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PREFACE

Welcome to the International Conference on Cloud Computing and eGovernance (ICCCEG) 2013 in Holiday Inn Express, Internet City, Dubai, United Arab Emirates on 17 – 19 July, 2013. If this is your first time to Dubai, you need to look on more objects which you could never forget in your lifetime. There is much to see and experience. We also hope you join in engaging conversations about e-governance and cloud computing in all sectors of the field. Cloud computing has become a great solution for providing a flexible, on-demand, and dynamically scalable computing infrastructure for many applications. Cloud Computing also presents a significant technology trends, and it is already obvious that it is reshaping information technology processes and the IT marketplace.

This conference provides a unique multi-disciplinary forum for Government, Healthcare, Education, and Business professionals to discuss and exchange the latest research, development, applications, issues, and strategies, to explore new technologies, and to identify solutions for today's challenges related to e-learning and distance learning.

With the dramatic growth of cloud computing technologies, platforms and services, this Conference can be the definitive resource for persons working in this field as researchers, scientists, programmers, engineers, and users. The conference is intended for a wide variety of people including academicians, designers, developers, educators, engineers, practitioners, researchers, and graduate students. This conference can also be beneficial for business managers, entrepreneurs, and investors. The conference can have a great potential to be adopted in current and new courses on Cloud Computing.

The concept of cloud computing provides a brand new opportunity for the development of mobile applications since it allows the mobile devices to maintain a very thin layer for user applications and shift the computation and processing overhead to the virtual environment. However, mobile cloud computing is also facing many challenges such as the dependency on continuous network connections, data sharing applications and collaboration, and security.

Government and industry e-commerce agendas have become more closely linked in recent times and more people are now less tolerant of poor, impersonal service in the public sector as they become aware of the power of the web and experience good service in the private sector. With the advancement of Information and Communication Technologies, electronic government (e-government) has emerged as an effective means of delivering government services to citizens. It is in every government's interest to make their public services more efficient and available in order to gain citizens' trust, which has often eluded many governments and political leaders in modern society. While e-government has already established itself as the primary enabler for transforming the way government services are offered to citizens in developed countries, it is now beginning to show promising results in many developing countries.

We invite you to join us in this inspiring conversation.

Finally, I thank my family, friends, students and colleagues for their constant encouragement and support for making this type of conference.

-- **Manikandan Ayappan**
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Cloud Computing Applications

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***Abstract*—This paper gives an overview of cloud computing applications including its particular characteristics, traits and issues.**

***Index Terms*—Cloud Computing, Cloud Applications.**

I. Introduction

Today the use of cloud computing applications is mushrooming at an ever increasing rate. But what exactly is cloud computing? "Cloud computing is a technology that allows the users to access software applications, hardware, storage, computing processes directly from the web." [1] This is no doubt being helped by the prevalence of mobile devices such as smart phones and tablets with fast internet access using 3G and 4G communications links in the form of mobile cloud computing [2]. These devices have direct, fast and cheap links to the internet which makes it easier to upload and download programs and applications onto the internet and on online network storage services. Often this mobile link provides a superior and faster link to the internet cloud than using a fixed broadband access. This paper describes the various major applications of cloud computing along with its pertinent characteristics.

II. Cloud Computing Applications

Cloud computing applications are intimately linked with mobility of the user, this may involve international travel. The user wants a seamless integration of services using multiple devices often from multiple locations. The user wants convenience and to carry the minimum amount of hardware. Loss of hardware storage devices may also be an issue. Thus applications which caters for these needs have a special appeal. Security applications, disaster relief, crowd computing involving social networking [2] are prime candidates for adoption of mobile cloud computing applications.
Both Apple and Google provide cloud applications, such as Apple's iCloud and Google's mobile email service.

The adoption of cloud computing has not been as fast as mobile telephony. Khan *et al*., [3] mentions that by 2014 there is expected to be about 1 billion mobile cloud services subscribers, this, however, only represents 19% of mobile subscribers. The main reason for this slow adoption has been due to security concerns. Fig. 1, below illustrates how security concerns can be addressed to provide a very secure cloud computing platform.

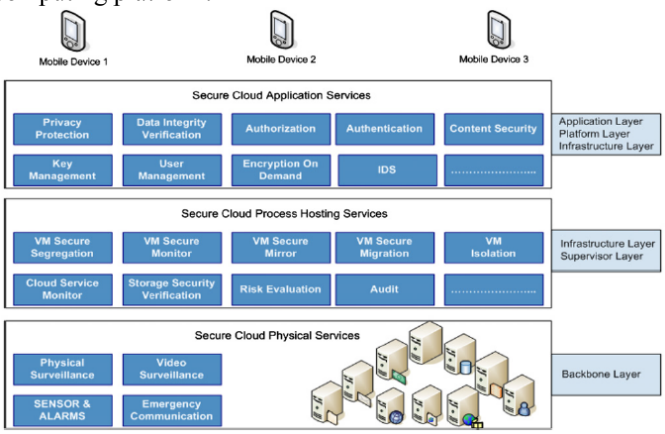

Fig. 1. Security Services on Different Layers of Cloud Computing [2].

Many cloud applications also request and send location data. This sensitive information of the user also needs to be "cloaked" or hidden. This can be implemented as an "in-device" service [3]. Even though end-to-end security may be available when utilizing cloud computing, the issue of who is responsible for "personal data" is a very important issue. This is discussed in length by Hon *et al*. [4].

Table 1. The features of the two computing models2

Features	Client-server model	Cloud computing model
Sharing of information	Upload and download Needs to access a web site	Continuous automatic synchronization
Sharing direction	One direction	Multi directions
	Lecturer-student	Lecturer-student
	Student-lecturer	Student-student
		Student-lecturer
Type of information	Limited	All type of information
size	limited	Minimum of 2GB

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[4] concludes that an end-to-end accountability approach has to be taken. Where data is not processed then an intermediary role of neither data controller nor processor should also be adopted, like the action of a host.

Cloud computing is particularly suited for distance e-learning. A comparison between the client-server model and the cloud computing model is shown in Table 1 [1] with regard to this.
Cloud computing can be offered as "SaaS (Software as a Service) such as data storage, computing power and PaaS (Platform as a Service) such as web development platform." [1].

Table 2 [5] summarizes the essential requirements of security, privacy, availability, auditing, flexibility, archiving, quality of service and scalability. Table 2 was composed from studying case studies in the domains of Government Applications, Large Scale Computations (Business Intelligence Systems), Financial Services, Healthcare Applications and Online Entertainments.

Table 2. Requirements Summary [5].

	Governmental Applications	*Large-Scale Computations*	*Financial Services*	*Healthcare Applications*	*Online Entertainment*
Archiving	High	Low/Medium	High	High	Medium
Audit	High	Low	High	High	Low
Availability	Medium/High	Medium	High	High	High
Flexibility	Medium	Low	High	Medium	Low
Privacy	High	Low	High	High	Low
Security	High	Low	High	High	Medium
QoS	Medium	Medium	Medium	Medium	High
Scalability	Medium	High	Medium	Medium	High

Digital Library Applications are discussed in depth in [6]. [7] discusses using cloud computing to implement a distributed geographical information system platform.
Table 3 [8] summarizes the main policy and applications of cloud computing in large-scale organizations.

Table 3. Main Policy and Applications of Cloud Computing in Large-scale Organizations [8].

	Enterprises	*Cloud Offerings*	*Types of Service*
Major Foreign Enterprises	Google	Goole App Engine Platform for web apps	Delivery and deployment platform (App Engine) and productivity tools (Google Apps). Low-cost hardware, scalable software infrastructure, innovative applications. Easy to build, maintain and scale.
	Microsoft	Online Services Windows/Office Live. Windows Azure Platform	Via internet to build cloud computing platform. Connect the billions of desktop and explore to a strong cloud network. Software + Services strategy: future is a combination of local software and Internet services
	Amazon	Elastic Compute Cloud and Simple Storage Service	Through its Amazon Web Services (AWS) products, offers a pay-as-you-go access to virtual servers and data storage space
	Salesforce	On-line CRM services	Based on network, advocating NO Software.
	HP, Intel, Yahoo	The plan of Cloud computing trial platform	Open source software; integrate the Internet; eliminate data intensive research computing and business computing in a variety of obstacles, promote open collaboration.
	SAP	ERP software based on cloud computing	End-user applications delivered as service, instead of On-premise implementation.
Major Domestic Enterprises	Qihoo, Kingsoft, etc.	"Cloud Saftey"	Cloud safety via the network of plenty End-cloud customer computers to detect the software abnormal actions. The more cloud node users is, the more safety will be.
	Alibaba	Ali-software	E-commerce business based SaaS and PaaS model.
	21vianet	Distributed IDC sources And CloudEx	Include complete internet host computer CloudEx Computing Service. Cloud security services, data backup for Individuals and enterprises to the Internet
State policy about cloud computing and Major collaborative research institutions	The policy "*Pilot Program of Cloud-Computing Service Innovation*" demonstrated Beijing's vision and determination of pushing forward Cloud-Computing in China, in which Beijing, Shanghai, Shenzhen, Hangzhou and Wuxi have been chosen as the first wave pilot cities in the program. IBM in North Carolina and Tokyo's cloud computing datacenters; IBM Innovation Center in Beijing, China, the establishment of IBM Greater China Cloud Computing Center; Electronics Research Institute and Guangdong Dongguan Songshan Lake Science and Technology Industrial Park in cooperation to invest in cloud computing platform; Ali Baba and Nanjing Municipal Government: E-commerce cloud computing center.		

It should be noted that the idea of cloud computing was proposed jointly back in 2007 by IBM and Google [9].

Smart Mobile Devices [10] can use sensors that make applications context aware, which reduces user input. Mobile Applications can be enhanced with REST (Representative State Transfer) based cloud computing technologies to create applications that exceed the capabilities of traditional mobile devices. Combining these creates the opportunity to develop a completely new paradigm of consumer software applications.

The need for speed can easily be achieved by adopting the platform of cloud computing. This is realized as a parallel multiple pipelined architecture which is shown in Fig. 2 [11].

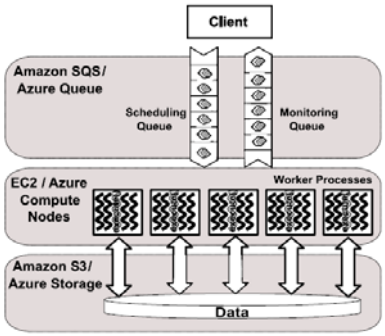

Fig. 2. Classic Cloud Processing Model. [11]

Recent advances delivered by HTML 5 is now being exploited in implementing efficient mobile cloud computing applications. Some of the features present in HTML 5 are shown in Table 4, below.

Table 4. Contribution of HTML 5 Features in Dealing with Mobile Device's Limitations [12].

HTML5 Features	Energy efficiency, battery life	Bandwidth networking functionality	Processing power, memory	Screen size	Data entry capabilities
2D Vector Graphics (SVG)				√	
2D Programmatic API, HTML <canvas>		√	√		
Graphical effects				√	
Downloadable fonts			√	√	
Video and audio playback			√		
New types of form controls		√	√		√
Touch-based interactions, Vibration API				√	√
Device information, CSS-based adaptation			√	√	√
Bidirectional connections		√	√		
On-line state		√			
Application Cache, Widgets		√			
Page visibility detection		√	√		
Battery status	√				
Threading			√		

[13] describes three types of cloud computing:

"All functions are provided to users in form of services in clouds, that is, X as a service (Xaas). Above the three types of cloud services are Infrastructure as a Service, Platform as a Service and Software as a Service. **Infrastructure as a Service (Iaas):** Users will deploy processors, storage systems, network and other fundamental computing resources, and run operating system and applications software according to their own willing. **Platform as a Service (Paas):** Users write the application using programming languages and tools supported by providers, and run it on cloud platform. **Software as a Service (Saas):** Software providers run programs on cloud computing facility, and users use these programs through a variety of thin client interface by client devices. There are three types of cloud application instances corresponded with three types of services: infrastructure for cloud services, platform for cloud services and application for cloud services." [13]

With concerns for security ever increasing globally, mobile cloud computing for biometric applications is a rapidly expanding area of application [14]. Fig. 3. shows how important biometric feature vectors may be extracted and processed by parallel cloud computing to increase the speed of execution. This is important in arriving at a near real-time decision in matters of security.

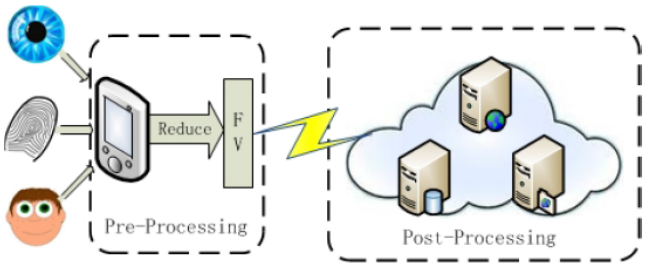

Fig. 3. Example of Mobile Extracts Feature Vector and Offloads Recognition Task to the Cloud. [14].

[15] offers a novel and extended cloud computing application architecture which has taken into consideration features provided by both IBM and NIST and extended them. This is shown in Fig. 4.

With the prevalence and adoption of QR codes, it is very important to be able to process these in near realtime as possible. [16] offers an approach where the QR code has been used as an image while partitioning and executing the data as a stream through a mobile cloud computing environment. Fig. 5. shows the superior performance in terms of images processed per second if the images are first partitioned and then processed via cloud computing.

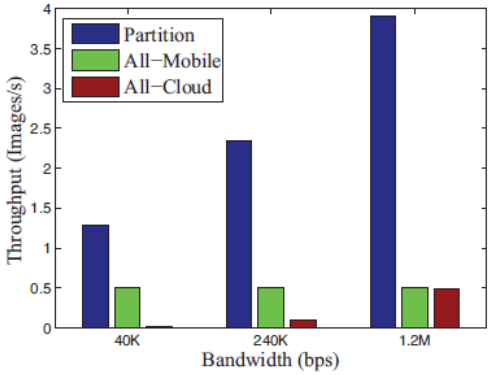

Fig. 5. QR-Code Recognition Performance through various Platforms [16].

Mobile Internet Devices (MID) can enhance their limited computational power by offloading computational tasks onto the cloud. Fig. 6, shows cloud computing applied to MID.

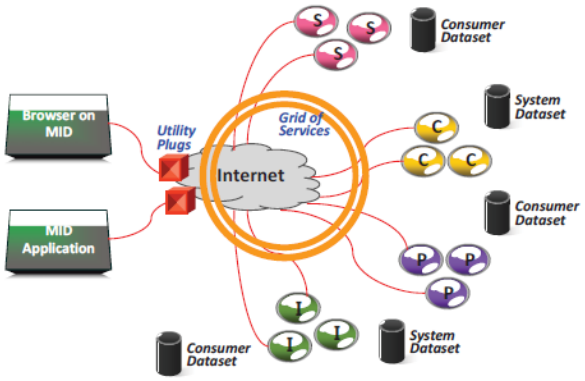

Fig. 6. Overall Architecture for CC Applied to MID. [17]

Cloud services can thus provide rich functionalities to MIDs by utilising the powerful internet connectivity of the mobile devices [17].

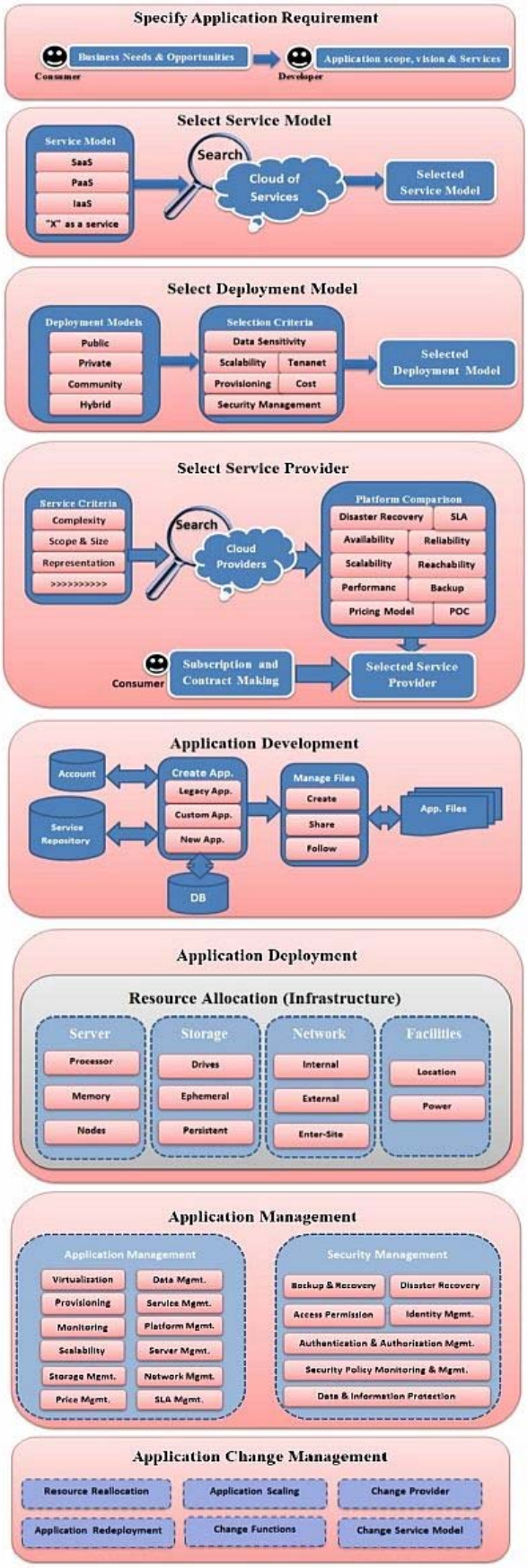

Fig. 4. Hassan's Cloud Computing Architecture [15].

It is important to take into account how faults are to be handled. [17] addresses this in cloud computing by the adoption of an autonomous fault manager module. Fig. 7 shows the use of blocks with functionalities of 'identifier', 'detector' and 'determiner' in the autonomous fault manager.

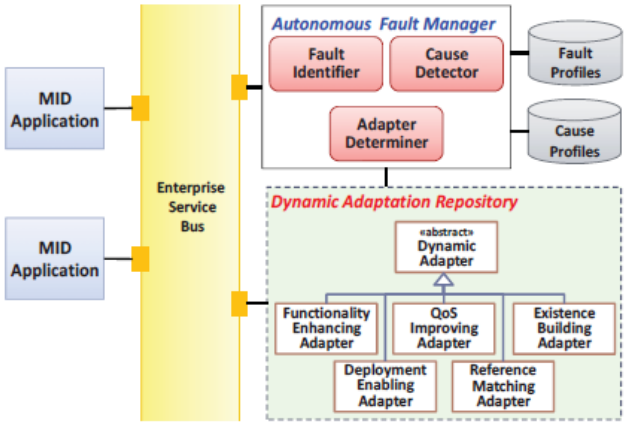

Fig. 7. Architecture for Fault Management [17].

[17] has proposed six essential and key methods to be adopted in the efficient and smooth running of Cloud Computing applications, these are: "*capturing commonality into cloud service*, *design for adaptability*, *architecturing thin-client*, *methods to ensure high QoS*, *monitoring services*, and *autonomous fault management*." Adopting this strategy will reduce potential future technical problems.

Libraries are also adopting cloud computing to offer their services. An earlier paper [18] published in 2011 discusses offering medical library services utilizing the cloud.

[19] discusses the adoption of cloud computing by small and medium enterprises in the North East of England. Fig. 8, shows the decision making points that need to be considered for the adoption of on-demand computing services.

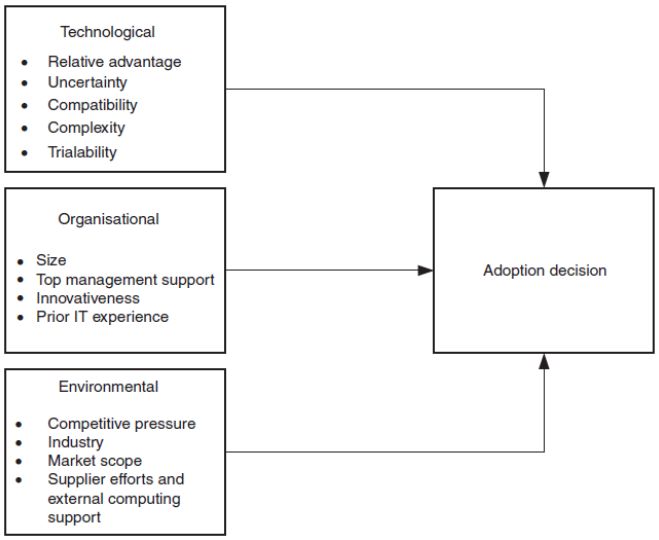

Fig. 8. Framework for SME Adoption of On-demand Computing Services. [19].

[20] identifies the prime differences between traditional cloud computing and mobile cloud computing. This is shown in Table 5.

