menu

- Ministries
- News
- Services

Figure 13: Blog Interface

x) Respondent Locations Module

The location of survey respondents is collected using geo-coding and the coordinates of the location where they accessed the forum from collected in the form of longitudes and latitudes. These coordinates are mapped onto Google maps integrated in the system and a summary of the location points and respondent details shown.



5.4 System Security

The software prototype has in built security features to ensure the software works the way it was intended. The information manager back end can only be accessed by the system manager by logging into the system using correct user name and password. Here, the system manager can add, edit and update poll questions, surveys and blog articles. The manager can also create news articles and send texts to mobile phone holders. The manager also creates and manages county staff accounts in the system, accounts with which the analysis data can be accessed. Analysis data is extracted from the system database. Members registered as users of the system can participate in the polls and surveys. Membership is attained through the creation of an account by the system.

Contact details and sub-county information are also collected in order to enable further breakdown of statistical data by geographic locations for better decision making.

5.5 System Testing

Unit testing and user acceptance testing were the most commonly used software testing strategies used. Unit testing was performed to check system code structures to find bugs and errors. Unit testing involved the testing of each of the modules developed as if they were complete systems on their own. In this study, unit tests were done in parallel with the coding process. A set of unit tests were done and after change of any module, all the unit tests were re-run to ensure that the units functions as per the expectation to avoid introduction of major faults in the system.

User acceptance testing was implemented by the developer role playing a user and peers. The user (developer in this case) would come up with a list of all desired functionalities and system behavior and ensure these were met. The peers tested the system and gave feedbacks which were implemented in the subsequent prototypes. At each development milestone, the system was evaluated against mock user requirements prior to delivery. In the development of the software prototype, other testing carried out included the following;

5.5.1 Incremental Testing

Incremental testing is where codes of a software system are tested as they are being written. Incremental testing was used in the development of the software prototype and activities involved, testing the stability of the code, saving a copy of the stable code and

falling back to the stable code should something go wrong with the code later. This form of testing helps the programmer to quickly identify problems in the code, debug them and establish stable builds of the code hence reducing the time spent on debugging.

5.5.2 Integration Testing

In Integration testing the modules were combined and tested as a whole. It was highly possible that integration testing of certain modules could fail, though each module passed the unit testing. It was met to uncover errors associated with interfacing.

5.6 System Installation and Deployment Strategy

The System is hosted on a PHP / MySQL web server. It is deployed by opening the system URL address in the web browser. Any JavaScript enabled browser can run the system but Mozilla Firefox is highly recommended for this function. The System interface is also responsive and resizes to suit the device on which it is deployed. It can be deployed on any browser enabled device once hosted such devices may include smart phones, Desktop computers, Laptops, and Tablets. The System can also be deployed on multiple devices simultaneously since the database is shared and it is network based. This allows for seamless access to the system by anyone, anywhere, subject to connectivity to the internet or the network on which the system is hosted. The system is hosted on a webserver and can be accessed through the domain name www.davidmarangu.com. Here, the user can access the main system interface which allows him or her to view news items, blog articles and ministry information details as explained in user manual (appendix IV). The user can participate in polls once he or she has an account with the system. The account is acquired by self-registration with the system. County staff

accounts are created by the Information manager in the main Content management section (CMS) of the system. The CMS is accessible only to the Information manager who has control over all system elements. The information manager can edit, update and delete any article or comments and can also send text messages to the county members through text interface provided in the CMS. The system database is hosted on the webserver too and this is where all system data is stored to and retrieved from. Access to the database and system files can be achieved by logging into the Webserver's main dashboard.

System Requirements

For the system to work efficiently, these prerequisites have to be met

- i. Domain Name (for access to the system)
- ii. Web Server (PHP 5.3 & Apache Host)
- iii. Server Disk space (1 GB Minimum)
- iv. Database Server (MySQL 5.0 Database server)
- v. FTP capabilities for files upload

5.7 Summary

The chapter has described system design process, system security, system testing and system installation and deployment strategy.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter discusses the findings of the study in respect to the formulated set of objectives.

6.2 Summary

Meaningful citizen participation faces significant challenges. The Web-based application that was developed here addresses several of these challenges by eliciting public opinion in a systematic and comprehensive way. The development of Web technology and real-time interactive changes allows us to measure the public preferences in ways never before possible. The real-time, interactive nature of the Web application allows respondents to participate in governance.

The Web-based interactive surveys provide the graphical interface which presents the respondent with a much wider variety of information than is possible using computer-assisted telephone interviewing systems. The Web-based survey can be opened up to the public. Community fora can be designed around the Web-based survey to increase civic engagement and understanding of the tough trade-offs facing decision makers.