Table 5. Connectivity, Device and Service Differences between Fixel-line Cloud and Mobile Cloud [20].

Category	*Factor*	*Traditional cloud computing*	*Mobile cloud computing*
Connectivity	Network access	Continuous fixed line (possibly through local Wi-Fi)	Interrupted wireless depending on MNO coverage, or available ad-hoc Wi-Fi or Bluetooth connections
	Network bandwidth	High and constant	Currently limited, variable dependent on network coverage and user movement speed
	Network latency	Typically ~8-35ms from user to DSL/Cable ISP in The Netherlands ~2-5ms for fiber optic connections	Currently typically 100ms due to mobile network latency. Will drop to ~10ms with next-generation networks
	Network data plans	Flat-rate	Trend towards data caps (De Vries, 2011), possibly differentiated fees per type of use depending on net neutrality
	Location	Fixed	Variable: on the move or fixed
Devices	Devices used	Desktop computer, laptop computer	Laptop, tablet, smart phone, feature phone etc (Warner and Karman, 2010)
	Device properties	Standardized input methods, large displays, large resource pool in case of thick clients, scarce resources for thin clients	Currently limited battery life, processing power, storage capacity and memory (Kumar and Lu, 2010), varying form factors, for instance screen size, input methods, fragmented OS and web interfaces
	Device sensors	Microphone, camera, light sensor (on laptops)	GPS, camera, microphone, proximity sensor, light sensor, barometer, NFC, gyroscope, accelerometer
Services	Service scope	Anything from applications to operating systems and enterprise resource planning packages, in general all service that run on business IT infrastructure and platforms	Limited due to device form factor, wireless connectivity, input and processing limitations
	Service focus	Full range of location bound applications e.g. home entertainment, office productivity	Mobile value services with a focus on communication, information, entertainment and transaction services; business applications and productivity tools; location-aware, proximity aware applications (Chen and Cheng, 2010; Song and Yoon, 2010)

Table 6, highlights the common elements of cloud computing that is applicable to Mobile Cloud Computing resources.

Table 6. Common Elements of Cloud Computing Applied to Mobile Cloud Resources [20].

Common elements of cloud computing (NIST, 2011)	*Element in mobile cloud*	*Description*
Virtualization of resources	Yes	Virtual overlay networks on top of mobile devices (Niemegeers and Groot, 2002; Samimi *et al.*, 2006)
Variety of resources	Yes	Processing power, storage, sensors, connectivity (Ananthanarayanan and Zats, 2009; Beng, 2009; Elespuru *et al.*, 2009; Marinelli, 2009)
Shared resource pool	Knowledge gap	Often distinctions between mobile resource sharing (Dodson *et al.*, 2011; Wijngaert and Bouwman, 2009) and mobile resource pooling (Elespuru *et al.*, 2009)
Scalability (automatic/dynamic)	Yes	Scaling the number of devices required for processing, storage, sensing or connectivity according to service requirements (Marinelli, 2009)
Convenience in use and access	Yes	Automated service configuration and delivery (Christensen, 2009) End-user to end-user sharing requests without service provider interaction (Wijngaert and Bouwman, 2009)
Network enabled	Yes	Via mobile network operator: mobile or wireless (WiFi) *Ad hoc* or local connectivity methods (Wi-Fi, Bluetooth)
Service level agreements (SLAs)	Knowledge gap	Perishable mobile resources: battery and connectivity Multiple resource owners with unpredictable usage patterns; may not be able to guarantee QoS
Pay-per-use	Knowledge gap	Compensating individual resource owners Unknown what or how to compensate e.g. data subscription, device or energy expenses, goodwill

Finally Table 7 from [20] shows the essential characteristics that needs to be carefully scrutined before the migration to cloud services.

Table 7. Essential Characteristics Based on Mobile Cloud Resources [20].

Cloud characteristic	*Application to mobile cloud*
On-demand self-service	Manual on-device prompts to switch on or discover additional mobile resources (Christensen, 2009; Wijngaert and Bouwman, 2009) Automatic (M2M) detection of additional available mobile resources (Ananthanarayanan and Zats, 2009)
Network access	Sharing and pooling mobile resources via (mobile) network operators Sharing and pooling local mobile device resources via ad hoc connections methods such as Wi-Fi or Bluetooth (Ananthanarayanan and Zats, 2009)
Resource pooling	Aggregating mobile devices for collaborative tasks such as computation, sensing and connectivity (Ananthanarayanan and Zats, 2009; Beng, 2009; Elespuru *et al.*, 2009; Marinelli, 2009; Satyanarayanan *et al.*, 2009; Want *et al.*, 2008) Pooling of platform resources and resources on mobile devices
Rapid elasticity	Scaling the number and range of mobile devices used for tasks as needed, from personal or local devices (Niemegeers and Groot, 2002) to remote devices accessed via internet (Marinelli, 2009)
Measured service	Compensating individual device owners Compensating a third party for the coordination of multiple mobile device resources No compensation, incentives such as trust or reciprocity in resource sharing (Wijngaert and Bouwman, 2009)

[21] compares global IT outsourcing with Cloud Computing along with the evolution of traditional IT services. The major findings were that the impact of Cloud computing on IT outsourcing is no doubt significant. Cloud computing represents a fundamental shift in how organizations pay for

and access IT services. It has created new opportunities for IT services providers and the outsourcing vendors will have to modify their strategy to take advantage of this new computing paradigm. Table 6, shows the similarities between IT outsourcing and Cloud Computing.

Table 6. Some Similarities between IT outsourcing and Cloud Computing [21].

IT outsourcing	Cloud computing
Reduce cost using third party vendors	Reduce cost using Cloud-based services
Minimize risk	Minimize risk
Global scale	Global scale
Quick time to market	Quick time to market
Applications delivered by a third party	Applications delivered by Cloud-based services
Control and application management done by third party	Control and application management done by Cloud service provider
Security is a concern as data is handled by third party	Security is a concern as data is stored in the Cloud
Various non-core business services deployment and integration can be done through outsourcing	Cloud services deployment and integration can be done through outsourcing
Dedicated data centers available for data protection and privacy	Private Cloud aims to protect data and privacy
Backup systems, disaster recovery, and high availability are supported	Backup systems, disaster recovery, and high availability are supported
24-hour support and availability	24-hour support and availability

Table 7, also shows some challenges faced in the adoption of Cloud Computing.

Table 7. Some Challenges of Cloud Computing [21].

Security and privacy	There is a lot of concern about the security and privacy of the data. Many CIOs are not comfortable about their data located in a data center in a foreign country	Different countries have different laws related to the protection and privacy of data
Maturity and performance	Many Cloud providers may not be able to provide 24/7 service always. Cloud outages may cause severe damage to the services and any breach of service level agreements will lead to huge potential losses	High availability is a major concern. Hence a reliable service is very much necessary
Compliance and data sovereignty	Cloud service providers need to comply with the requirements that may restrict about hosting services in the data centers in that country. Organizations are subject to audits and oversights which may restrict them from free exchange of data from one country to another	Organizations in many countries have specific requirements and laws about data sovereignty
Lack of standards	True standards for how applications communicate and control applications that are in a vendor's Cloud have not yet been established	Cloud service providers have their own proprietary standards and switching from one Cloud service provider to another becomes quite complicated

[22] examines the characteristics of managing records in a cloud computing environment and compares these with existing archiving models, exemplified by the open archival information system (OAIS) reference model. The proposed model to preserve records is shown in Fig. 9.

III. Conclusion

This paper has given an overview of the requirements to establish cloud computing. The main model of mobile cloud computing and fixed cloud computing have been covered. Services and their demands and characteristics to ensure a smooth operation over a cloud network have also been discussed. Results have been reported from the literature review. Cloud Computing applications have now rapidly matured and stablised to offer many services integrated with the mobile communication network.

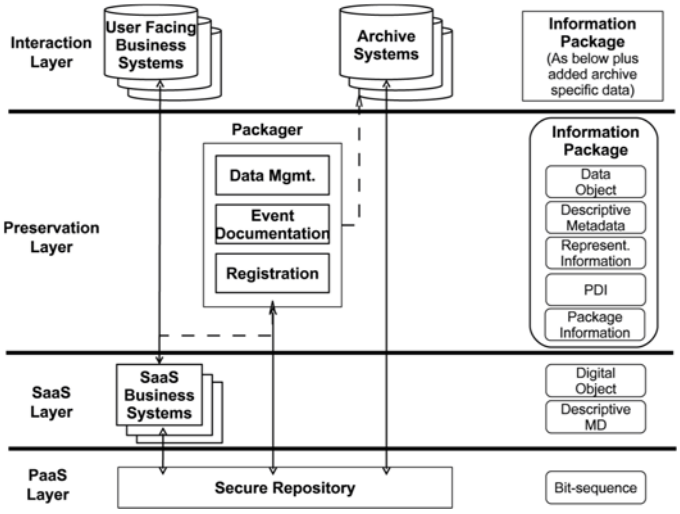

Fig. 9. Information Flow to Preserve Records in Cloud Computing [22].

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Agricultural Information Systems Collaborative platform Maghreb

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Abstract— **Nowadays the control of the information becomes essential and so is consequently for the competitive factor advantage for the global knowledge-based economy. It is considered as a strategic raw material for companies, in order to take a competitive advantage of it. Regarding the field of agricultural research, we know and this is an achievement for all those involved in this sector, the research makes sense if it is related to the organization of the society and its economic and social development. To fall under this logic of value enhancing and production transfer, knowledge should become social shared and the researchers need to be equipped with tools of visibility and analysis of their activities.**

This requires propose a model of information system destined for meshing links between actors involved in research and development. The construction of an information system is a tool for development and transfer of research results to the destination sector of agricultural production. Because it is better for us to propose a model of information system capable of managing intellectual capital in the Algerian agricultural sector and generate value from intellectual assets.

Then, the creation of a shared space should be considered. Such a space will provide an accurate visibility of information and knowledge, to strengthen the institutions, setting up networks of actors. The point is to establish closer links with people who share a similar interest (scientists, professionals, political leaders…). This project will take another aspect in the future in order to creat an agricultural information systems for a Collaborative platform Maghreb.

Keywords - Information System, Agricultural Information System, Collaborative Platform, Multilingual Agricultural Information, Thesaurus Agrovoc, Algeria, Maghreb

I. INTRODUCTION

Information became a discriminating element among all the factors which contribute to the economic and cultural development of a country. It is a strategic resource and has a determining impact on the processes of decision-making aid, planning, management, and scientific research.

Production, storage, diffusion, and exchange of information become major challenges for any organization. For this reason we speak now about “information society”. In this context, Ambrosi et al. state that “there is not just one information society but many societies, multiple, moving, emergent, changing. These societies, like the words which carry them, are not given to us to be consumed, or adapted but to be constructed, collectively and in an cumulative way. Information and its technologies are not just the same project. The project consists in what we will do with information, and its related risks and potentials. Let the creativity to be expressed by itself and increase it, circulate knowledge” (Ambrosi et al., 2005).

We observe then the emergence of a company of knowledge within the company of information. Nonaka affirms that “n an economy where the only certainty is uncertainty, the single source of durable competitive advantage is knowledge” (Nonaka, 2000). The purpose of what is called the “knowledge management” is to preserve, transmit and develop knowledge while increasing an intellectual capital. This one acts on the one hand, like a stimulant for the innovation and a factor of productivity. It represents on the other hand a device of enhancing the value of knowledge and competence transfer.

To create a decision-making tool to define or evaluate the situation of knowledge on a certain subject we are developing an observatory on the national level. This requires the definition of "targets" of observation, and the type of information we are searching for, once the objectives of the observatory are clearly expressed.

So, the primary application for Local Information System is to provide a place-focused evidence base that is easily accessible to a wide range of users including data experts, managers, policy makers, front-line staff and citizens. They provide a wide range of statistics and reports allowing users to review the current evidence base and build a picture of localities and neighbourhoods for their area of interest (LIS).

There are already some national experiments to create observatories intended for this mission. In France, the Observatory of Sciences and Technology (OST) was created in order to conceive and to produce quantitative indicators related to scientific and technological activities and innovation. It contributes to a strategic analysis and to advance public policies of research on French and European scale (Généralités- Bibliométrie). These activities are based

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on a database made up of more than twenty corpora (scientific publications, patents, participation in the PCRD, data on teaching, European areas, economic situation of the companies…) (Observatory of Sciences and Technology). The National Agency of Evaluation of Higher Education and Research is charged also in a global mission to evaluate higher education and research. This evaluation relates at the same time to the establishments, the research units and the trainings (AERES).

The experiment which is given to us by Canada is also very interesting. It allowed to see how the observatory approach contributes to measure the evolution of science and technology at the country level. The Canadian OST, looks after the constitution, the enrichment and the maintenance of several data banks on R&D, the financing of research, the patents and publications. It allows also the development of an expertise at the international level, in scientometry, technometry and evaluation of research (L'observateur).

We have been inspired by the experiments of neighbouring countries (Morocco and Tunisia). The Moroccan Institute of the Scientific and Technical Information is in charge of the collection, the treatment and the circulation of scientific and technical information for the Moroccan and foreign scientific community. The IMIST makes the documentation and the scientific and technical information available to scientific and industrial circles that they need to be in the vanguard of their research activities or decision making (Moroccan Institute of the Scientific and Technical Information).

In Tunisia, the National observatory of Sciences and Technology of Tunisia (ONST) has a mission of monitoring scientific and technological development. It acts in collaboration with national competences inside and outside the country. It is in charge of ensuring the follow-up of the progress as regards technologies and the realization of the prospective studies in the fields of development progress research and innovation (National Observatory of Sciences and the Technology of Tunisia).

Lastly, we present the Observatory of the National Documentary Potential (PDN) which can be considered as an example of reflection on design of Algerian observatory. This is a diagnostic system for the scientific development of national libraries.

The creation of the Observatory of the National Documentary Potential is the resultant of the implementation of a strategic development plan of a national information system (Kasdi 1998). It meets the following needs:

- To diagnose the actual position of the systems and services of information at the national level.
- To improve the documentary services and resources, to define the needs for the information system in the national scales.

This study presents the observatory of the PDN as a scientific body having current, reliable and objective information which is necessary for the definition, the control and the regularization of the national information system.

The objective of the presented project is thus to combine the various actions around a consortium to allow the documentary resource sharing which will be standardized with the aim of installing a true national portal whose final objective is to get access to big databases.

In spite of these authorized efforts and undertaken actions that we have tried, they remain insufficient taking into consideration the challenge and importance of the scientific information for decision making.

The interest of these experiments, that we analyzed within the framework of our feasibility study of the observatory on the agronomic research in Algeria, permitted us to observe that the information systems, in the complex universe, in which our economic companies and scientists move, must be conceived like monitoring space of environment, but also like management tools of the own resources of a country. It is this double dimension of technological monitoring, at the same time national and international which will make our future information system a means of piloting the research/development. In the middle and long term, it will be able to integrate functionalities of economic intelligence.

Within the framework of our feasibility study of the observatory on the agronomic research in Algeria, we realized that the information systems in the complex context, in which our economic companies and scientists act, must be conceived like a monitoring space of environment, but also like management tools of the own resources of a country.

In this context, Algeria which faces a food invoice of 3,6 billion dollars (Bouzidi, 2008), with the risk to endanger its food safety, must consider the scientific, industrial and economic information, as a strategic resource that is necessary to manage and exploit in aid of all its sectors of activities and, more particularly of the agricultural sector. But, that cannot be done without the installation of mechanisms supporting the sharing of knowledge and allowing the analysis of the results of the national agronomic research for the benefit of its development. Then, will emerge a collective intelligence characterized by the production of knowledge associated with the structuring and the evaluation of collective actions, the construction of a memory, and the organization of individual competences, in spite of the geographical or cultural distances which separate the individuals concerned.

II. Project of a National Observatory on Agronomic Research

Algeria which faces the risk to endanger its food safety, must consider more particularly the agricultural sector. In order to provide an information system with added value corresponding to researchers expectations and adapted to their needs, a survey was undertaken among different research personnel. Here we are presenting some results of this study.

The study lead to the creation of an information system, which will be in the hands of the decision makers and the scientists, a tool of piloting and increasing the value of the scientific research, by the development of several databases on the institutions, the research laboratories, the projects, the researchers and their publications.

One of the challenges concerns tools capable to favour the capitalization and the transfer of the scientific production towards the agricultural and economic sector.

The query interface of the system which we propose will be presented like a Web page.

We will implement it by setting up a relational management information system for research purposes at the level of the Maghreb. It holds five functions:

- A query and retrieval interfaces: one for public access (Internet and Intranet), the other for restricted access designed for decision makers and research managers, by providing an identification to each user.
- A data management interface (access, update) allowing each institution to access its own data.
- An organization and input system presented as standard access forms for institutions, departments, laboratories, projects and individual researchers.
- A development system allowing the administrator to parameterize and add values according to future needs.

Therefore, the intended system will include three distinct spaces to access the information:

- Relational databases of national research interest: organizations, laboratories, projects, researchers (publications are related to individual researchers in the document databases).
- Access spaces and exchange international information: news, activities, forums.
- A search engine for the databases of agricultural research on the national level.

For this purpose we will propose a diagram which shows the total architecture of the data description:

- An interface to the current observatory database which will be used by the managers of the various research institutions.
- A database maintained by a pilot organization and managed by only one administrator.
- An annual safety copy for the conservation of the scientific inheritance of the various institutions.
- A history resulting from the annual safety copy, allowing the production of evaluation indicators of scientific research, such as:
    a) construction of network sets of themes which are most important and useful for the socio-economic environment of the country;
    b) best themes covered by the research projects;
    c) most supported competence clusters, as well as the least covered specialities, in terms of human resources;
    d) published research in core journals, e.g. the counting of the publications (by institution, laboratory, project, researcher), the impact factor of articles, the most quoted reviews,…

III. Survey Design and Methodology

We conducted a large national survey that had attracted the participation of over three hundred researchers in Algeria, to know their degree of knowledge on different criteria and evaluation methods.

The organization of our investigation consisted of two main phases: at first, an exploratory phase was developed to conduct qualitative interviews, followed by a pre-survey and, at second, another phase that has been devoted to the questionnaire survey.

An administrative mail was also sent to reference research institutions and to allow the completion of this survey by the researchers. The exploratory phase is divided into two stages: the exploratory interview and the pre-survey. These two approaches reveal that the qualitative survey and pre-test were very effective in gathering opinions. This is due to the fact that the comments we have published were more personal and subjective.

Therefore, it is important to note that the start of our study by the qualitative survey allowed us to understand the mechanisms of thought and behaviour of the investigated scientific community. A total of 500 set of questions were distributed. The gathering lasted five months (February - June 2008). We received 395 returns from which 345 were correctly filled, a rate of 69% of valid questionnaires.

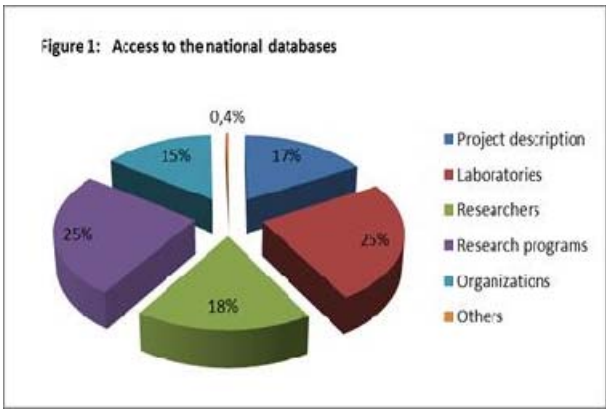
Algeria is facing a challenge by creating an information system of production and dissemination of knowledge on agricultural research. That is what we propose to present as results an extensive survey that we conducted among more than 300 researchers at the national level.

IV. Information Offer of the Planned Information System on Algerian Agronomic Research

There are various ways of access to information, in order to facilitate the exploitation and to enhance the value of the results of a research, and their appropriation by the various actors as well as their diffusion. Through this study, we want to evaluate the needs of the scientists in terms of informational offer, which should be available by the future Algerian information system of the agronomic research. This analysis is based on the demands expressed by the researchers concerning the access to information in a big variety of fields: national device of research, national and international publications, databases on the actors, tools of technological monitoring and collaboration.

A. Access to National Databases

Concerning the various intended databases by the information system to describe the national status of research, the demand expressed by the scientists is quite balanced. The number of selected items is in total 1019, each researcher has selected on average approximately 3 different items (cf. Figure 1).



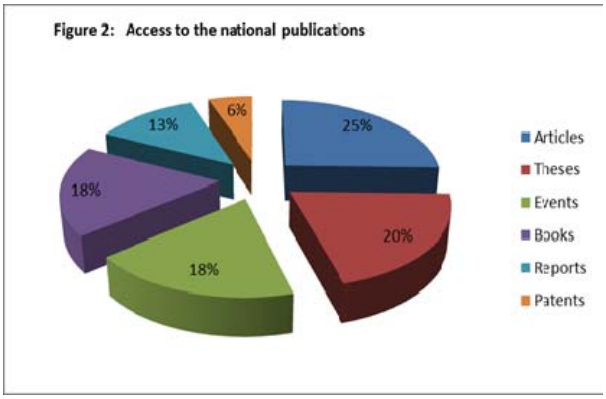
The strong homogeneity of these answers shows that the researchers wish to have information on all the research details in its various components. This consolidates the choice of the agencies of the observatory project who planned to create five distributed federate databases: organizations, research laboratories, research projects, researchers, and research publications.

B. Access to National Publications

The analysis of the researchers' demands concerning the access to the national publications, according to the type of publication, indicates the information sources to be taken into consideration by the future information system on the agronomic research.

The scientists express a clear preference for journal articles (25%), which communicate information of best scientific level, relevant and topical in the field of the agronomic research, either fundamental or applied.

The theses, come in second position, with 20%; they are followed by lectures and books (18% for each of the two types). The reports represent 12% of the demands (cf. Figure 2).



On the other hand, the investigation reveals a lack of interest in national research patents for the development of innovations and the protection of knowledge, in spite of their interest to develop innovation and the economic potential of the country. This disinterest marks for some, an ignorance of the existence of this type of publication in their field. Others estimate that they do not need another information source on the inventions and the holders of the inventions except for the INAPI (Algerian National Institute of the Industrial Property), where they can carry out their bibliography research in the Property patents.

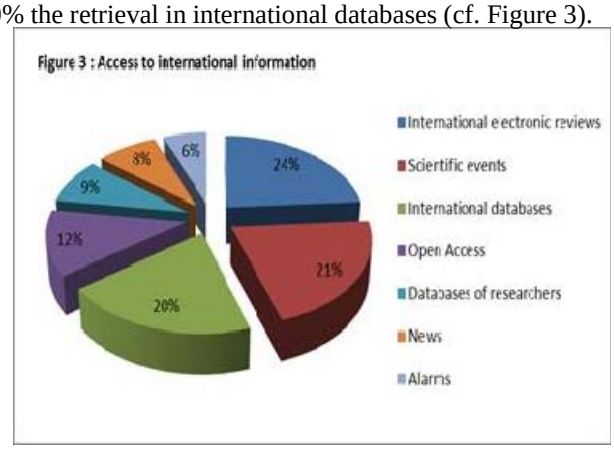
Globalement, ces chiffres montrent que le chercheur algérien souhaite exploiter les résultats de la recherche, tout en pensant à valoriser ses propres résultats et à les rendre accessibles à tous les acteurs concernés.

We can say that all these figures show that the Algerian researcher demands to exploit the results of research, he also thinks to enhance his own results and to make them available for all the actors.

C. Access to International Information

The context of international research, the new information technologies, the evolution of the knowledge and the development of the interdisciplinarity transformed the practice of research and the environment in which the researchers carry out their work. In particular, the access to international information is regarded as a precondition to scientific research innovations in the various countries all over the world.

The survey gives the following results: 24% of the expressed demands concern the access to international electronic reviews, 21% the access to scientific events and 20% the retrieval in international databases (cf. Figure 3).



A result deserves a deeper consideration: the open access represents only 12% of the demands. Exploratory interviews highlighted the ignorance of the scientists related to this type of resource of information (Open access and HAL - Hyper Article on-line). These results correspond to the rate of answers of a study performed in 2007 on "The initiative of open access in Algeria" with a sample of 108 people: 78% of the Algerian researchers seem to be unaware of the existence of the movement of free access repositories (ArchiveSIC, arXiv and HAL; cf. Amrouni, 2007). Another study on "The electronic edition as tool for the enhancement of the agricultural scientific research in Algeria" made in the same year showed similar results: 80% of the researchers are unaware of the existence of open access (Bellahreche, 2007).

We have found this reluctance in other French studies. Those of Swan in 2005 and Wojciechowsa in 2006 respectively reveal 22% and 30% of reserve related to unguaranteed author rights s (Swan, 2005),

(Wojciechowska, 2006).

We note that the researchers of both countries (Algeria and France) are unaware that the sites of open access facilitate the access to publications, accelerates scientific exchange and improves persistency of the stored data. This collective initiative of the movement of free access emphasizes the relevanceof co-operation for sharing knowledge, production of innovations, and the creation of a society of knowledge.

The researcher databases (Who is who?) represent only 9% of the expressed demands. However, this type of database recording competences facilitates the search for colleagues sharing similar interests, the establishment of partnerships and the exploration of new fields or new tendencies.

In the same way, the tools of scientific monitoring do not seem to be known. The news account only for 8% of the demands and alarms (SDI) 6%. These results affirm that, within the Algerian research institutions, there is not only nonexistence of tools adapted to circulation, diffusion and division of scientific and technical information, but that there is also a lack of researchers interest for these tools.

Hence, the Algerian researcher is unaware that these tools currently constitute the principal means of access to the topicality of scientific information; they allow a shared knowledge and facilitate the communication and the interactions near the centers of excellence.

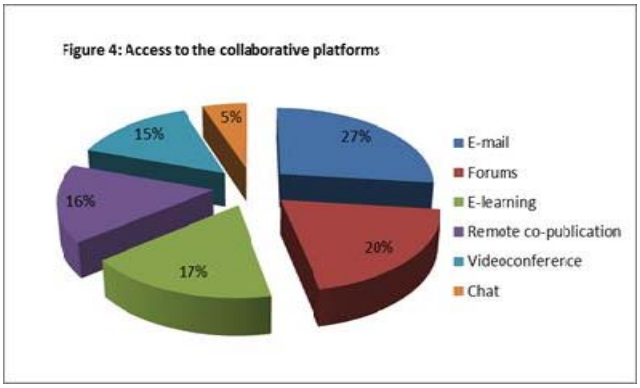
D. Access to Collaborative Platforms

As collaborative work tools intended for scientific production and exchange, the Algerian scientists classify in first the position e-mail with 27% of the expressed demands.

We found the same tendencies as those revealed by a study which was undertaken in France in the year of 2000 among researchers of a business school and which reveals that the use of e-mail is also a means mostly used by the researchers to share the writing of an article (Melot, 2002).

According to Poissonet, "e-mail is based on a representation of exchanges as a space of a singular meeting between two subjects" (Poissenot, 2002). Then, we have the forums of specialized exchanges with 20% of the demands. These are also tools which support the membership of virtual scientific communities and the performing of collective scientific productions. In addition, if we compare our results with those of a study carried out on the "Pooling of knowledge and the Web community portal" concerning the use of technological by Algerian teacher-researchers, today we note that the Algerian researchers start to be interested in the tools of sharing knowledge. The study quoted above shows that the discussion forums are used by 30% of the researchers in the background of people networks sharing the same knowledge and the same foci of interests (Boukara, 2007).

Among the tools for distance collaboration that the researchers wish to find in the information system, we have the e-learning with 17% of the demands and the remote co-publication with 16% (cf. Figure 4).



The rate of these two media, according to the answers, copies not comparable to the extent of means set up by the ministry for higher education and scientific research (MESRS). Consequently, for the policy followed by this ministry to develop the e-learning in Algeria, it was agreed to create a device for teacher training in the field of ICTs, the mobilization around new telecommunication technologies and teleprocessing contributing to the improvement of the quality of teaching, with a greater democratization of the access to the university.

Indeed, the Algerian researchers work more in bulk-heading than in co-production. The exceptions apply to collective products made by researchers who are inserted in networks associating external organizations or in collaborative networks within the same research department. Okubo Yoshiko states "scientific creation still remains a largely national act: the co-authorships show that the researchers refer to national knowledge first of all and that they conjoin more and more within the same laboratory and between national laboratories " (Okubo, 1996).

The videoconference appears only in 14% of the demands. This application makes it possible to organize conferences between people who are distant geographically and who do not need to move in order to establish distant contacts and exchanges.

At last, the chat (asynchronous messages) which makes it possible to constitute living rooms of discussions is also of limited interest (15% of the demands). The scientists consider that the chat is rather a tool of leisure and distraction. It is important to specify that this type of exchange is usually used within the scientific social networks and can meet, initially, a personal need for discovering others on the Internet. This data reveals how much certain preconceptions can force the bulk-heading research activities and the isolation of researchers. Contrary to what the scientists think, this type of tool proposes also services of collaborative information management between researchers. It can be used in order to have relation and to create project teams.

V. CONCLUSIONS FROM THE SURVEY

The general results of this survey allowed to locate a number of strong points and weak points. Among the strong points, we noted a rather strong expectations of the examined scientific community concerning a better

visibility of the total national devices of agronomic research: they wish a broader diffusion of the cartography of the institutions and research laboratories, their programs and research projects and their poles of competences.

A second remarkable point is the interest of the majority of the scientists in research results treating unpublished new topics of topicality (journal articles , talks and theses). Thus, the Algerian researcher is initially interested in the national publications and then in the knowledge produced in his country. In return, he wishes to make known his own publications and his work to be valuated by scientific peers. So, as Chartron underlines, the production processs of the publication and the use of information are very linked: "The information sources prefered by the researcher are generally those on the basis of which he will seek to valorize his work, in order to be published" (Chartron, 2003).

Concerning the access to international information, the tendencies of the researchers are directed too much towards the international electronic reviews, the scientific events and the international databases, but the new forms of publication, like the open access are ignored. Among the collaborative work tools, the Algerian scientists are interested initially in the e-mail. Then we have the specialized forums of exchanges which are appreciated, but the directories of competences (Who is who?) are neglected. The tools of the technology monitoring (news and alerts) give rise also to little interest for the researchers. However these information sources permit to identify topical themes which carry innovation, to seek the specialists in the corresponding fields, to reinforce the networks between researchers, in order to lead to a consolidation and a mutualisation of knowledge.

Lastly, it would be important that tools such as chat platform exchanges, e-learning, videoconferences and resource sharing for coproduction see an increasing usage to decrease an inter-institutional bulk-heading of the research teams. Indeed, Serge Boulier insists on the importance of the groupware which develops […. an improvement of the contact between people concerned with the same task or the same project, an increased quality of production by the multiplication of views, a dynamic of creativity….] ([…. une amélioration du contact entre personnes concernées par une même tâche ou un même projet, une qualité accrue de la production par la multiplication des regards, une dynamique de créativité….]) (Boulier, 2008).

The technical potentialities are such as they exist already: a broad co-operation between many scientific communities through a planetary network which builds a science without border. Research teams who are not very committed in this evolution will be quickly marginalized. It is the challenge which the must raise researchers in the Algerian agronomic research by increasing their participation in international scientific activities: seminars, exchanges of researchers, co-operations with broader projects, and collective publications, etc.

VI. Future Prospects

The conclusions of this project are the following: the exchange and the division of information play a fundamental role for the development, the people in charge of the research and development institutions, and also the political powers (research programs and strategic planning) work more and more on the emergence of a culture of knowledge division as a source of richnesses creation.

As stated above, the Algerian researchers in agronomic research, must increase their participation in the international scientific activities.

It is essential that the Algerian researchers will be integrated in this dimension of collaborative work on widespreadarising themes. These solid networks are requirements for the relationship between partners whose missions must be retained more precisely on topics of current events and innovation.

The survey that we conducted among those more than three hundred Algerian researchers reveals a fundamental need for the creation of a favourable framework for the division of knowledge to get more collective intelligence. This focuses on the creation of an information system of high added value, which will be in the hands of the decision makers and the scientists, a tool of piloting and increasing the value of the scientific research, through the development of several databases on the institutions, the research laboratories, the projects, the researchers and their publications.

With respect to future international projects, it will be necessary to think of the creation of a Maghrebian information system devoted to the best processes of renewal and development of the mechanisms of research related to Maghrebian agricultural co-operation.

This implies an information system that has a common language for research exchange what means however, the application of multilingual features in the construction of the documentation language, e.g. in the sector of agronomy. In particular we are thinking of the control of indexing and vocabulary (Richard 2011, Soergel 1974).

A. Agricultural Information Systems in the Maghreb

The creation of an information system and of a data acquisition system specialized on the agronomic research in Maghreb proves to be an essential need, following the problems of enhancement and sustainability of the scientific information. To control and anticipate their evolution, the decision makers and the researchers have an urgent need in knowing:

- who is who, by identifying the centers of competences in the field of agronomic research,
- who makes what, by adopting a technological interface allowing to establish links between the researcher databases and the ones of the scientific work,
- who collaborates with whom, by setting up a project database allowing to identify the partners in a specific area.

Accordingly, it is possible to retrieve data of the information system whatever their nature. E.g. it could be a

search in full text over all the headings of all the tables. Further features will be a field allowing the selection of the required words and a possibility to limit the research objects. All these key tables and words were developed starting from several thesauri such as "Agrovoc" (Agricultural information management standards and "Agris" (International system of information for agricultural sciences and technology). Different hierarchical and associative relations (broader/narrower terms, related terms, equivalent terms, combination use) are established between the terms. It is suited for indexing and searching documents, web pages and digital objects. Agrovoc has also been used in combination with linked open data techniques to connect diverse vocabularies and to build the backbone of retrieval on Internet data.

We think it's very important to work out a standardized harmonized language and to build a thesaurus common to all the adherent organizations at the observatory.

The tool of indexing of the thesaurus AGROVOC will facilitate, on the one hand, the indexing of the scientific production of the research institutions and the retrieval of the various relational databases of the Maghrebian observatory on the other hand.

Nous pensons qu'il est important d'élaborer un langage harmonisé normalisé et de bâtir un thesaurus commun à tous les organismes adhérents à l'observatoire. L'interrogation des différentes bases de données relationnelles de l'observatoire maghrébin se fera à travers l'outil d'indexation AGROVOC d'une part et l'indexation de la production scientifique des institutions de recherche d'autre part. A titre d'exemple, nous avons la base de données des projets et celle des publications scientifiques.

As an example given, the word 'Algeria' in Agrovoc, will display the word tree: [1]

UF	13207 - People's Dem Republic of Algeria (EN)
BT	5218 - North Africa (EN)
RT	564 - Arab countries (EN)
RT	3084 - Francophone Africa (EN)
RT	4698 - Mediterranean region (EN)
RT	331313 - AU (EN)

If we take the number 5218 (North Africa), this gives us the word tree:

UF	37930 - Maghreb (EN)
BT	165 - Africa (EN)
NT	259 - Algeria (EN)
NT	2503 - Egypt (EN)
NT	4312 - Libyan Arab Jamahiriya (EN)
NT	4940 - Morocco (EN)
NT	8007 - Tunisia (EN)
RT	564 - Arab countries (EN)
RT	29755 - Sahara Desert (EN)

[1] **BT** : broader term, **NT** : narrower term, **RT :** related term, **UF :** used for

B. Advatages of the Multilingual Agricultural Thesaurus AGROVOC

B.1. Usage of AGROVOC

The thesaurus AGROVOC [2] is a multilingual vocabulary and the most complete one in the world. Structured and conceived to cover the terminology of fields like: agriculture, forestry, fishing, food, and related fields. It is available on line in several languages (German, English, Arab, Chinese, Korean, Spanish, French, Hindi, Hungarian, Italian, Japanese, lao, Persan, Polish, Portuguese, Russian, Slovak, Czech, Thai).

It is used in the whole world by the researchers, the librarians, the managers of information to index, extract and organize data in the agricultural information systems. Its role is to help for standardizing the semantic description of the objects of information with an aim of integrating information in the systems, and for providing an access to the relevant resources.

Many institutions use it to index and to research numerical documents, Web pages and objects. It will be easy to incorporate into existing systems as it is available in many formats, like MySQL format, MS Access, XML, HTML and ISO2709.

B.2. Structure and Application of the Thesaurus

Today, AGROVOC comprises 16.607 descriptors and many non-descriptors (synonyms). It is composed of terms which include one or more words, representing a single concept. For each entry term, a group of terms is offered, showing the hierarchical and nonhierarchical relationship to other terms: BT (generic term), NT (narrower term), RT (related term), UF (non-descriptor).

B..3. Concept Server AGROVOC and Workbench

The server permits to represent more semantics than the specific relations between the concepts and the relations between their multilingual lexicalizations, for example, " a synonym", "a translation". It is a resource which structures and standardizes the agricultural terminology in multiple languages, being able to be used by different users and systems wordwide.

A workbench is a Web work environment for the management of the concept server of AGROVOC. It is a tool which supports the maintenance of the data of the concept server , to support the users to add, publish and remove terms and concepts, and to create relations between them in a collaborative and distributed environment. Workbench of the concept server is freely accessible to all and facilites the collaborative edition.

[2] AGROVOC has been created in the 1980. <URL :http://aims.fao.org/website/AGROVOC-Thesaurus/sub> (Consulted page 20/03//2012).

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Assessing the Impact of e-Government Projects: The Case of Limpopo Province in South Africa

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***Abstract*—This paper evaluates the impact of major e-Government (e-Gov) projects implemented in the Limpopo Province of South Africa. These projects involves investment of millions of dollars and huge amount of effort and time; yet little is known about their impact, partly due to lack or inappropriate use of measuring frameworks.**

The study proposes an Impact Assessment Framework based on Bhatnagar and Sigh's e-Government Impact Assessment Framework developed in 2010. The framework accounts for all possible stakeholders that could be affected by an e-Gov delivery project namely: clients receiving the service, the agency that delivers the service and the wider affected society consisting of citizens, government, business and the civil society. For data collection, 350 questionnaires were distributed to e-Gov users in five different sites in Limpopo Province and studying of secondary data sources of the e-Systems. A combination of qualitative methods and quantitative data analysis using SPSS were used for data analysis. Key dimensions for measuring impact was based on: cost to clients of accessing computerized-services, customer satisfaction with services, governance transparency and sustainability impact.

Findings showed wide variations in impact across implemented projects; but overall, clients revealed deep satisfaction with e-Gov services; reduced number of trips to service offering offices; less waiting time in queues to be served; reduced corruption and increased satisfaction in e-Gov services; and increased revenue collection. In conclusion, e-Gov has a positive impact on the way citizens access government services electronically and participate in democratic processes.

The study recommends adoption of a multi-dimensional impact assessment approach by the government when evaluating impact of e-Govt projects. The identified key success factors in some e-Gov projects should be incorporated into other legging e-Gov projects to become fully-transactional and reap the same gains for the full-benefit of the citizens and government.

Keywords- e-Government, Impact, ICT, Service-Delivery, Developing Countries.

I. INTRODUCTION

E-Government can be defined broadly as the use of information and communication technologies (ICTs) in the public sector to improve its operations and delivery of services [6]. It is perceived as a diagnostic mechanism for the chain of problems associated with government and its public service delivery system in its endeavours to give effective services to its constituencies. E-Gov is also seen as a tool to increase transparency in administration, reduce corruption, and increase political participation [1].

In the context of South Africa, the State Information Technology Agency (SITA) is tasked to roll out broadband network for all nine provinces, including Limpopo Province which is predominantly rural area, with 88% of its population residing in rural areas and 11% in urban areas [2]. Telkom is also contracted by the government to install public and virtual networks. However, progress has been very slow due to squabbles between SITA and the Limpopo Province as to who should spearhead ICT infrastructure setup. Nevertheless, there have been notable e-Gov projects, for example the District Health Information Systems (DHIS) [3], e-TB Register, SARS e-Filling Tax Returns and the e-Natis used by the National Traffic Departments. Driven by the success of a few projects in improving delivery of services to citizens and business [4] in other provinces, the Limpopo Province of South Africa embarked on these several e-Gov initiatives.

On the contrary, there has been evidence of failed projects resulting in huge losses of millions of invested dollars. A failure rate of more than 50% is widely cited in this context [8]. As a result it is very important to assess the impact of such e-Gov initiatives, not only in the traditional monetary value or return-on-investment terms; but as impacting three distinct groups of stakeholders: a) the clients receiving the services; b) the agency that delivers the services; and c) wider society consisting of citizens, business, government as a whole, and civil society [4]. In all these three dimensions, the focal point of evaluation is to arrive at a conclusive decision on the impact of e-Gov initiatives in the Province after employing multi-dimensional quantitative and qualitative indicators for analysis.