6.3 Conclusion

To conclude the study and to show that the aim of the study was achieved, the objectives are presented below together with a brief explanation of their achievement.

Objective 1: To assess how the public participate in governance in Murang'a County.

From the study findings, it can be deduced that there exists various methods and techniques used for stakeholder consultation in Murang'a County. These methods include workshops, and public meetings. Kenya's constitution has laid a foundation for public involvement and participation in governance as explained in literature review.

Objective 2: To establish the challenges faced in the current methods of public participation.

The study concluded that there were challenges faced in the current methods of public participation. Several of the challenges acknowledged by interviewees in this research, include the prevailing top-down nature of the process, the problematic nature of engaging inexperienced members of the public, and the potential lengthiness of the process. Detailed explanation of the challenges faced in current methods of public participation is in section 2.5.3 and 4.3.3

Objective 3: To investigate how ICT can be used to enhance public participation.

It can be concluded from this study that ICT could be used to enhance participation since it is easy to involve many people and get feedback within a short period of time. The respondent further agreed that public participation is most likely to be successful when its costs are low and benefits are high and this could be achieved through ICT.

Objective 4: To identify and analyze requirements for an ICT solution.

From the study findings the ICT staff identified both functional and non-functional requirements for an ICT solution. The requirements are discussed in detail in section 4.3.5

Objective 5: To design and develop a web-based application to support public participation in governance for Murang'a County.

This study has come up with a web-based application designed to achieve the functional and non-functional requirements of the system proposed by ICT staffs during data collection. System installation and deployment strategy is explained in section 5.6. System development is explained in details in chapter five. The system can be accessed at *www.davidmarangu.com*

After achieving all the specific objectives then the aim of the study was met through development of a web-based application for public participation in Murang'a County. Generally, it can be concluded that the software prototype could be an effective tool for public participation in governance since:

- i. It supports public participation using mobile phones where the participant can receive notification sent through SMS and reply using a message.
- ii. It supports public participation via web portal which is highly interactive
- iii. It analyzes responses arising from public participation using visualization techniques and this can aid in decision making.

System interactivity has been achieved through the use of web and mobile technology. The web based interface is responsive and therefore allows users with mobile devices that have internet accessibility to comfortably access the elements that make the system usable.

6.4 Study Recommendations

The following are the study recommendation:

- There is need to create intensive awareness for mobile participation and improve literacy levels on the usage of mobile technologies to enhance citizen participation.
- It is recommended that the system should be adopted for effective and efficient participation by residents in decision making.
- It is further recommended that citizens of Murang'a County be sensitized on its use.

6.5 Suggestions for Further Research

Further research is recommended on improving the developed system to allow data mining and visualization of data obtained from public participation through social media. The prototype can be improved to carry out data mining in the data obtained from the public participation in order to come up with associations, clustering and interesting patterns. Further enhancement can also be done on the security aspect once vulnerabilities are detected. Every day, new hacking and unauthorized access techniques are developed; therefore, progressive security enhancement is crucial. This can be achieved through an added module or functionality.

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Appendix I: Interview Schedule for Public and County Officials

Topic – Public Participation in Governance

1. Do you participate in governance of Murang'a County? If yes, which activities of governance do you usually inquire about?
2. How do you participate in governance in the above activities?
3. What challenges do you face as you participate using the current methods of public participation?
4. Have you ever used any ICT tools in other areas of participation other than public participation? If yes, which forms of ICT Tools are you familiar with?
5. How else do you think people can participate in governance using ICT tools?

Appendix II: Interview Schedule for ICT Officer

1. a) Do you have any formal training in ICT?
b) What kind of training did you undertake?
2. Which ICT facilities / equipment are available in your organization?
3. Do you have a web portal for public participation in governance? If yes which features does it support?
4. Which services do you think can be offered through a web application?
5. How can you determine where the participant lives using web application?
6. In your own opinion, how can public participation be done when using internet?
(through sms, social media, emails etc)
7. What features do you expect the web-based portal to have in terms of sharing and support to public participation?
8. What level of interaction would you prefer in a web application?

Appendix III: Observation Checklist

An observation checklist is a list of things that an observer is going to look at when observing events. Observation checklists not only give an observer a structure and framework for an observation but also serve as a contract of understanding with the researcher.

Observation checklist is an instrument/tool for recording occurrence and/or detail focusing on issues one is interested in.