Existing literature review on researches undertaken in evaluation of e-Gov projects shows that there are basically two broad classes:

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i. First group focused on assessing the post-implementation of e-Gov initiatives and these varied widely in terms of what was measured, employed methodologies and the measurement parameters used. These studies largely anecdotal and done in piecemeal fashion, provide project-level evaluations with little prospect for generalization [4; 5]. These studies revealed great variations as to what was evaluated: some focused on assessing whether the e-Gov project actually achieved its intended design goals or services, others dealt with long-term sustainability and scope for replication for the project [6], whilst the last group concentrated on net benefits brought to the stakeholders. It has been noted in [4] that these studies adopted the following methodologies: "surveys, expert opinion, ethnographic studies, and internal assessments carried out by lending agencies." Despite sound evaluation and analysis by these approaches, there were notable weaknesses: lack of notable benchmarks to be used for future analysis and replication in related projects; diverse results for various analysis of the same projects – showing lack of credibility of results [4] and this was attributed to lack of rigor in employed sampling techniques that resulted in results being not easily generalized and a total ignorance in analysis of the prior and post implementation of the e-Gov project.

ii. The second group focused on establishing new e-Gov evaluation frameworks that could be used in their analysis of the impact of individual e-Gov initiatives considering prior and post implementation effects. Amongst the notable impact assessment frameworks are: "MAREVA (A Method of Analysis and Value Enhancement) [15] - focuses on calculating the ROI, necessity for the project, level of risk, benefits to employees and society (which include gains of time, savings of money and simplification of accessibility); WiBe Economic Efficiency Assessment methodology [13] being used by the German federal administration – to assess cost and revenue for e-government project; the eGEP measurement framework developed by the European Commission [14] on the basis of a review of MAREVA – built around the three values of efficiency (organizational value), democracy (political value) and effectiveness (user-value)"[4, 7].

These two approaches have been deployed and tested in developed countries with substantial achievements. Nevertheless, such models will fail to achieve similar commendable results due to the peculiar nature of surrounding circumstances in ICT-infrastructures in e-Gov projects in developing countries, namely: existence of high levels of illiteracy amongst rural e-Gov clients compounded with use of multi-languages; impact assessment of e-Gov projects in their juvenile phases of presence and interaction (which may struggle to reach transaction and integration phases due to constrained government budget allocations to e-Gov projects), use of common service centers found at district and provincial cities; and use of mobile phones to access e-Gov services from deep in the rural areas. This study adopts the second option of proposing a framework.

The next section of the paper outlines the major e-Gov projects implemented in the Limpopo Province of South Africa. This is then followed by an outline of our proposed Impact Measuring Framework and the adopted methodology for this study. The study results for the research are then presented and discussed to reach the conclusion in-order to postulate recommendations for future directions to vertically and horizontally enhance e-Gov services for policy makers in the Limpopo Province of South Africa to benefit the Province, country and other developing countries facing similar e-Gov adoption and evaluation challenges.

II. MAJOR E-GOVERNMENT PROJECTS IMPLEMENTED IN LIMPOPO PROVINCE

The E-Filing system for tax returns is one of the successful e-Gov projects spearheaded by the South African government through its South Africa Revenue Services (SARS) in 2001. This is a national e-Gov project, servicing all the nine provinces in South Africa including Limpopo Province – thus deserves recognition due to its enormous contribution to citizens' wellbeing. This is both a G2C and G2B initiative whose major goal is to facilitate electronic submission of tax returns and payments by taxpayers and tax practitioners, as well as extension use on collection of value added tax (VAT) [9] by the government. SARS Offices in Limpopo Province are located in four towns: Giyani, Lebowakgomo, Polokwane and Sebasa. First timer customers have no choice, but to go and join long-winding queues at any SARS offices in these four towns for registering and obtain a tax number that they can then use later on for any electronic filing of their tax returns online and thus greatly cut travelling cost and saving time spent in long queues. The SARS e-Gov system enjoys commendable success due to the following factors [9]:

- Provision of clear step-by-step guidelines on its website on how to file tax applications and returns – offering real-time taxpayer information and online services at lower operational costs.
- Strong government support that enforces zero-tolerance approach to corruption in the SARS electronic operations – thus resulting in the realization of billions of tax revenue.

National e-Health Informatics in South Africa is provided by the National Department of Health through the Provincial Departments of Health and Private Actors. This

is an initiative intended to bridge the digital divide of the poor rural and underprivileged community with its urban counterparts. However, it has been noted by the Minister of Health, Dr Aaron Motsoaledi in e-Health Strategy South Africa 2012-2016 [10] that "health information systems in South Africa have been characterised by fragmentation and lack of coordination, prevalence of manual systems and lack of automation, and where automation existed, there was a lack of interoperability between different systems." Nevertheless, the District Health Information Systems (DHIS) and e-TB Register are the two major successful e-Gov initiatives in South Africa thriving on the established Telkom and established mobile networks. These systems are used by health practitioners deep in the remote rural areas to collect health-related patient data and sent it for further processing in well-equipped major laboratories in major hospitals and feedback is relayed back immediately.

The National Traffic Information System (e-Natis) uses a state-of-the-art technology in providing essential e-services related to the South African Department of Transport. It is meant to handle services related to road-traffic law enforcement, specialized transactions like payment for the services over the internet and on automated teller machines, online car registration of cars by financial institutions, issuing and handling driving licenses and online real-time booking for learners' licenses. Nevertheless, most of the real-time functions are on the testing phase and not yet gone live for client use, but all others are functioning.

III. Impact Measuring Framework and Methodology Adopted in this Study

The study proposes an Impact Measuring Framework based on some fundamental aspects used in Bhatnagar and Sigh's Key Outcome Dimensions, MAREVA, eGEP, EAF and WiBe Frameworks. The proposed framework adopts both quantitative and qualitative measurable outcomes that could be directly linked to e-delivery of a particular e-Gov service. This framework takes into consideration the key identified distinctive characteristics sharping e-Gov initiatives and e-delivery services, namely: existence of high levels of illiteracy amongst rural e-Gov clients compounded with use of multi-languages; low internet connectivity and access which is often expensive for the majority of rural citizens; impact assessment of e-Gov projects in their juvenile phases of presence and interaction (which may struggle to reach transaction and integration phases due to constrained government budget allocations to e-Gov projects), use of common service centres found at district and provincial cities; and use of mobile phones to access e-Gov services from deep in the rural areas.

The framework focuses on key measurable aspects under study: net benefits delivered by the e-Gov system to various identifiable interested parties, ascertaining numerous measurable value components to be measured, showing various outcomes as experienced by the various identified stakeholders. Table 1 outlines detailed multifaceted set of values pertaining to identifiable stakeholders that can be measured by means of structured surveys, specifically in the context of developing country with the above key distinctive traits of an e-Gov project. The frameworks acknowledges that not every aspect of impact assessment can be quantified monetarily, but qualitatively – thus recognizing the essence of both qualitative and quantitative indicators.

Three key broad groups of impacted stakeholders in the framework are 1) clienteles receiving the e-Gov service, 2) service provider organizations (project champion, usually government department and its associated partners, usually international donor urgencies), and 3) the broader society (made-up of businesses, civil society, citizens, entire government and the international community). Reference [11] noted that "E-government systems frequently encompass strategic goals that go beyond efficiency, effectiveness, and economy to include political and social objectives, such as trust in government, social inclusion, community regeneration, community wellbeing, and sustainability."

The study adopts stratified random sampling methodology in selecting the four e-Gov service centres. The study population consisted of 350 respondents from villages located nearer and far away from the e-service centers and those within the towns and cities to whom the questionnaires were distributed. The questionnaires (usually using multi-languages) were designed based on the key impact assessment dimensions in Table 1 and distributed to 350 participants. Of these, 321 questionnaires were returned for analysis, 5 were spoiled and 316 questionnaires were used in the final analysis, representing 90% overall response rate. Key notable elements and features in the framework relevant to e-Gov projects in their various phases of growth in developing countries are:

- Measure of impact on the society through trust by citizens on the e-Gov services. This is closely associated with governance transparency (a direct measure of the extent of corruption/bribes requested in order to receive a service). The service delivery mode is a combination of both assisted service centres and self-use through online websites.
- Evaluate impact of cost on citizens of accessing the e-services as measured in terms of time spent in queues waiting for a service versus online access; number of trips made to service centres in cities and towns.
- Measure of impact on quality of e-service as measured in terms of customer satisfaction in using the e-Gov service, simplicity and reduced number of steps to access the e-service, customer-

care centres, error free transactions and clients' motivation to reuse the e-system.

- Sustainability effect/impact on the part of government (this have a huge effect on successive progression of the e-Gov system through the various e-governance phases)

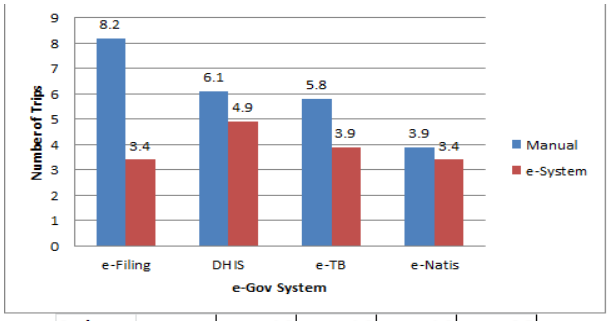
IV. Results of e-Government Project Impact Assessment

The fundamental objective of this study was to measure the impact of the four e-Gov systems on users in the Limpopo Province and validate the applicability of the framework across various e-Gov services for the same clients. The statistical analysis of the 316 questionnaires was carried out using the Statistical Analysis Software - SPSS. Secondary data was obtained from study and analysis of the actual e-Gov websites. The profound significance of the study called for the adoption of both quantitative and qualitative result analysis so that it can be of profound essence to all concerned stakeholders – considering varying levels of interpretations and education. Impact for the key assessment dimensions of costs, customer satisfaction, governance-transparency and sustainability-effect are presented. For all the analysis for costs, customer satisfaction, governance-transparency and sustainability-effect, the study uses *t-tests* to assess whether the differences between the manual and e-system were significantly different. The outcomes showed a significant difference at 99% confidence interval for all the four e-Gov projects under study.

A. *Impact on Cost to Users*

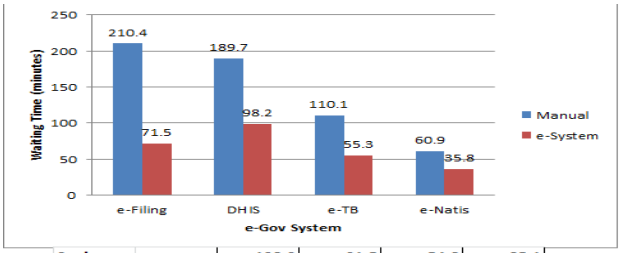
The impact of cost to users are two-folded: reduction in the number of trips to sort for e-Gov service and queuing time spent waiting to be served at the service offering offices for each respective system. Figure 1 shows variations in the number of trips made to access services to the nearest town or city with offices offering the service. For all the e-Gov systems under study, there has been a significant traveling cost savings in terms of reduced number of trips made by clients to get a service by 4.8 trips for the SARS e-Filling system to 0.5 trips for the e-Natis. The huge cost-saving in trips for accessing the e-Filing systems is attributed to that it is the only e-Gov service out of the four under study that offers transactional services over the internet and mobile phones for clients in the villages. For the DHIS, e-TB and e-Natis, clients do not have to travel to the towns and cities for enquiries purposes, all information can be accessed online. However, for the actual services, they do not have option; but to travel –hence the realization of marginal differences in reduced trips between the manual and e-System in Figure 1.

Figure 2 shows a significant reduction in the waiting time between the computerised and manualized systems at all the four service centers of between 44% for the e-Natis system to 66% for the e-Filling system. Such reduction in waiting time spent in queues possess a direct impact on worsted time by workers trying to access a service and resembles an opportunity cost on clients on lost working hours, which translate to lost wages. Thus, the results revealed a significant reduction in waiting times of 138.9 minutes for the e-Filing system because clients have to travel and wait in queues to receive services (at least once for the first time to the nearest service-offering office in the four towns for registering) – thereafter, other subsequent services are done online. This is unique to the e-Natis and e-TB were rural clients have to spent minimal waiting times to receive the services at the service offering centers. These e-Systems websites offer informational services only like inquiries – but client-service is greatly increased due to intensive computerization of working procedures.



Savings:	4.8	1.2	1.9	0.5
Standard Error:	0.27	0.08	0.11	0.05

Figure 1. Cost Saving in Number of Trips



Savings:	138.9	91.5	54.8	25.1
Standard Error:	6.7	4.1	5.2	3.6

Figure 2. Waiting Time at Service Centers (minutes)

B. *Customer Satisfaction on Quality*

This measure the impact of e-Gov systems on clients compared to the manual system and its benefit to the clients. A 7-point key scale has been used in Figure 3. For all the four projects, users highly rated the e-Gov services as satisfying. In the case of e-Filing system, there is a 2.2 variance in favour of the computerised system offering a quality and better service. This is attributed to the fact that e-Filing system is user-friendly, with well-explained step-by-step instructions on how to perform a transaction online with minimal steps to complete the service. Error rate in the system are minimal. With the DHIS, e-TB and e-Natis systems versus the manual system, customers complained of poor customer-care services; but greatly appreciated the use of e-system by the respective government departments. They also outlined reduced errors, that greatly benefited

both the clients in reduced further trips for services due to errors in reports and records and workers using the e-system, as their work becomes less strenuous with minimal errors.

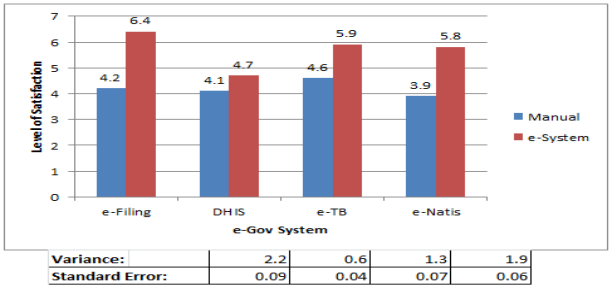


Figure 3. Overall Customer Satisfaction on Quality (7-point scale)

C. *Governance Transparency*

This measures the impact on the society (customers) through trust on the e-Gov services. These are G2C (government to citizen) e-Gov services and it has been discovered that due to low wages and remunerations, government workers resorted to soliciting for bribes from customers in addition to the service cost in order to get the service, often quickly through jumping long queues at the service offering office. Figure 4 shows a highest level of bribes of 15.5% for the manual system and 8.3% for the e-system in the Department of Transport. This is attributed to the fact that most of the clients soliciting for services at the Department of Transport cannot forego the wanted service like obtaining a driver's licence; hence they are willing to pay bribes to get the service. Low levels of bribes has been recorded in the e-TB and DHIS systems because most of their clients are less privileged patience with low disposable incomes, who cannot afford to go to private hospitals. The only bribes reported to be paid were in the form of "token-of-appreciation" in return for preferential-treatment to receive a service in their next visit, usually quickly by bypassing long queues. For the e-Filing Tax Returns system, bribes of 2.2% were recoded to be paid by first-timer visitors to obtain preferential-quick service and avoid long queues. However, for the online tax returns and claims, bribes are virtually absent.

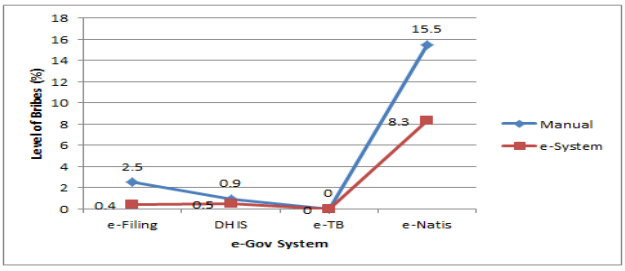


Figure 4. Levels of Paying Bribes

D. *Sustainability Impact*

Due to the classified nature and significance of data in this area, the study relied mainly on secondary data for analysis – from relevant journal articles, government reports and websites. Reference [12] outlined that for the 2011/12 fiscal year SARS realized a sharp increase of 10.2% in total revenue collection and a "growth of 32.5%" in the number of individuals registered for tax income. These percentages are on year-on-year-growth and were made possible by the effective use of the efficient e-Filing system for tax returns – thus having a huge impact for its future expansions. With regard to the DHIS and e-TB systems, the actual statistical figures on their successes with regard to sustainability impact are spatial – nevertheless, they are very vital e-Systems for data collection, for further integration and processing in major cities. The e-Natis system has tremendous potential to advance from informational stage to transactional phase of e-Gov – thus its current sustainability impact could not be easily established.

V. Key Findings, Implications and Conclusion

The study found that the majority of the respondents who had used both the manual and e-system revealed vast inclination for the computerized system service delivery system as indicated in Figure 3. For all the four e-Gov systems, the costs of accessing services in the form of number of trips travelled to respective offices and total waiting time in queues to receive services were tremendously reduced by an average of 2.1 trips and 77.6 minutes (reduced by more than 50%) respectively. The level of corruption was drastically reduced below 3% for the e-Filing tax returns, DHIS and e-TB systems and this could be attributed to the fact that the e-Filing e-Gov system is the government's cash-cow on revenue collection – thus there is a zero tolerance on corruption. The DHIS and e-TB systems are servicing the less privileged poor sector of the community at highly subsidized (almost nothing) cost; thus no motivation and room for corruption. However, for e-Natis, the study found high levels of bribes of 15.5% for the manual system and 8.3% for the e-system. This could be attributed to the fact that most of the clients soliciting for services at the Department of Transport cannot forego the wanted service like obtaining a driver's licence, hence they are willing to pay bribe to get the service.

With regard to sustainability of the e-Gov system in the long run, the study found that the SARS e-Filing tax returns system is self-sustainable due to the full-transactional-functioning of their e-Gov systems and stringent policies on revenue collection and penalties on tax evaders. For all the four projects the study showed that the implementation of e-Gov systems did not result in any job loss; which is a great concern for both the policy makers and the workers who are mostly rigid and not willing to adapt to new technology.

In summary, the study found out that the framework can be of great use and applied to assessing the various e-Gov

projects qualitatively and quantitatively in their different project lifecycles across the country. The study assesses direct economic impact of the e-system on clients, efficiency of the system using customer satisfaction on quality and long-term project sustainability on the part of the government. The study recorded tremendous achievements in all the four implemented e-Gov projects and the few existing elements of corruption in the e-Natis system must be uprooted.

VI. Limitations of the Study and Recommendations

This study has been exploratory in nature and that bears limitations of studying a relatively small sample (four e-Gov projects from one Province only) which is inadequate to give a clear picture of all e-Gov systems in the country. Financial limitations prohibited an impact analysis of major national e-Gov projects, which could give a clear picture of the success and failures of government e-Gov initiatives. Since the manual systems have been decommissioned many years ago, participants under study had to rely entirely on recalling and the facts could somehow not be verified. Not every key impact assessment outcome dimension like impact of e-Gov system on Millennium Development Goals and on citizen democracy could be evaluated due to time constrain – these are reserved for future assessment.

The study recommends the adoption of a multi-dimensional impact assessment approach like this framework by the government when evaluating impact of e-Govt projects across the country. Furthermore, the study recommends that the identified key success factors in the SARS e-Filling tax returns system can be incorporated into other legging e-Gov projects to become fully-transactional and reap the same gains to benefit the citizens.

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Table 1. KEY IMPACT ASSESSMENT OUTCOME DIMENSIONS

Key Stakeholders	Key Impact Assessment Dimensions
Clienteles	1) Cost of accessing e-Gov services: • Travelling costs (number of trips and distances covered to offices offering the e-Gov services). EAF, MAREVA, eGEP, WiBe. • Total time spent out of office in queues waiting to receive services at the government offices (minutes/hours, translated to hour-rate compensation) – MAREVA, eGEP • Bribe paid for by-passing queues and quickly receive services 2) Quality of governance and services – 7-point key scale measurement: • Extent to which functionaries can be held accountable for their actions (eGEP) • Transparency of rules and procedures (eGEP, MAREVA) • Availability of a mechanism to provide feedback to the agency and its effectiveness (EAF, eGEP, MAREVA) • Satisfaction with query handling and offered services • Easiness of use by clients with minimal assistance (as measured by the number of step executed to complete a transaction) • Perception about the confidentiality and security of data (eGEP) • Accessibility of the e-Gov service (does it offer 24/7 services?) 3) Overall impact assessment on the clienteles • Perceived net benefits and motivation to re-use the e-Gov system over traditional "brick-and-mortar" long-queues
Service-Provider Organizations(including government-department, partners and donor agents)	1) Measure for economic impact • Increase in revenue through increased compliance by taxpayers, wider base of taxpayers, collection of user fees from clients, reduced leakage due to less fraud and corruption (EAF, eGEP, MAREVA, WiBe) • Reduced cost of office space, paper, manpower, and travel (EAF, eGEP, MAREVA, WiBe) 2) Measure of impact on quality of governance transparency: • Extent of corruption/bribes requested in order to receive a service • Accountability, measured as the ability to trace decisions and actions to employees (eGEP) • Transparency of decisions, procedures, and information for internal and external clients (eGEP, MAREVA) • Participation, measured as the involvement of employees in internal decision processes (EAF, eGEP) 3) Social impact performance measurement (all non-financial fulfilment of goals through satisfactory stakeholders services and charity obligations of the e-Gov project) 4) Internal process improvements leading to reduction in employee workload, improved work environment, and supervisory control, (EAF, eGEP, MAREVA, WiBe)
Broader society	1) Long-term impact on Millennium Development Goals measured on a 5-point scale (Bhatnagar & Sigh) [4]. 2) Sustainability effect/impact on the part of government, measured on gliding-scale of affordable, manageable, expensive or unsustainable. 3) Measure of impact of the e-Gov system on facilitating citizen-democratic participation (measured by the extent to which citizens can fairly participate in council, senatorial or presidential electronic voting through the IEC e-Gov system - using a gliding 4-point scale)

Privacy Preserving Model in Semi-Trusted Cloud Environment

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Abstract : **Storing sensitive data in an untrusted storage could lead to privacy violations, mainly due to disclosing of sensitive data by cloud service providers or external attackers. In this work, we address this issue by introducing a secure and fine granular access control solution that enhances the privacy in semi trusted cloud storage. Our solution protects both the data and access control policies confidentiality from privacy violations using proxy re-encryption and access control policy.**

Keywords- privacy preserving; cloud computing; proxy re-encrpytion

I. INTRODUCTION

Cloud computing provides several benefits to the user such as flexible and scalable on-demand services at reduced cost [1]. Many organizations have realized that building their own infrastructure, software or platform require large amount of budget and skilled resources. Moreover, allocating such budget or finding the most suitable skilled resources is not an easy job. Cloud computing provides a well monitored resources (i.e. software, platform or infrastructure) according to the organization demand and can be expandable as they requested easily. Such offering pleased many organizations to adopt the cloud computing. Therefore, cloud computing technologies are expanded and improved rapidly to accommodate most organizations requirements.

While there are many benefits to adopt cloud computing, there are also some challenges and risks facing that adoption. One of the biggest challenges facing cloud computing is privacy issues. Sensitive data like personal, financial and medical data is stored, processed and shared in an untrusted cloud could lead to privacy violations, mainly disclose of sensitive data by cloud service providers or external attackers [2]. Moreover, loss of control raises serious concern of privacy since the data owner unaware of the location of his/her data and the operations applied on his/her data in the cloud. Also unauthorized access to the stored data due to the weakness of access control mechanism represents a serious threat to data confidentiality [3, 4]. Numerous cloud service providers have privacy and security problems that need to be addressed [5, 6]. Moritz Borgmann et al [7] studied several cloud storage service providers namely: CloudMe, Wuala, CrashPlan, Dropbox, Mozy, TeamDrive, and Ubuntu One. None of them are able to meet all the security requirements sufficiently. Several vulnerabilities are found to name a few: week authentication, shared files are exposed using the search engines, the data stored without encryption or cloud side encryption only does not prevent the disclosure of the sensitive data by the cloud. Similarly, Amazon S3 provides only a cloud side encryption to the stored data which is not protecting the data confidentiality from the cloud provider [8].

Many researchers have been discussing the privacy and security issues in the cloud [9, 10, 11, 12] .Tim Mather et al pointed that one way to enhance the privacy in cloud is via using security principles which reduce the risk of privacy violation such as unauthorized access or disclosure of sensitive data [13]. Several research works suggested a range of guidelines, recommendations and techniques to enhance the privacy in cloud environment services at early design stage [2,14,15].Yun Shen et al introduced a detailed reviews on a recent technologies used to enhance the privacy, and indicated that the security tools have a direct effect on enabling the privacy to the data [16].

Recently, many researchers propose solutions to address privacy in the cloud [17, 18, 19, 20] those solutions are usually based on data protection using cryptography, and/or authorization. Solutions such as [21, 22, 23] combine attribute-based encryption and a proxy re-encryption to provide data confidentiality and fine-grained access control in cloud; however they did not provide a sufficient protection over accesses control policy since it leaks information about the user and the encrypted data. Moreover, the data owner must re-generate a key for a user when changing in user's access privileges happened. In contrast, our solution protects both the data and access control policies from disclosing and changing in user's access privileges does not affect the user key.

Some solutions such as in [19] consider the cloud service providers as fully trusted and protect the outsourced data

Proc. Of the International Conferenceon Cloud Computing and eGovernance 2013 – ICCCEG 2013.Edited by ManikandanAyappan.© Organizers of ICCCEG 2013 [iccceg@iccceg.org].Published by Association of Scientists, Developers and Faculties, HQ, India.ISBN : 978-81-925233-2-3 || DOI : 10.ASDFOI/925233.001

from unauthorized users using the access control policy only, however our solution considers them as semi trusted and we protect the outsourced data from both the unauthorized users and the cloud using cryptography and access control policy . In this paper we address the privacy issue and propose a solution to achieve secure and fine granular access control over the data stored in semi trusted cloud by using the powerful proxy re-encryption [24] and access control policies. The main contributions of our work are: first, the solution we presented protects both the data and sensitive information and access control policies from privacy violations. Second, user revocation does not involve any data re-encryption or key re-generation to unrevoked users. Third, changing in user's access privileges does not affect his/her key.

The remainder of this paper is organized as follows, section II presents related work, section III discusses system model and design goals, section IV describes our solution in details sections V and VI introduce security analysis and discussion , and section VII concludes the paper.

II. RELATED WORK

The research on data privacy in cloud computing is evolving over the time. Various solutions have been proposed about privacy preserving in cloud environment, those solutions are usually based on concepts like cryptography, and authorization.

Siani Pearson et al. [17] have proposed architecture of a privacy manager that has many features to provide privacy called obfuscation, preferences and personae. However, the solution is not suitable for all cloud applications. Wassim Itani et al. [18] have presented PasS (Privacy as a Service) to data stored and process in the cloud. In this approach, providing the privacy of the data in the cloud is depending on the use of a secure cryptographic co-processor and a set of privacy enforcement mechanisms which offer a trusted environment in the cloud. Nevertheless, the co-processor is an expensive hardware which makes this solution not practical. Sascha Fahl et al [5] have introduced confidentiality as a service (CaaS) where the data is protected by two communication layers of encryption. This service can be integrated with other cloud services to provide confidentiality to the outsourcing data , the CaaS is responsible for protection the data while the cloud provider is responsible for storing the data and enforcing the access control mechanism. Chadwick David [19] have built a privacy preserving authorisation system for the cloud on assumption that the cloud can be trusted and the cryptography is not necessarily to protect the data from cloud. The system consists of several components to enforce the privacy policies of the data owner, data controller or the law. Further, the system is able to resolve the conflicts between the policies written by different authorities and different languages and capable to do an obligation before and after the access to the outsourced data. Kamara S et al. [20] have introduced three architectures for a cryptographic storage service in the cloud. They composed of three basic components: data processor which encrypts the data before outsourcing them, data verifier that checks the integrity of stored data and token generator that responsible of creating credentials for data sharing and tokens for data searching. However the communication between the data owner and the users will be a bottle neck when the numbers of search requests increase.

Existing solutions such as [21, 22, 23] provide a secure and fine-grained data access control in the cloud based on several cryptography techniques to protect the outsourced data including attribute-based encryption and a proxy re-encryption. In contrast with those approaches, our solution provides protection to both the data and sensitive data in access control policies.

Yu et al. [21] have proposed an authorization method for data sharing in the cloud environment to prevent unauthorized access to the sensitive data using two type of encryption techniques: the first is the key policy attribute-based encryption that combines an access control policy with an encryption, each data file associated with a set of attributes and each data user has an access privilege embedded in his/her secret key. This access privilege is in a logical expression form over certain set of attributes to define the data files allowed for the user to access. Only the authorized users who satisfy the set of attributes associated with the encrypted data file can decrypt it. The second is proxy re-encryption that enables cloud servers perform re-encryption when they receive instructions from the data owner without knowing the original data. The first encryption is used for fine-grained access control and the second is used to prevent a user whose permissions are revoked from accessing the data in the future.

Similarity, Qin L, et al. [23] have proposed a time-based method called TimePRE also depending on attribute-based encryption and proxy re-encryption however they introduced a new feature that enable user's revocation automatically. Every user has a predetermined access time to the stored data and when it expired the cloud servers automatically re-encrypt the data without receiving instructions from the data owner. Nevertheless, it not suitable for environment where the data owner revokes a user anytime. Moreover, it has a limitation in the length of predetermined access time; it assigns one key to the user with same period of access time to all his attributes or multiple keys to represent different length of access periods to different attributes.

III. SYSTEM MODEL AND DESIGN GOALS

In this section, the system model and the design goals along with our assumptions are introduced.

A. System Model

In our model there are three parties: cloud service provider, data owner and data users. The cloud in the system model is responsible for storing the data, authorizing the users based on the stored policies and re-encrypting the requested data (refer to section III for more information). We assumed that the cloud is semi trusted party, honest to do the required

activity i.e. authorizing and re-encrypting but curious to know the stored data, thus both the data and the policies are hidden from the cloud. The data owner is responsible for encrypting the data before outsourcing it to the cloud, determining the policies and constrains for each data file and encrypting them before outsourcing to the cloud and generating the keys (public/private) for the users and the re-encryption keys for the cloud. When a user requests a file, his/ her request is encrypted before sending to the cloud. The cloud validate the request according to the stored encrypted policies then execute the re-encrypting on the encrypted data using re-encryption key dedicated for the user and send it to the user. At the user' side, he/she decrypts the file using his/her private key.

B. Design Goals

The design goals of our solutions are the following:

1) Protects the confidentiality of the stored data from the unauthorized user and the cloud server not to decrypt them.

2) Protects the confidentiality and privacy of sensitive information in the policies from the cloud.

3) Provide a fine granular access control using the access control polices.

IV. OUR SOLUTION IN DETAILS

A. Preliminaries

The basic idea behind our solution is using Proxy re-encryption [24] with access control policies. The Proxy re-encryption simply converts a cipher text under public key of user A into a cipher text under public key of user B without disclosing the plain text. The policy is in the following format policy (S, O, P, C) . We denote S, O, P, and C as subject, object , permission type and constrains respectively. The subject could be a user, a role in Role-based Access Control (RBAC) or even attributes in Attribute-based Access Control (ABAC) depending on the environment requirements. The permission type could be read, write, or delete. The constrains are the access time, location or any other privacy constrains.

B. Solution Description

In our work there are two main procedures: data owner initialization and user accessing the data and each of them consists of numbers of functions some of them are Proxy re-encryption functions. Next, the functions definitions and the working procedures of our solution are introduced. Summary of notations is shown in table1.

1) Functions Definitions:

The proxy-re-encryption is used to hide the data from the cloud, it consists of the following functions:

- PRE-KeyGen (par , u)□(PKu,SKu):this function is responsible for generating the key pair to the authorized users, it takes a global parameter par and the user id u and output the user key pair (public key PKu, and private key SKu).
- PRE-ReKeyGen (SKo , PKu)□RKo□u: it takes the data owner private key SKo and a user public key PKu and generates the re- encryption key RKo□u.
- PRE-Enc (data, PKo)□C: it encrypts the data using data owner public key PKo to output the cipher C.
- PRE-ReEnc (C, RKo□u)□C': it re-encrypts the cipher C to another cipher C' using re- encryption key RKo□u.
- PRE-Dec(C', SKu)□ data: it decrypts the cipher C' using user private key SKu.

- The following functions are used to hide sensitive information from the cloud:
- Pol-Enc (S, O, PKo)□(S',O'): it takes the subject S and the object O, combines them with salt, hashes them with SHA512 and then encrypts them using data owner public key PKo.
- Match(S', O', policies store)□R: it searches for the two encrypted units in the policies store and return the result of the matching R.

Notation	Description
PKo	Data owner public key
SKo	Data owner privet key
PKu	User public key
SKu	User privet key
RKo□u	User re-encryption key

TABLE 1: Summary of notations description

2) Working Procedures:

The main working procedures are: data owner initialization and user accessing the data.

a) Data owner initialization:

In this process the data owner generates the keys (public/private) for the users using PRE-KeyGen function then distributes them to the users. Moreover, he/she generates a re-encryption key for each user using PRE-ReKeyGen function; this key enables the cloud to convert the encrypted data under the data owner public key to another encrypted data under the user public key without knowing the data. Moreover, the data owner determines the policies for each data file and encrypts the sensitive part of them using Pol-Enc function. In addition, he/she encrypts the data using his/her public key PRE-Enc function. Finally, the data owner outsources the policies, the encrypted data and the encryption keys list to the cloud. Steps from 1 to 4 in Figure 1 illustrate this process.

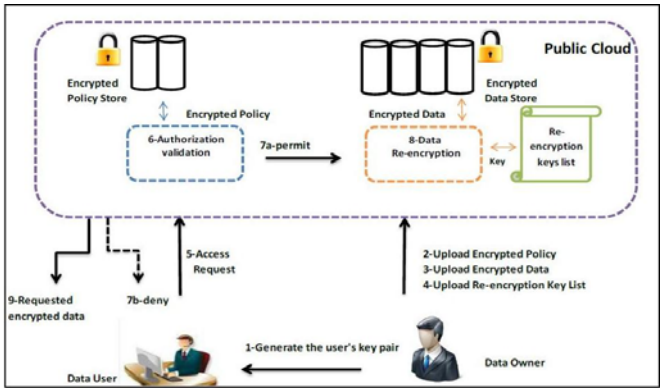

Figure 1: privacy preserving model for cloud environment.

b) User Access:

In this process, the user request access to specific data, his request is encrypted at client side using Pol-Enc function (step5 in Fig1). When the cloud receives the encrypted request, it searches for the request in the policy store to validate the authorization using Match function (step 6 in Fig1). If the user has permissions to the requested data, the cloud performs the next process which is the data re-encryption. It re-encrypts the requested data using the re-encrypting key belongs to the user in PRE-ReEnc function and sends them to the user. At the user' side, the user decrypts the data using his/her private key in PRE-Dec function.

If the user is not authorized to access the data because the matching is not found cloud denies the access and informs the user (step7b in Fig1).

C. User revocation and Permisstions Changing

User revocation process is very expensive process, usually it requires the data owner re-encrypting the data with a new key and re-distributing that key to authorized users, this emerges heavy computation overhead to the data owner because it involves data re-encryption and key re-distribution to authorized users. Some solutions delegate this heavy workload from data owner to the cloud [21]. In our solution, user revocation does not involve any data re-encryption or key re-generation to unrevoked users. The cloud only removes the revoked user re-encryption key from the re-encryption keys list without involving any addition change to other user key or the stored data. Thus, the revoked user cannot access the data without this key.

In regard to changing in user's access privileges, solutions that combine attribute-based encryption and proxy re-encryption [21, 22, 23] generate a new key for a user who permissions are changed. In our solutions, changing in user's access privileges does not affect his/her key. Simply the data owner changes the policy related to the user.

V. PRELIMINARY SECURITY ANALYSIS

Against cloud: our solution protects the confidentiality of the data against the clouds provider via encrypting them using a public key of the data owner thus the cloud cannot know the encrypted data. Moreover, our solution protects the privacy of the policies, the sensitive part of the policies (i.e. subject and object) are hidden from cloud using the encryption.

Against unauthorized access: Unauthorized users will not pass through the authorization validation. Moreover, if unauthorized user somehow accesses the data, he/she would not be able to decrypt the data; since the stored data is encrypted by the data owner public key and only he/she is able to decrypt the data, and unauthorized user does not have the re-encryption key to transfer the encrypted data to another encrypted data under his/her key .

VI. DISSCUSSION

There are three assumptions in this work, first we assume that a robust authentication stage is done prior to our authorization stage and it that authenticates the user and initializes shared session encryption keys to encrypt all ongoing communication afterward, thus, assuring secure channel for all later stages.

Second, although the process of re-encryption every file on the cloud is a power-consumption process, but we are dealing with the cloud computing which can handle such overhead much better than local resources-limited computing.

Third, we encrypted the subject and object only in our policy model and leaving the permission and constraints on clear text, because we believe that revealing the subject or object to the cloud could jeopardize the privacy of users such as the possibilities for the cloud to know the most critical file by knowing the files that grant only the CEO or other important role to access. It is not possible to encrypt the permission (i.e. read or write) or constraints (time or location) because the cloud needs to read the policy to process the right.

VII. CONCLOUTIONS

In this paper, we presented a solution to enhance the data privacy's in cloud environment. Our work is based on using a proxy re-encryption and access control policies. The main advantages of our work are protecting the confidentiality of data and a policy, and it facilitates the processes of user revocation and privileges changing comparing to existing solutions. Our ongoing work addresses expanding authorization to accommodate other aspects of security and privacy and to support more complex policies. Moreover, we will try to solve authorization conflicts and inconsistencies.

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Asset Optimization and Economic Issues in the Smart Grid

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***Abstract*— Today's electrical grid is considered one of the greatest engineering accomplishments of all time. It was recognized in 2003 by the National Academy of Engineering as the preeminent engineering achievement of the twentieth century. Currently, the utility industry is facing a number of challenges that are bringing about the need to make major changes to the grid. These challenges include the need for greater energy security arising from increasing demand for energy worldwide and decreasing supply of fossil fuels to meet the demand, worldwide concern about global climate change, aging infrastructure and inefficiency in the existing grid. Additionally, consumers want to play a role in their own energy management and conservation. To address these challenges, the utility industry is in the early phases of migrating toward a "smart grid." The goal of the smart grid is to make the existing grid more efficient and less harmful to the environment, while continuing to provide safe, reliable, and affordable electricity to consumers. This paper discusses the current issues in regard to energy consumption, problems with the existing grid and the goals of the smart grid , information and communication technology (ICT) infrastructure, and communication technologies, standards, and protocols that are either already in use or are being considered for the smart grid , micro-grids, plug-in hybrid electric vehicles (PHEVs) and smart homes and the role they will play in the smart grid, existing smart grid deployments and pilot projects , the economic issues related to the smart grid and focuses on sensors for smart grid networks, and green networks.**

***Index Terms*—smart grid, ICT , wireless Technologies, sensor, micro grid, smart home.**

I. INTRODUCTION

The existing electricity grid is becoming less reliable as the infrastructure it is built upon continues to age, and because electricity and electronic devices now permeate every facet of our lives, the demands placed upon the grid are growing exponentially. American electricity consumption increased from about 118 kilowatt-hours a month in 1950 to nearly 1000 kilowatt-hours a month in 2010 [1] and world energy consumption is on track to increase by 44% from 2006 to 2030 [2].

The growth in worldwide energy consumption is due in large part to the availability of cheap energy that is provided by fossil fuels such as oil, coal, and natural gas, but these resources are becoming increasingly scarce. The supply of these fuels will not continue to meet the demand. Many oil and natural gas fields have peaked (or will in the near future) and their production will continue to decline, causing prices for this "peak-oil" to steadily increase. Estimates of when global oil production is likely to peak are between 0-20 years. The remaining oil and gas fields are either in politically unstable or environmentally sensitive areas [3]. Even if fossil fuels remain plentiful, a future based on fossil fuel consumption will threaten the environment by causing damaging climate change, the effects of which are still largely unknown. In order to reduce carbon emissions, the use of plug-in hybrid electric vehicles (PHEVs) and high-speed electric trains will need to replace gasoline and diesel powered vehicles, and homes and offices will need to be heated and cooled electrically rather than with coal, oil fired burners, or natural gas. This transition is expected to increase electricity demand globally by 76% by 2030[2].

This increased demand for electricity means the existing grid will need to be re-tooled and the utility industry's business model redesigned in order to continue to provide safe, secure, reliable, environmentally friendly, and affordable electricity service to consumers. The grid will have to transition from a mostly unidirectional, centralized, and hierarchical organization to a distributed, networked, and automated energy value chain [1]. The existing grid topology is an hierarchical pyramid, with a few large power plants (burning fossil fuels) at the top that generate electricity and send it over a long distance through the transmission system to smaller utilities, who in turn provide electricity to end-users, on-demand, through the distribution system. Figure 1 is an illustration of the structure of the existing grid [4].

End users are typically located far from where the electricity is generated. Because of this hierarchical structure, failures in the system cause a domino affect, where one failure can affect thousands or even millions of users, and power outages today are much more detrimental than in the past given our dependency on electricity in order to function as a society. Inefficiencies in the existing generation system cause a loss of nearly 8% of its capacity in the transmission lines, and it reserves nearly 20% of its capacity to meet peak demand. In other words, 20% of generation capacity is only used 5% of the time [4]. The existing grid is also a

Proc. Of the International Conferenceon Cloud Computing and eGovernance 2013 – ICCCEG 2013.Edited by ManikandanAyappan.© Organizers of ICCCEG 2013 [iccceg@iccceg.org].Published by Association of Scientists, Developers and Faculties, HQ, India.ISBN : 978-81-925233-2-3 || DOI : 10.ASDFOI/925233.001

unidirectional system both in terms of delivery and communication. Figure 2 [5] illustrates the current level of asset utilization in today's grid.