The researcher will observe the following:

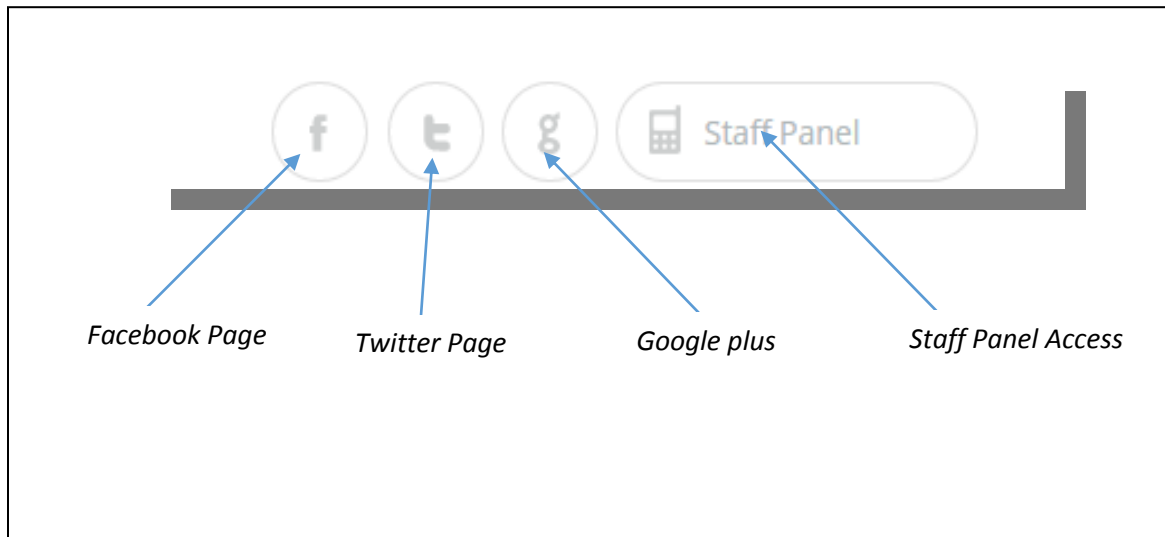
1. Operation in the reception office
2. Hardware parameters (number of computers)
3. Software parameter
4. Integration level (do they use ICT in rendering service within and without)
5. Notice boards

Appendix IV: User Manual

The Homepage of the system can be accessed from the URL *www.davidmarangu.com*.

The Homepage has a header that holds the social media links, the link to the staff panel access login and the main system menu. The social media Links take the user to the respective social media pages that provide means of information dissemination and opinion collection.

The Links include:



The Lower section of the homepage has the links to the news, polls and surveys, services, ministries, contacts page and the login section for regular members, who are mainly county citizens who have access to the system via the web platform. The interface is responsive and can be easily accessed using either computers or smart phones.

The ministries menu item opens the ministries list page. This page contains all the county ministries, their descriptions and functions. The Ministries, when selected allow the user to leave a comment through the comments section, either as a registered user or as a

guest. This one way the county government can collect citizens' response to its services and also provide insights, criticism or appraisals from the public.

Comment

Comment Section allows for commenting using the system comments interface or Facebook comments plugin.

Polls

Here, one can select an active poll and submit a vote. One can only vote once. Once the vote has been submitted, the poll item ceases to appear

Contact us

Contact us displays contact details through which the public can contact the county management.

My Account

This section allows users to create accounts and log into the system. This is because most functions like commenting and polling require further details like locations and contacts for analysis.

The Staff Panel

The staff panel gives access to the back end where one can create web surveys, send text notifications / conduct text surveys to users who do not have access to the web based platforms, access suggestions from users with lower end mobile phones in the suggestion box, access the administrator panel (only for admin level users) and log out. This section also gives access to the data analysis section of the system.

To log in staff panel access use username as *admin* and password as *password*.

Survey Creator

The Admin creates a survey questions and clicks next to add the answer options. This survey appears in the front end polls page.

Text Sender (text survey creator)

One can create text surveys or questions, notifications and send to selected mobile phone numbers

Suggestion Box

Received suggestions from the public through text messages are analyzed in the suggestion box section.

Admin Section

The admin section allows for access to the News, Services and Ministry information management, system users management and comments approval and denial. It can only be accessed by users with administrative rights. Use username as *admin* and password as *password*

Data Analysis

The analysis module shows analyzed data depicted in bar graphs, Pie charts and line graphs. It also displays response by region (Geo-spatial analysis). Location data is collected using Google maps location services when users are commenting or voting on the system. Text Survey results are also grouped by answers