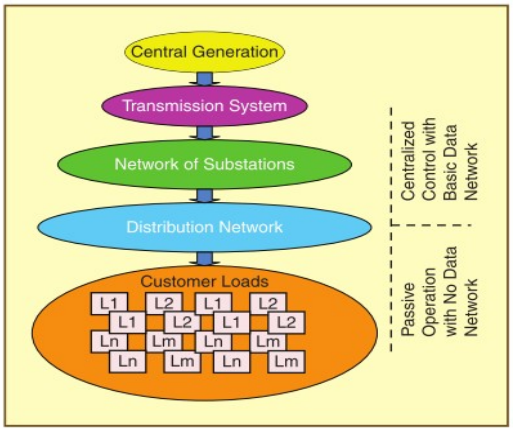

Figure 1: The Existing grid

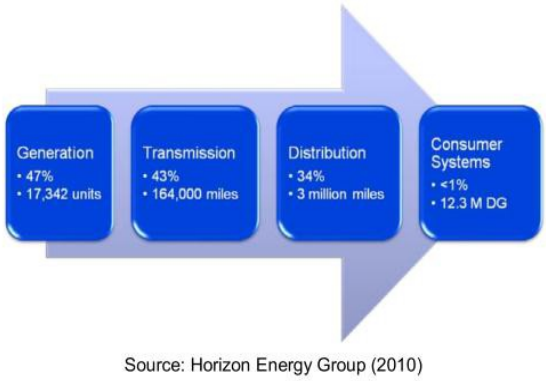

Figure 2. The current level of asset Utilization

The figures shown are the average utilization as a percentage of capacity. The figures indicate that there is room for improvement by increasing utilization of existing assets as opposed to building new ones. It should be noted that the most under-utilized area is the consumer systems asset class where millions of Distributed Generation (DG) resources are not connected to the grid [5].

The smart grid will require utilities to make more efficient use of assets in the generation, transmission and distribution systems, create a bi- directional flow of real-time information, and incorporate renewable generation resources such as wind, solar, and tidal sources, as well as plug-in hybrid electric vehicles (PHEVs) that will not only consume electricity, but also give back to the grid by acting as a distributed form of energy storage[3]. The supply of renewable sources of energy changes in response to changing conditions (wind speeds, cloud cover, PHEV battery capacity etc.), so a shift in the way electricity is provided to consumers will be necessary. Perhaps the most difficult transition that utilities will have to make is the transition from supplying electricity to consumers on-demand, to using demand- response (DR) to reduce peak demand. DR means the demand for electricity is managed in response to the available supply of resources. DR is needed in order to reduce peak demand, which is a major source of inefficiency in the existing grid, as mentioned earlier.

Reference [5] list three ways in which the smart grid differs from the existing grid:

a. Decentralized Supply and Control – Increased number of generation and storage resources from a few large, centralized power plants to many millions of decentralized resources, some of which will be owned by utilities, and others that won't.

b.

b. Two-way Power Flow at the Distribution Level – Although the transmission system in the existing grid currently allows two-way flows, the distribution system does not. The smart-grid will allow consumers to sell energy back to the grid. Consumers who both consume and provide energy back to the grid are referred to as “prosumers.”

c. Two-way information flow – The transmission system uses SCADA to gather information, but
SCADA has not been implemented in the distribution system, and no information is exchanged at all between consumers and grid operators [3].

Some of the principal characteristics of the smart grid are follows:

- Enable active participation by consumers;
- accommodate all generation and storage options;
- Enable new products, services, and markets;
- Provide power quality for a digital economy;
- Optimize asset utilization and operate efficiently
- Anticipate & respond to system disturbances
- (self-heal); and
- Operate resiliently against attack and natural disaster.

This paper discusses the current issues in regard to energy consumption, problems with the existing grid and the goals of the smart grid in section 1. The definition and general description of the smart-grid as well as a description of the information and communication technology (ICT) infrastructure, and communication technologies, standards, and protocols that are either already in use or are being considered for the smart grid are discussed in section 2. Section 3 is a discussion of micro-grids, plug-in hybrid electric vehicles (PHEVs) and smart homes and the role they will play in the smart grid. In Section 4 a few of the existing smart grid deployments and pilot projects are covered Section 5 covers the economic issues related to the smart grid. In section six we discuss sensors applications for smart grid and the paper concludes in Section 7.

II. ICT Infrastructure, Standards, and Protocols

Smart-grid is defined as a system that uses two- way communication and information technologies, and computational intelligence in an integrated fashion across electricity generation, transmission, distribution, and consumption to achieve an electric system that is clean, secure, reliable, efficient, and sustainable[6]. The smart-grid will incorporate advanced information and

communication technologies (ICT) along with automation, sensing, and metering technologies and energy management techniques in order to optimize the supply and demand of energy and improve asset utilization in the electrical system[7].

Communication of real-time data and the use of analytics and predictive modeling are crucial to the operation and management of the generation system within the smart-grid, therefore, IT will play a large role in the transition from the existing grid to a smart grid. System operators will need to use advanced system operation tools that provide real-time monitoring of all system components in order to optimize performance and avoid blackouts and integrate renewable energy sources that are variable in nature. Examples of these advanced tools include wide-area situational awareness (WASA), wide-area monitoring systems (WAMS), and wide-area adaptive protection, control and automation (WAAPCA)[8].

In the transmission system, smart-grid technologies include flexible AC transmission systems (FACTS) that enhanced the controllability of transmission networks and maximize power transfer capability. Dynamic line rating (DLR) are used to optimize existing transmission assets through the use of sensors that provide real-time information regarding the currant carrying capacity of a section of the network. Lastly, high voltage DC (HVCD) technologies assist in connecting wind and solar resources to the grid that are located large distances from load centers [8].

The distribution system has largely been the focus of smart-grid initiatives, since it is the least automated and provides the most opportunity for improvement. Advanced metering infrastructure (AMI) is used in the distribution system that enables the bi- directional flow of information and provides utilities and customers with real-time data on consumption and electricity pricing. AMI refers to smart meters and the technologies that are combined with them. Other technologies used in the distribution system include customer-side-systems, which include energy management systems, smart appliances, energy storage devices, in-home displays, building automation systems, energy dashboards, and energy applications for smart phones and tablets [8].

A three-layer smart grid conceptual model has been proposed by the Power Engineering Society, as shown in figure 3 [7]. The layers include the energy and power systems layer, communications layer, and information technology layer. The ICT layers of this model account for approximately 70% of the smart grid infrastructure.

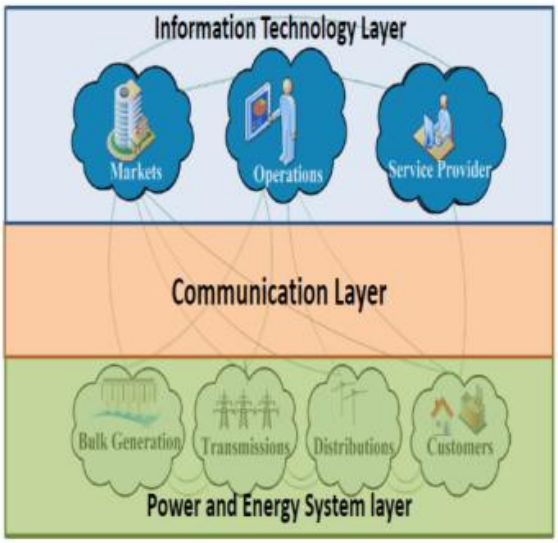

Figure 3. Smart Grid conceptual model

1) IT Layer

The IT layer of the smart grid is divided into two sub-layers; the Computing Platform and Operational Systems Layer (CPOS) and the Business Applications and Services (BAS) Layer. The CPOS layer consists of hardware in the form of servers that host all of the grid's operation systems. These systems include demand-side management and demand response, grid optimization, switching plans, outage and geographic information, transmission and distribution automation, communication networks analysis and management, self-healing and disturbance correction, dispatching and tracking, tagging power flow analysis, cyber-security protection, renewable energy integration, and protection and real-time Supervisory Control and Data Acquisition (SCADA) analysis[7].

The BAS layer consists of software packages that are responsible for the following:

1) Utilities customer care and billing, consumer interface and web interface.

2) Business and home energy management, distribution mobile workforce management

3) Third party service providers, their party access for marketing and financial applications.

2) Communications Layer

The smart grid communication layer connects all of the sub-systems (generation, transmission, distribution, and consumptions) within the smart grid to the IT and energy and power systems layers, allowing for the bi-directional exchange of information between grid and ecosystem operators and consumers. The communications sub layer is further divided into three sub-layers in addition to the existing SCADA. The communication layer sub-layers include; Automatic Meter Reading (AMR) networks layer, Advanced Metering Infrastructure (AMI) networks layer, andAdvanced Metering Infrastructure Plus (AMI^{+}) networks layer [7]. Each of these sub-layers serves certain types of networks within the grid. The network types are described in the following paragraphs. Figure 4

illustrates the functions of each of the sub layers.

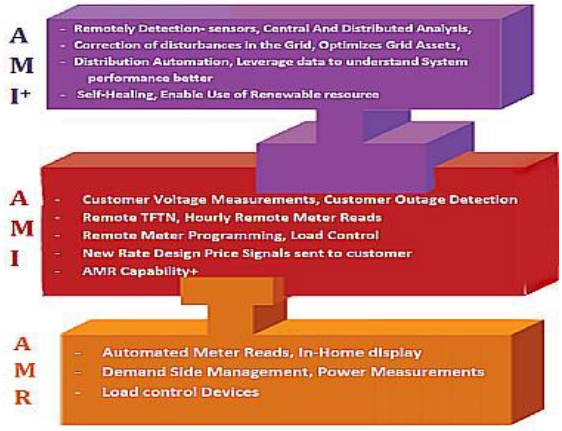

Figure 4. Smart grid software layer

Consumer Premises Networks (CPNs) are located on the customer's premises and facilitate communication between appliances and smart-grid equipment. These networks are served by the AMR sub-layer. The CPNs are also sub-divided based on the consumer's consumption profile into Home Area Networks (HAN), Business Area Networks (BAN), and Industrial Area Networks (IAN) [7]. These networks can serve devices like smart appliances, EV charging outlets, and in-home displays for HANs, load control devices, renewable energy integration, power measurements, and demand side management. Data in these networks can be exchanged though real-time measurement parameters (RTMP), or power consumption data. RTMP is used for demand-response and demand-side management. It measures current, frequencies, voltage and power. The smart meter power consumption data profile is defined by IEEE standard 6010-6011 [9]. The possible communication technologies for CPNs include both wired and wireless networks such as Zigbee, Xbee, Wi- Fi, BACnet, Home Plug, 6-lowPAN, and SAEJ6847[7].

Neighborhood Area Networks (NANs) are part of both the AMI and AMR sub-layers. The function of a NAN is to gather information from devices in the CPNs via smart meters and send the data to the data center at the utility for processing. Devices served by NANs include concentrators, which collect data from meters in all neighborhoods, load control relays, and advanced smart meters. Communication technologies used by NANs include both wired and wireless networks such as Wi-Fi, WiMax, LTE, GPRS/EDGE, RF Mesh, FTTP/FTTH/Ethernet, and RF Radio point-to-multipoint [10].

Access Area Networks serve devices at the distribution level such as voltage regulators, renewable energy resources, re-closers, remotely operable switches, capacitors, line sag and maximum demand indicators, distance to fault relays, and line fault indicators. Access Area Networks use both wired and wireless communication technologies that include WiMax, GSM- CDMA, BPLC, 1G/LTE, and FTTP/FTTH/Ethernet.[2]

The Backhaul Network also serves devices at the distribution level. These include SCADA devices (RTU substations and IDE), Pressure, Temperature, and Oil level sensors, protection relays, and monitoring cameras. The communication technologies used by the Backhaul Network include WiMax, BPLC, LTE/LTE Public, FTTP/FTTH/Ethernet, Microwave, and Fiber[7].

Core and Office Networks are responsible for corporate communications in order to provide voice, data, planning, and Quality of Service. Network communication technologies used in these networks include GPRS, LTE, Leased Line Circuits, and FTTP/FTTH/Ethernet. External Access Networks use public access networks in order to provide access to the previously described networks to ecosystem operators. Figure 5 [7] provides a visual summary of the different networks and their associated communication technologies, as well as how they interface with one another.

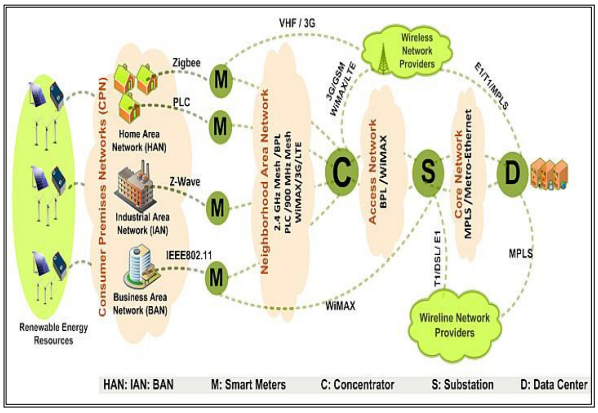

Figure 5. Available Networks options for smart grid

III. MICRO-GRIDS, PHEVS, AND SMART HOMES

The transition to a smart-grid is expected to be an evolutionary process where utility companies slowly incorporate more and more smart-grid technologies into their existing infrastructure. Much like the evolution of the Internet, the smart-grid could become an interconnected network of smaller networks, called micro-grids. Micro-grids provide decentralized generation and storage that is more efficient and located closer to the customer's premises. Utility micro-grids, along with a Distribution Management System (DMS) will enable large numbers of DG to contribute resources and assist in demand response to reduce peak load and improve reliability when the grid needs their support [5]. The Department of Energy describes micro-grids as:

"A micro grid, a local energy network, offers integration of distributed energy resources with local electric loads, which can operate in parallel with the grid or in an intentional island mode to provide a customized level of high reliability and resilience to grid disturbances. This advanced, integrated distribution system addresses the need for application in locations with electric supply and/or delivery constraints, in remote sites, and for protection of critical loads and economically sensitive development [5]."

In addition to utility micro-grids, community micro-grids are emerging whose purpose is to optimize local assets in order to best serve a community. They are self- contained power systems that operate in a small geographical area and are controlled locally [4]. They incorporate renewable resources along with traditional local generation. These micro-grids operate alongside the main grid most of the time, but can seamlessly move into "island mode" when necessary. The community micro- grid's intelligence can determine if conditions require the transition into island mode in order for the community to be best served. Once the conditions return to normal, the community micro- grid will connect back to the main grid seamlessly. The military has relied on micro-grids for some time as a way to generate its own power, leaving it to rely on local utilities strictly for supplemental power and other services. Figure 6 illustrates a typical micro-grid design [11].

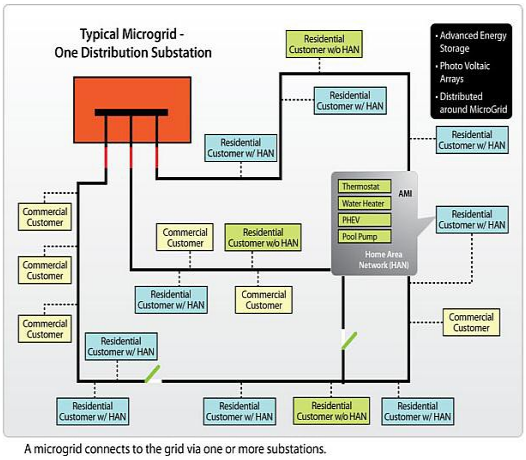

Figure 6. A typical Micro grid design

As the smart grid evolution progresses, micro-grids will begin to aggregate distributed generators into "virtual power plants," allowing distributed generation to be entered into the main grid and sold on the market by individuals. Micro-grids are still a contentious issue for some utilities who question their true value. The research to date seems to discredit this notion. Micro-grids can assist in solving problems that on a large scale seem impossible, but become more manageable within smaller areas. Some of the suggested benefits of micro-grids are:

1. Easy renewable energy integration
2. Reduced losses in transmission
3. Lower carbon emissions
4. Local control and ownership
5. Use of island mode when blackouts occur
6. Cheaper and faster to build than large power plants.
7. Ability to incorporate storage from batteries or other devices
8. Micro-grids can contribute unused energy back to the main grid
9. Postponement of construction of new centralized power plants

Government regulation may be needed in order to require the use of micro-grids for the purpose of asset optimization in the smart grid. Further research is needed in this area to examine unintended consequences and to determine if the implementation of micro-grids will be cost effective for consumers.

Plug-in hybrid electric vehicles (PHEVs) will also play an important role in the smart-grid. PHEVs are part of the vehicle-to-grid (V2G) system, which is an auxiliary distributed storage system that exploits the capacity of vehicle batteries[12]. More and more of these vehicles will be used as the need to reduce carbon emissions and the price of gasoline increases. PHEVs will put an added burden on the grid as people will need to charge them. But PHEVs will also be able to store energy and assist with load shaving. Consumers will be able to sell the power stored in their vehicle's back to the grid if/when they choose. This will help grid operators deal with peak demand for energy. When electricity prices go up during times of peak demand, consumers, through smart-grid technologies, will be notified of rising prices and can profit from selling their PHEVs stored energy back to the main grid based on time-of-use pricing, which is discussed later. PHEVs already come equipped with Time–of-Use (TOU) recharching controllers. The electric vehicle charging infrastructure within the distribution system of the smart-grid handles billing and other needs related to smart charging PHEVs during periods of low energy demand [8].

Another important piece of the smart-grid puzzle is what's been called a "smart home." Consumers who use smart homes are able to manage their energy demand by installing advanced devices. These devices include two-way communicating thermostats and meters as well as other automation devices including programmable outlet controllers and smart appliances. Smart homes will contribute to demand response by lowering peak demand in the smart-grid. Reference [13] states an analysis by the appliance industry estimates that virtually the entire projected growth in peak demand expected for 2030 in the U.S. Could be avoided with full implementation of smart appliances. The appliance industry points out that new energy efficiency measures will have little impact on reducing peak demand and they are already beginning to affect the performance of some appliances. The Pacific Northwest Laboratory and Whirlpool conducted a demonstration project (that is discussed in detail in the next section) using a smart clothes dryer that could detect variations in frequencies on the grid that indicated an impending power outage and respond by turning off the dryer's heating elements for up to ten minutes while the dryer continued to run. The resulting analysis led the appliance industry and the energy-efficiency advocacy community to jointly request that demand-response capable appliances by included in the new ENERGY STAR program. Grid-connected refrigerators also offer significant energy savings as they can be programmed to defrost at non-peak times of day. The savings of having 100 million homes with connected refrigerators is estimated at 50 billion Watt [13]. Likewise, a connected dishwasher can be programmed to run in the middle of the night, even if it was loaded in the early evening. Smart homes allow consumers to manage their consumption based on the dynamic pricing that is later.

Lastly, smart homes can assist in the main grid in restoring power after an outage by waiting a sufficient amount of time before restarting. In many cases after a power outage, all the devices restart simultaneously as soon as power is restored and cause another failure as a result.

IV. SMART GRID PROJECTS

The Pacific Northwest project conducted by Clallum Public Utility District was one of the first to introduce an incentive program to encourage consumer's involvement in the plan for developing a smart-grid. Volunteer households were given free computers that received electricity rates every five minutes, along with thermostats, water heaters, and clothes dryers that were provided by Whirlpool. The devices could be programmed to inform households on current quantity of power they were using and at what cost, allowing the households to adjust their consumption accordingly. In addition, the computers allowed Clallum to remotely shut down the heating elements of the clothes dryers as described before in order to balance the load on the system. Each household was given a small amount of money at the beginning of the project and were allowed to keep whatever was left over at the end. The households were also given some instructional training on how to use the software. The 116 households that participated kept their demand below the utility's capacity at all times during the experiment, and saved an average of 10% on their power bills. This project was a good start, but replicating it on a large scale isn't likely as the participants were guaranteed that their bills wouldn't go up, and a single government laboratory ensured that the equipment was kept working during the entire duration of the project.

The Pecan Street Project is a research and development organization within the University of Texas at Austin that is carrying out a number of smart grid demonstration projects around the U.S. that emphasize customer participation. One of the projects in particular, the Meuller project, involves 1,000 homes that are equipped with energy management systems and incorporates most of the advanced smart-grid technologies. The project is analyzing new dynamic pricing models and studying the incorporation of DG, PHEVs, photovoltaic solar, and energy storage, as well as evaluating different smart-grid standards for interoperability. The expectation is that the results from this demonstration project can be extended to other smart-grid projects worldwide and under various conditions [14]. The Pecan Street Project rewards consumer participation by giving rebates for home efficiency measures and providing assistance financing efficient air conditioners as well as solar PV cells and solar water heaters. The Pecan Street Project is a model of the effectiveness of collaboration between utilities and policy makers as it also encourages green workforce development, promotes alternatives to automobile travel and the creation of energy business incubators [1].

V. ECONOMIC ISSUES

In order for the smart-grid to function effectively and efficiently, the electric utility industry's business model will require an overhaul. The electricity industry's business model was built on the notion that costs go down as supply goes up, therefore, the industry is largely responsible for consumer's lax attitudes toward energy consumption. The industry's strategy has historically been to sell more, and charge less.[1] Now the utilities are faced with the need to change their business model to go from selling as much power as they can as cheaply as they can to both selling and conserving electricity. This paradigm shift will be extremely difficult since there are many different stakeholders involved with heterogeneous needs and goals and there are tremendous economic and regulatory issues to address. Reference [1] provides a very detailed discussion of the economic and regulatory issues surrounding the smart-grid in his book .

The first issue facing grid operators is the way in which they charge customers for power. It is widely known that the most costly elements of producing and delivering electricity are the costs of the fuel required to make it, and the costs of building power plants. In order to provide the continuous balance necessary in the existing grid, human operators make decisions as to which power plants will need to be turned on during the day as demand increases. Some power plants costs more than others to operate, therefore, the cost of producing and delivering electricity changes by the hour or even by the minute throughout the day. At night, electricity is cheapest (2 to 3 cents/kWh) because the cheapest plants are running, but as people wake up and start turning on the lights, etc. additional plants are turned on and the costs increase (6 to 7 cents/kWh). During times of peak demand, when the most least efficient plants have to be turned on, costs are much higher (8 to 20 cents/kWh).[1]

Dumb meters don't account for this variation in costs, rather, they simply add up the number of kWh used by a customer over a month and charge a set rate for each kWh regardless of when it was used or how much cost the utility incurred to make it. Smart meters, on the other hand, track a customer's consumption hour-by-hour, allowing utilities to charge different prices for electricity used at different parts of the day. This is called time- based pricing. The use of smart meters and time-based pricing is beneficial for both the electric utilities and consumers. Utilities benefit in that they can set time- based prices and bill them and offer more pricing options. Also, smart meters allow appliances to be programmed to respond to price signals or user commands and adjust their use accordingly as in the Pacific Northwest project described earlier. Lastly, smart meters “make it easier to integrate small-scale generators and storage on a customer's premises” in that they can keep track of self- generated power and decide when to store electricity to be used later.[1] The smart meters, along with the systems that allow them to communicate price signals and record hourly use are collectively called Advanced Metering Infrastructure (AMI). AMI provides some core smart-grid functionality and is currently being used on a small scale, but it is just the beginning of the capability that fully enabled smart-grid technologies will provide in the form of sophisticated customer controls. Having large numbers of consumers who can adjust their demand when grid operators signal rising electricity prices is how peak loads are reduced via demand-response.

There are three types of time-based electricity pricing. First, real time prices (RTP) are set based on hourly wholesale prices with a mark-up. Real-time pricing can vary dramatically as much as 300% [1] so utilities tend to favor one of the other two pricing structures. TOU rates are calculated in a stair-step manner based on the daily patterns. For example, prices are highest in the middle of the day, lowest in the middle of the night, and mid-range during the morning and early evening. This pricing structure has been most commonly used by utilities since it doesn't require real-time communications with customers. TOU rates take into account consumption at different parts of the day, but they don't address the times when demand on one day is higher than another, as in when the temperatures are much higher or lower from one day to the next. Critical peak pricing (CPP) gives utilities the option of increasing rates substantially for just a few days during heat waves or extremely cold weather conditions when there is a spike in demand. Customers are notified in advance of the price increase so that they can plan to adjust their consumption. All of these pricing structures are designed to be profit neutral for utilities, but provide valuable benefits for customers and are very effective at reducing peak power demand. For example, TOU rates reduce peak demand by about 5% and CPP rates bring about a 20% reduction [1].

Pricing is one issue facing the utility industry, but implementing a smart-grid will require a complete overhaul of the industry's business model. It places the industry's current business models into two categories; the vertically integrated regulated utility and the disintegrated structure with retail choice. He then examines the likely path the two models will take within the constraints of three elements of a triad that include structure, regulation and competition, and business model, and describes two forces that have played a role in the triad. Structure refers to which parts of the industry a firm owns. Regulation and competition refers to how the industry is regulated, and business model deals with the business practices that meet regulatory requirements while maximizing profits. The two forces include vertical integration, which is "the savings that occur when a single utility owns all stages of the electric production and delivery process," and the benefits of competition within the electric utility industry.

The vertically integrated regulated utility owns the generation, transmission, and distribution and is regulated by the government. The idea behind vertical integration is that by interconnecting all power sources, costs are minimized and value is maximized because it is cheaper to serve the needs of a large group than to serve customers individually. Reference [1] believes vertically integrated regulated utilities will transition into "energy service utilities" Energy service utilities will keep their vertically integrated regulated structure, while incorporating dynamic pricing and distributed generation resources, and smart-grid technologies.

The other scenario [1] describes is that the benefits of vertical integration become weaker and competition increases as a result of increasing implementation of smart-grid technologies. In this scenario, the utilities will stay out of the business of generating power and limit themselves to running a smart transmission and/or distribution system that integrates, sets prices for, and balances all types of generation, storage, and demand-response. These utilities are called "Smart Integrators[1]."

VI. SMART GRID AND SENSORS

Another critical component of the smart grid is the use of sensors that provide reliable communication of information within the grid. Wireless sensor networks (WSNs) are being introduced into the smart grid that will enhance the operation of all three sub-systems; generation, transmission, and distribution. The use of online sensing technologies provides the ability to monitor, diagnose, and protect the power system, which in turn reduces the impact of failures that result from natural disasters, equipment failure, etc. These sensors are the basis for maintaining safe, reliable, and efficient electrical service for consumers and businesses via the smart grid. Online sensing technologies will replace the wired communications systems that have been used in the existing grid for electrical system monitoring and diagnostics. These systems are expensive to install and maintain as they require extensive cabling infrastructure, so their implementation has been limited in the existing grid. In the existing grid, remote system monitoring and diagnostics are largely non-existent because of their high costs. Reference [15] states that at present, utilities have no monitoring whatsoever of most of their critical system equipment, such as motors that are less than 200 hp[1]. But the costs of widespread power outages to consumers and businesses are too high for this situation to continue. In order to maintain safe and reliable service, utilities must improve on their ability to monitor their critical equipment and do a better job of coordinating protection devices. WSNs offer a low-cost solution and can provide monitoring of all system components, identifying faults and isolating them before they spread and cause widespread power system failures. Because of their low-cost, wireless sensors are the preferred tools for providing quicker reaction to changing conditions within a smart grid. . Reference [15] posits that the advantages of WSNs in the smart grid over traditional wired communication networks include rapid deployment, low cost, flexibility, and aggregated intelligence via parallel processing. Another application of WSNs are wireless automatic meter reading (WAMR). WAMR allows utilities to reduce costs by eliminating the need for human meter readers, and by deploying WSNs that provide two-way communication between utilities and consumers, utilities can offer the dynamic, time-based pricing schemes discussed earlier.

WSNs will only be successful if they are able to provide reliable and efficient communication, and there are challenges that have to be addressed. Interference exists within electrical environments that pose a threat to the ability of wireless sensors to operate effectively and reliably. Quality of service is also a concern given the many different applications that WSNs are expected to provide. Each application will have different QoS requirements, and because the bandwidth and latency of each wireless link will differ depending on conditions specific to its location, QoS requirements will be difficult to meet. Error rates are another issue in wireless communications. Link asymmetry, when

one node can communicate to another, but not vice versa[1], is also a problem with WSNs, especially at long distances or low power transmissions. A link quality metric is needed in order to predict the quality of wireless links under different conditions and maintain safety and reliability. But because of the harsh environments within electrical systems, link quality is constantly changing, making it difficult to determine the value of link quality at any given time. Reference [19] suggests two areas of research to consider when designing wireless networks for electrical systems which include wireless channel modeling and link quality characterization. Channel modeling allows designers to predict the performance of the communication network for a specific propagation environment, channel modulation, and frequency band.

Growing concern about global climate change and rising energy prices is producing much research and discussion about green networks and sustainability. The U.S. Environmental Protection Agency describes sustainability as being based on a single principle, "Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations[16]. The use of WSNs in the smart grid will add to the already large amount of traffic that exists in the Information and Communications Technology infrastructure, and will require an approach that maximizes energy efficiency within the wireless sensor networks in order to maintain a sustainable communications network within the smart grid. The amount of greenhouse gases caused by ICT is estimated to be 2% of the global greenhouse gas emissions and will continue to increase as more wireless technologies are added [17].

In order to minimize the carbon footprint associated with WSNs used in the smart grid, energy- efficiency measures must be taken at all layers of the ICT protocol stack, while maintaining acceptable error rates and Quality of Service. Assuming the WSNs will operate as WANs similar to the existing cellular telephone networks, there are several proposals for reducing energy consumption in mobile networks. One technique for reducing energy consumption in mobile networks is aimed at mobile base stations, which at present are very inefficient in their use of energy, since even when there is little or no traffic they still continue to consume 90% of their peak energy.[17] Coordinated multipoint communication (CoMP) is a technique that allows dynamic coordination of base stations so that redundant base stations can be turned off when there is little or no traffic. CoMP extends the service area of BS while maintaining QoS levels and data rates[18].

Cell shaping is another technique that can increase efficiency in mobile wireless networks. Two cell shaping schemes are the basic switching off and cell breathing schemes. Figure (7) illustrates the use of cell shaping, which is a way of adapting the shape of a particular cell to traffic distribution so that the maximum number of BS are turned off without affecting network performance[17].

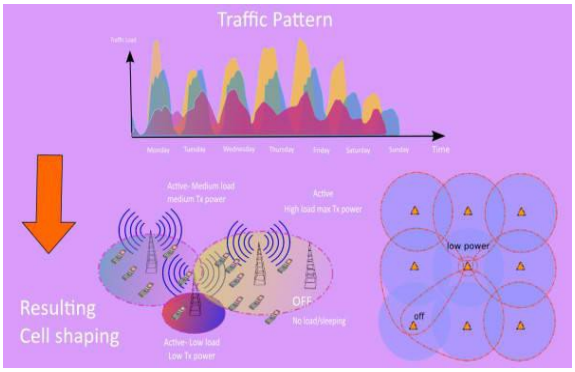

Figure 7. Cell shaping technique for traffic distribution

WSNs may also operate as WLANs. The main energy consumers in wireless LANs are the access points (APs), therefore the focus for reducing energy consumption is on increasing AP efficiency by reducing the number of idle APs in the network and providing network resources on-demand so that APs, network switches, and controllers can be turned off when they aren't needed [19]. In [15], the SEAR (Survey, Evaluate, Adapt, Repeat) strategy is proposed as a resource on demand strategy for high density WLANs. This approach offers most efficiency gains in highly redundant, centralized WLANs with overlapping APs, but only provide modest, if any, advantages in single layer wireless networks. SEAR operates from a centralized WLANs central controller, and is policy based, allowing administrators to set policies that maximize efficiency while maintaining specific network performance requirements.

VII. CONCLUSION

The issues and challenges surrounding the implementation of a smart-grid are many, although advancements are rapidly being made. There are technology issues regarding interoperability between various parts of the grid and the devices connected to it as well as competing standards and protocols. There are privacy concerns regarding the use of smart-meters that gather large amounts of information about individual households and businesses. The utility industry's business model must change its focus from encouraging mass consumption to energy efficiency. Regulatory policies will have to be put in place that ensure privacy and fair access. But one thing is certain; the smart-grid is a necessity in the face of shrinking supplies of fossil fuels and increased climate change. The smart-grid benefits will far outweigh its costs. Work must continue and collaboration between utilities, policy makers, and the IT community will be needed.

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An integrated model for influencing Saudi Arabian citizens to adopt E-government services

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***Abstract*— This paper discusses Electronic Government (E-government), in particular the challenges that face its development and widespread adoption in Saudi Arabia. E-government can be defined based on an existing set of requirements. In this paper we define E-government as a matrix of stakeholders: governments to governments, governments to business and governments to citizens, using information and communications technology to deliver and consume services. E-government has been implemented for a considerable time in developed countries. However, E-government services still face many challenges, including trust, privacy, security, computer and information literacy, culture, accessibility, and open government data, in their implementation and general adoption in Saudi Arabia. It has been noted that the introduction of E-government is a major challenge facing the government of Saudi Arabia, due to possible concerns raised by its citizens, including a high rate of failing to set up E-government project properly. In addition, the literature review and the discussion identify the influential factors, such as quality of service, diffusion of innovation, computer and information literacy, culture, lack of awareness, technical infrastructure, website design, security, privacy, and trust, that affect the citizens' intention to adopt E-government services in Saudi Arabia. Consequently, these factors have been integrated in a new model that would influence citizen to adopt E-government services. Therefore, this research presents an integrated model for ascertaining the intention to adopt E-government services and thereby aiding governments in accessing what is required to increase adoption.**

Keywords-component; E-government, adoption, factors, G2C, intention, citizens' intention, influential factors.

I. INTRODUCTION

The World Wide Web (WWW) has become a necessity and an indispensable tool in the daily life of people worldwide [1, 2]. It is widely recognized that many people prefer the online version of a service as a quick and easy approach to achieving their daily activities, including reading newspapers, paying bills, etc.

As information and communication technologies (ICT) rapidly develop, coupled with considerable improvements in digital connectivity, governments are reassessing the way they work and interact both internally and with external organizations [2, 3]. This technology has encouraged the government's organizations and affiliations to reconsider their internal and external relations and transactions. Therefore, in order to succeed and build for the future, the administrative processes of government are being transferred to electronic systems. Governments worldwide are considering establishing an electronic approach (E-government) to government organizations and agencies in order to provide and facilitate many services to people anywhere and at any time, and to replace traditional routine procedures. Within the paradigm of human and social development, the United Nations [4] has a conceptual framework for E-government programs. In the United Nations context, E-government is achieved when a state uses ICT to improve the availability of information to its citizens. In order to achieve this, the capacity and readiness of the public sector have to increase in the areas of a country's technological and telecommunications infrastructure and the level of its human resources development [5].

A. E-government in Saudi Arabia

The Saudi government launched the YESSER Program, the country's first national E- government strategy, in 2005 [6]. The aim of this initiative is to create user-centric electronic initiatives that focus on improving government services to the public sector. In addition, the vision of the Kingdom of Saudi Arabia is to adopt and activate communication and IT systems which led to realize an IT community and a digital economy [7]. The government of Saudi Arabia has taken steps to develop business process and disseminate the concept of e-services in various government agencies in order to realize their vision[7]. Furthermore, it has been announced by Saudi E-Government Program [7] that to achieve the objectives, a set of promising ambitious plans and strategies have been adopted by the Saudi Arabian government. The plans for developing and implementing the E-government program has been sat and have to actions, which is the first plan has took a place from 2006 to 2010, and the second is progressing from 2012 to 2016. Additionally, the E-governance strategy will provide citizens with access to all government-related services and

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information. This will enhance the accountability of the public sector in Saudi and it is being implemented in all ministries in the country. This Saudi initiative to implement E-government has been criticized for not being feasible and for having transaction systems limited to business [8].

B. *Adopting new technology*

Adopting new technology is required to success in implementing E-government in developing countries, Saudi Arabia for insistence [9]. The success of the implementation of the E-government is dependent not only on the government support, but also on willingness to accept and adopt E-government services by the citizens [10]. Although the government decision makers are keen on providing services using the traditional ways, they also need to understand the factors that would encourage their citizens to use the electronic service delivery channels [10]. In fact, the research on exploring factors that would encourage citizen to adopt E-government services in developing countries is not enough [10]. Therefore, one of this research's aims is identifying the factors that affect the citizens' intention to adopt E-government services.

C. *Report's Structure*

The structure of this paper is as follows: the next section discusses the literature review and previous models used to measure new technology adoption; in section 3, a set of factors that influence the citizens' intentions to adopt E-government services is identified; Section 4 presents the integrated model; and finally, Section 5 presents the conclusion.

II. LITERATURE REVIEW

A. *E-government*

To define E-government from a single perspective is relatively easy, but defining E-government in a way that suits everyone's view or needs is a significant challenge. Meng Seng, et al. [11], noted that although E-government as a term has become known across the world, there is evidence of insufficient consensus on its meaning, particularly regarding the main features of E-government [11, 12]. E-government can be defined in different ways. For instance, it can mean everything from just looking up information to using an online service, such as renewing a passport [4]. In addition, the use of information technology to enable and increase efficiency is key to E-government, while providing services and information to citizens, employees, businesses and government agencies [13]. A different approach is to define E-government as using the Internet as a tool for information and communications technology (ICT) to accomplish better government [14, 15].

A wide range of different definitions from researchers have been identified; while everyone has a different view and requirements, most of them share the view that E-government incorporates ICT as one of its major elements.

In this paper, E-government is defined as a matrix of stakeholders: government to government, government to business and government to citizens, using information and communications technology to deliver and consume services. E-government has the objective of saving money, time and effort with increased efficiency, with due consideration for information security and privacy.

B. *Citizen Adoption*

Adoption is an important aspect for the success of E-government initiatives in developing countries [9]. However, growing interest in E-government raises the question of how governments can increase citizen adoption and use of their online government services [16]. To date, there has been little research exploring factors that determine the adoption of E-government services by citizens in developing countries, especially in the Arab world [10, 17]. Moreover, Dong, et al. [18] point out that E-government researchers often do not consider the adoption of E-government. They also make the point that, although there is enormous potential for online government services, citizens are not adopting them [16]. Furthermore, Carter and Belanger [13] agreed with other researchers that, although numerous studies have analyzed user adoption of electronic commerce [19-21], to date, no study has identified the core factors that influence citizen adoption of E-government initiatives. According to Colesca [22], many studies focused on the citizen adoption of E-government services suggest that trust [23], security [24] and transparency [25] are major issues for E-government adoption. Based on Margetts [26], cited by Yonazi, et al. [9], high adoption of these initiatives increases the chance that E-government will facilitate social and economic benefits to citizens.

In the case of Kuwait, the increasing use of ICT by government departments resulted in the creation of an IT infrastructure capable of supporting E-government services [17]. User acceptance of IT is deemed a necessary condition for the effective implementation of any IT project [10, 27]. Adoption comes after direct experience with the technology and after an individual has decided to accept the technology [10, 28]. A number of studies have investigated the adoption of E-government services in developed countries [10, 29], whereas relatively little has been undertaken in developing countries [10, 17]. Successful implementation of adoptable E-government initiatives in that context requires complex customization between the technology and implementation context in developing countries [9, 30]; the result in designing citizen-adoptable E-government initiatives is still a challenge to many developing countries' governments [9]. AlAwadhi and Morris [10] conducted a study in Kuwait to explore factors that affect the adoption of E-government services. The result identified the main factors that could influence citizens to adopt E-government including usefulness, ease of use, cultural and social influences, face-to-face interaction, gender issues, technical issues, lack of awareness, trust in the Internet and cultural differences.

Although these factors influence Kuwaiti citizens to adopt E-government services, there is no evidence that these factors can influence Saudi citizens. However, the culture is similar between Kuwait and Saudi Arabia. Additionally, Alshehri, et al. [31] has identified some general factors for E-government in Saudi Arabia Therefore, in order to determine which of all these factors can influence Saudi citizens and whether there are other factors that have not been mentioned, an investigation is going to be carried out among citizens of Saudi Arabia and selected Saudi organizations.

C. Models used to measure adoption of new technologies

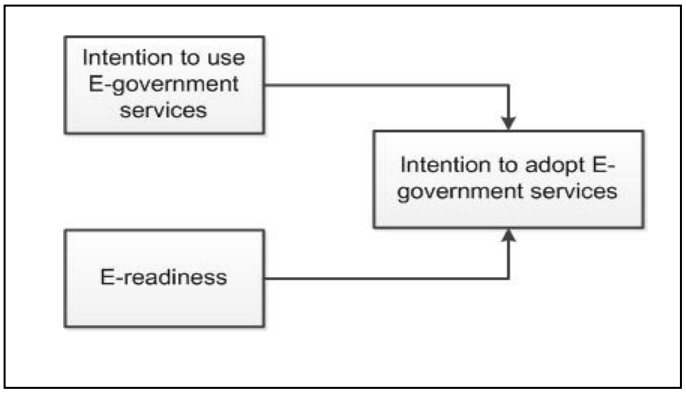
To identify the influential factors, different researchers' models and contributions have been reviewed includes Technology Adoption Model (TAM) by Davis [32], Diffusion of Innovations Model (DOI) by Rogers [33] and Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh *et al.* [28]. The other models reviewed where:, Trustworthiness by [34], model for citizen adoption by [35] and. Rehman and Esichaikul [36] delivered a third model of citizen adoption based on integrated models adapted from TAM, DOI and UTAUT. Reviewing these models allowed us to identify the factors that may influence citizens in Saudi Arabia to adopt E-government

III. RESEARCH METHODOLOGY

Based on the literature review, this discussion will consider, first, the challenges facing E-government implementation and development in Saudi Arabia, and secondly, the factors that influence citizens' intention to adopt E-government services; in order to answer the following key questions: (i) What are the challenges or barriers to implement and develop E-government in Saudi Arabia?, (ii) What are the influential factors to be integrated in a model for implementing and developing E-government in order to be adopted by citizen?

A. Factors influencing citizens' intention to adopt E-government services in Saudi Arabia

The initial question for this research and investigation is: How can the Saudi government overcome challenges to help its citizens adopt E-government? To answer this question and to help people adopt E-government services, there are some factors that should be credited to government requirements. Table 1 presents the influential factors from the literature review in 10 categories. Although the identified factors are not yet proven to meet the needs of Saudi citizens, it will be used as bases to examine some well-known models and theories.



IV. THE RESEARCH MODEL

Figure 1.
high level overview of an Integrated Model for Citizen Adoption of E-government Services.

Based on what has been discussed previously, a new model will be addressed by adapting and integrating the critical factors that have been mentioned by other authors. Figure 1 shows the new model – higher level. The addressed higher level model contains the intention to use E-government services and E-Readiness.

These two main blocks, which are the intention to use E-government services and E-Readiness, have factors that affect the adoption of E-government services. The intention to use E-government services, which has been classified as citizens' concerns, includes Trust, Privacy, Security, Culture and Website design while E-Readiness has Quality Services, DOI, Computer and information Literacy, Culture, Lack of Awareness, Technical Infrastructure and Security, and it is classified as government's responsibility. The breakdowns of these blocks as shown in figure 1 are presented in the next sections and it is shown in figure 2. In the breakdown, the factors have been categorized in order to make the validation easy and accurate.

No	Factors
1	Technical Infrastructure
2	Computer and Information Literacy: • Age. • Gender. • Education.
3	Lack of Awareness
4	Security Issues Transaction Security. Information Security. Perceived Risk.
5	Privacy Issues
6	Trust Issues • Trust in Government. • Trust In Internet.
7	Quality of Service Service Quality. Reliability. Availability. Speed of Delivery. Information Quality.
8	Culture
9	DOI Compatibility. Complexity. Image. Relative Advantage.
10	Website Design Perceived Usefulness. Perceived Ease of Use. Usability. Accessibility. Multi-lingual Website.

TABLE I. FACTORS INFLUENCING CITIZENS TO ADOPT E-GOVERNMENT SERVICES.

A. Quality of service.

Quality of service has been suggested to play an important role in online services [36]. To encourage citizen to adopt E-government services, it is important to the government to provide high quality of service and high quality of information with the objective of the speed of delivery, with due consideration of information reliability and availability [36].

B. Diffusion of innovation.

This element of the model is based on Roger's [33] model of Diffusion of Innovation. Subsequently Carter and Belanger [37] have been made a modification by adopting compatibility, relative advantage and complexity, and excluding trialability and observability to replace it by image.

C. Computer and information literacy.

Literacy as applied to ICT is defined as whatever a person needs to be able to use (and know about) computers, while the ability to use information, or possibly the possession of knowledge of information is information literacy [38]. The computer and information literacy are affected by the level of education that citizen held, age and gender [2], which all bar the citizen to adopt E-government service .[39].

D. Culture.

Culture has impacts on the citizen intention to use E-government services, that including culture influences, culture awareness and national culture [40]. It has been defined culture as "values, beliefs, norms and behavioral patterns of a group – people in a society for national culture, staff of an organization for organizational culture, specific professions for professional" [41]. Akkaya, et al. [40] state that many researchers have recognized the importance of considering cultural characteristics in online services.

E. Lack of awareness

Awareness refers to how a person understands the activities of others, which provides a context for his own activity [42]. To influence citizen to adopt E-government services, the government should increase the awareness of their citizen. It has been found that awareness is one of the barriers that affect the adoption of E-government services [18, 35]. According to Baker and Bellordre [42] a major concern related to the deployment and use of new technologies is a lack of awareness that a given technology exists, or the citizen could benefit from using the new technology**.**

F. Technical Infrastructure

Technical infrastructure includes LAN (local area network) design and installation, cooperation scope's determination in the corporate WAN network (Internet, Intranet), technical parameter specification by using computers as workstations and servers, selection of operational system environment and database platform [42]. A study by AlAwadhi and Morris [43] found that most of the participants were worried about the technical issues. AlAwadhi and Morris [43] states that the finding give a clear view that technical infrastructure is important to influence citizen to adopt E-government services. In addition, Al-Sobhi, et al. [2] states that reliable and integrated technical infrastructure could be the difficult parts that face government, especially in developing countries, to obtain a higher level of E-government services that can influence citizen to adopt E-government services. [2] Suggests that governments should provide a budget to build strong technical infrastructure in order to encourage citizen to adopt E-government services.

G. Website Design

Researchers have suggested that the design of an E-government website may encourage citizens to use the services and make a good impression to increase citizens' repetition [38]. Website design including perceived usefulness, perceived ease of use, usability, accessibility and Para-lingual website are the main factors that governments should focus on to influence citizen to adopt and use E-government services [38].

H. Security

Security can be defined as the protection of information or systems from unsanctioned intrusions or outflows [44]. Lack of security is one of the main factors that affect the intention to adopt E-government services which have been identified in most studies [44]. In addition, transaction security is a critical for users when making online activities [45]. Furthermore, information security is defined as "the subjective probability

with which consumers believe that during information transit or storage their personal information will not be viewed, stored or manipulated by inappropriate parties, in a manner consistent with their confident expectations" [46].

I. Risk

Perceived risk refers to the subjective evaluation by consumers associated with possible consequences of wrong decisions [35]. According to Bélanger & Carter [35], online services consumer are more concerned regard perceived risk when they share information and complete transaction. In addition, it has been said that the relationship between risk, trust and intention to use E-government services are trust reduces risk perceptions while the effect of trust on intention is mediated by perceived risk [37].

J. Privacy

It is mentioned that citizen concern with privacy of information has an impact on the consumer of the electronic services. According to Akkaya, et al. [40] citizens are sensitive towards storage of their personal data which has a negative influence on the intention to adopt and continued use of E-government services.

K. Trust

Trust refers to *"an expectancy that the promise of an individual or group can be relied upon"* [47, 48]. According to Bélanger and Carter [48] initial trust, which refers to trust in an unfamiliar trustee, is required in a relationship between citizen, with a shortage of credible or meaningful information about the e-service, and government. Citizen's trust is generally based on trust of the government which is the assumptions made about the behaviors of the trustee, and trust of the Internet which is the institutional factors [48]

1) Trust of the Internet (TOI) is consistently identified as a key predictor for the adoption of e-service and frequently labeled institution-based trust [43, 48]. Institution-based trust refers to "an individual's perceptions of the institutional environment, including the structures and regulations that make an environment feel safe" [43, 48]. According toBélanger and Carter [48] "institution-based trust is basically trust in the Internet: trust in the security measures, safetynets and performance structures of this electronic channel". E-government adoption depends on the belief of citizens that the capability of providing accurate information and secure transactions using the Internet as a dependable medium [48].

2) Trust of the government (TOG) is identified as perceptions of a person that concerning about the integrity and ability of the service provider [48]. The confidence of citizen in an agency's ability to provide online services is imperative for the widespread adoption of e-government initiatives. It has been posited that the adoption of a technology has got a strong impact by trust in the agency [48]. According to Bélanger and Carter [48]"in order to enable E-government initiatives, citizens must believe government agencies possess the astuteness and technical

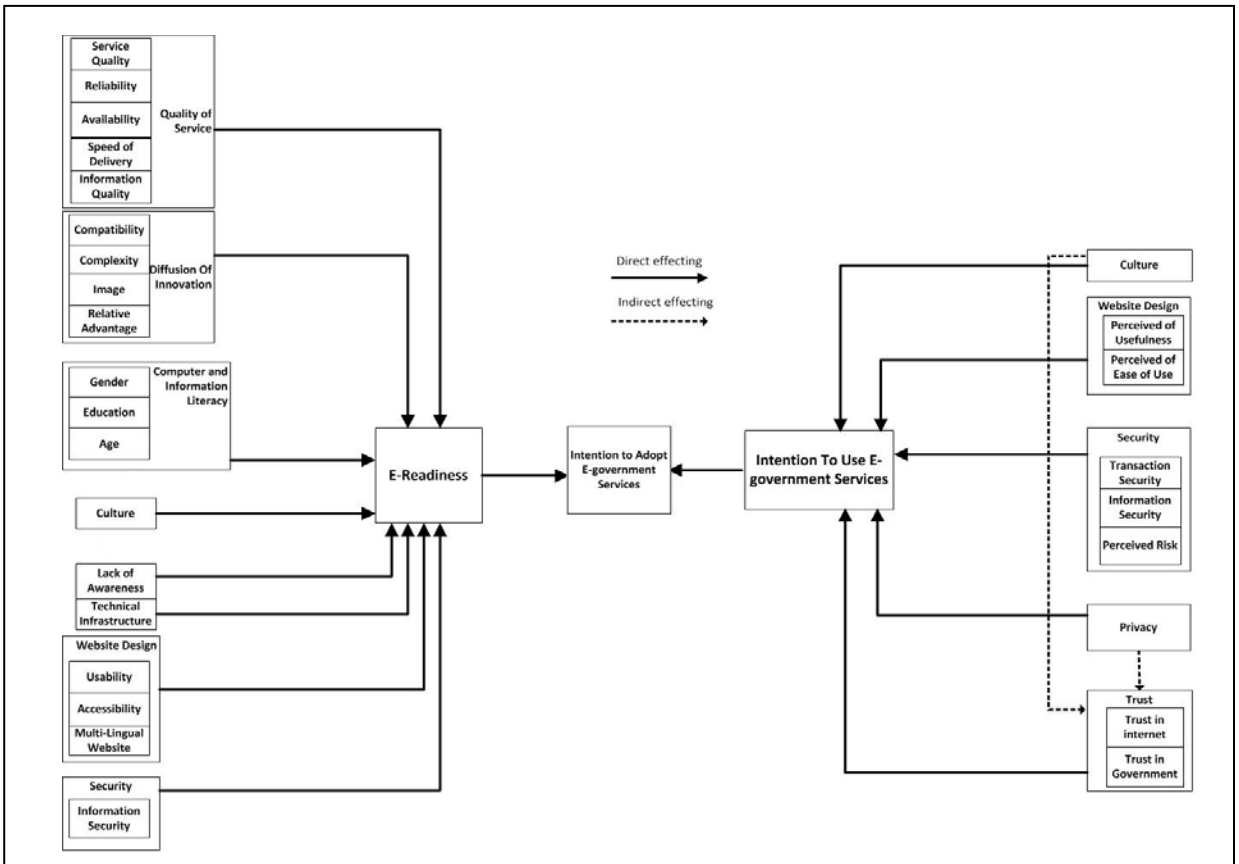


Figure 2. breakdown of the high level overview of the Integrated Model for Citizen Adoption of E-government Services figure 1

resources necessary to implement and secure these systems".

V. CONCLUSION

Currently the World Wide Web is becoming a tool of daily life, where people prefer online services as a quick and easy way of carrying out their daily activities such as reading newspapers, paying bills, etc. Due to this approach, proposing and developing electronic services has become a high priority in most countries. Moreover, since the rapid development in information and communication technologies (ICT) and the significant improvements in digital connectivity, adoption of E-government services by citizens is the concern of many governments. Therefore, this research has considered how to encourage citizens to adopt E-government services and address an integrated model for citizen adoption of E-government services.

Previously, we have conducted a literature review that has identified the key drives and factors that have to be considered in the development of any model. The model has been constructed following a review of approached to determine technology acceptance metrics.

Currently work is ongoing to validate the integrated model by using a triangulation method which includes focus group and questionnaires with citizens, and interviews and questionnaires with government officials in Saudi Arabia.

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Prominent Transformation of Cloud Computing Platforms and its Forces

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ABSTRACT: **Cloud computing is one of the present common exhilarating technologies due to its ability to reduce costs associated with huge capacity of computing while growing elasticity and scalability for computer resources and processes. Cloud computing is Internet-based computing, whereby shared resources, software and information, are provided to computers and devices on-demand, like the electricity grid.**
It aims to build an ideal system with dominant computing facility through a large number of moderately low-cost computing entities and using the highly developed business models. The creation of on-premises application platform into cloud environment with partial foundations, infrastructure and functional services. The combination of cloud platform structural design and on-premises platform together is a colossal reform on building a massive environment on today's cloud computing environment.
SOA is a place of services and promoter the principles of component reuse and well distinct association between a service provider and service consumer. This paper introduces the background, services and service form of cloud computing and have common distinctiveness of SOA and cloud computing.

Keywords: Cloud platforms, SOA, Integration, API

I. INTRODUCTION

Cloud provides everything as a service, aiming to provide a more active, scalable and cost effective infrastructure and application platform to the customer.

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. It can be broadly divided into three categories as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). Cloud service characteristics are on demand, flexible and service.

A public cloud provides global services. A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. When a service provider uses public cloud resources to create their private cloud, the result is called a virtual private cloud.
The objective of cloud computing is to provide ease of use, countable access to computing resources and information technology services. Service Oriented Architecture in Information Technology promotes use of shared model of resources that are improved with abstraction.

II. CLOUD SERVICES

To get a hold on cloud platforms, it's useful to begin by looking at cloud services in general.

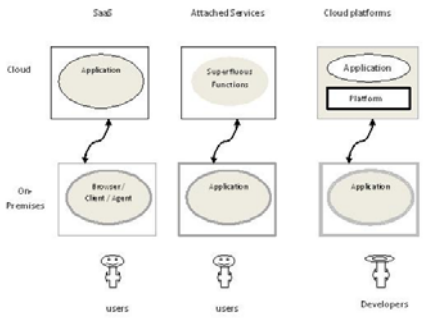

Figure 1: Various kinds of cloud services.

As Figure 1 shows the various kinds of cloud services as follows,

- Software as a Service (SaaS)
- Attached Services
- Cloud platforms.

A. Software as a Service
This application working fully in the cloud. The on-premises client is naturally a browser.

B. Attached Services
All on-premises software provides useful operation by itself.

C. Cloud Platforms
A cloud platform provides cloud-based services for developing application.

III. GENERAL MODEL FOR APPLICATION PLATFORMS ARCHITECTURE

All application platforms are mostly derived from on-premises platforms. Now the developer converts the application platform on on-premises environment into cloud as shown Figure 2.

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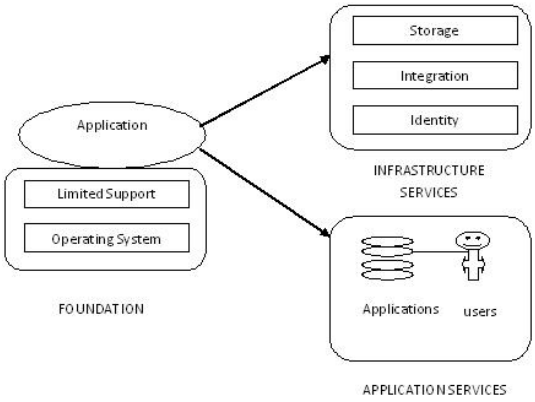

Figure 2: A modern Application platform in cloud environment

As Figure 2 illustrates an application platform consist of three components as

- Foundation
- Group of Infrastructure services
- Set of application services

A. Foundation

Each function exploits various platform software on the machine its own execution. It includes various support functions such as standard libraries and storage and a base operating system.

B. Group of Infrastructure Services

In a recent scattered environment, applications regularly utilize essential services provided on other computers.

C. Set of Application Services

The on-premises foundation consists of operating system (Windows, Linux and other versions of UNIX) and local support.

The .NET Framework application servers offer common support for Web based applications.

For on-premises infrastructure services, common examples include the following: storage (byte oriented storage), Integration (a message queue is the example for integration) and Identity.

The application in the on-premises platform is divided into two categories as packaged applications and custom applications.

IV. Integration Of On-Premises Platform And Cloud Platform

As the Figure 3 demonstrates, a cloud application can be built on a cloud foundation, while an on-premises application is built on an on-premises foundation. These applications can approach infrastructure and application services offered on-premises and in the cloud.

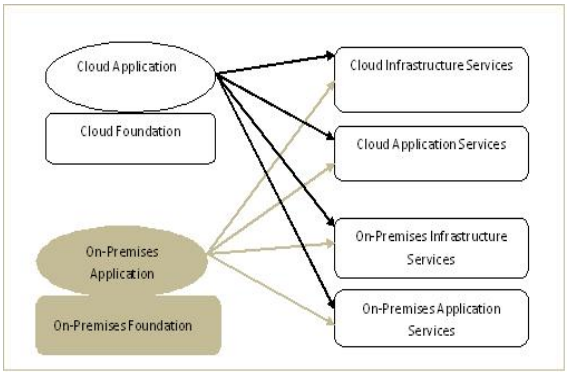

Figure 3: Integration of On-Premises and Cloud platforms

V. Service Oriented Architecture (SOA)

SOA is a concept which has influenced IT architectures in recent days. It represents and allows access to well-defined services, and then abstracts them to modular layers, which helps in application development, reuse and ease of integration.

VI. SOA Overlap Cloud

Cloud computing represents an “expandable” and “soft” IT framework or platform, which is exposed over the internet and enables enterprises to use their resources and services to the maximum potential. It provides a platform for developers to build tailored applications.

In cloud computing, infrastructure components are provided as hardware elements, as software are provided as web services, applications are exposed as APIs to the external world with high information security. Thus cloud computing has fundamental dominion of re-use and service orientation that runs the whole time. So SOA supports cloud at the first instance.

The SOA defines architectural principles for enterprise systems by defining interfaces, processes and communication between various sub system, focusing on predictable patterns and service behaviors. SOA is a set of services and advocate the principles of component reuse and well defined relationship between a service provider and service consumer.

SOA facilitate the chronic use of existing application functionality and attempts to share a common resources, information services and processes across the organization. Figure 4 shows how the cloud and SOA overlap.

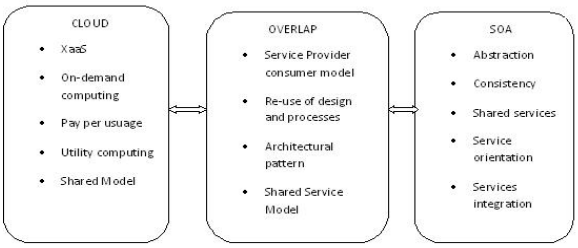

Figure 4: Overlapping cloud and SOA

SOA principles help cloud computing architecture to deliver the required services model with quickness and scalability. Service integration is the key aspect of cloud computing, and is not limited to infrastructure or applications running over it. Integration between various IT infrastructure components various application and workflow components, as well as between various service processes are becoming a corner stone in today's IT enterprise.

The below Figure 5 shows SOA for cloud starts within the enterprise. SOA has to be undertaken for the IT enterprise even in an on-premise environment, where a framework is established for the IT architecture, processes are defined and tools defined. This is the starting point for implementing the service orientation.

Abstraction of various services and definition of solution for various application and business requirements need to be done within the organization, and the same implemented in cloud. The roadmap for implementing SOA on cloud is to starts internally, build and test the processes, and finally move to the cloud.

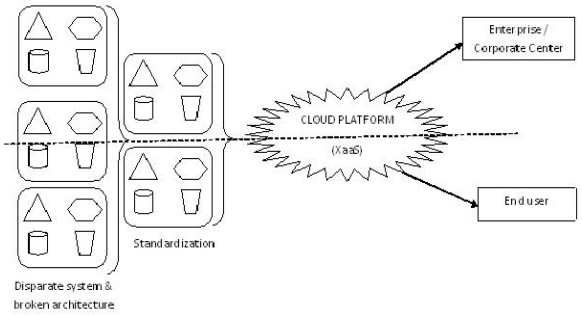

Figure 5: SOA principles pass through an enterprise and cloud

VII. Implementation And Result

This paper is a systematic study of integration of cloud computing different structure and introduces of services of architecture on cloud computing gives the quality services to various customers with highly tolerant features and result of this paper to avoid frustration on various building cloud platforms and security issues of cloud computing. The implementation of the integration of cloud platforms, on-premises environment and overlapping service oriented architecture give more efficiency, reduction of cost, flexible to current usage of cloud computing users.

VIII. Conclusion

The significance of cloud computing are scalability, expandability and reality. SOA and cloud are complementary to each other and it can be pursued either independently or concurrently. Increasingly SOA is being connected well with cloud and there are plenty of applications of SOA principles in architecting the cloudscape. There are some issues arises on overlapping SOA and cloud computing are security services such as authentication, confidentiality and integrity. Openness and flexible of cloud computing is double edge sword that carry complexity, reduce the trust degree and threat against security, so there should be a balance required between security and convenience.

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Position Based Sentence Search for Encrypted Unstructured Data in Cloud Environment

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***Abstract*— Over recent years cloud computing has attained foremost commercial success. Cloud computing minimizes resource wastage risk by reducing the entrance barrier for cloud service providers. By extensive usage of cloud services unstructured data volume is increasing over it. Therefore security considerations to save data from hackers are also becoming a necessary aspect. To avoid illicit use of data placed on the cloud different encryption techniques and standards have been proposed by the researchers. Data searching becomes a challenging task by adopting the existing techniques. In this paper a new technique Position Based Sentence Search (PBSS) has been proposed. This technique facilitates user with sentence searching for unstructured data from the original document in cloud environment. PBSS provides an efficient ranked sentence search by means of preprocessed indexes. There is no need of decrypting documents during the search process as in existing systems. Decryption is done on the retrieval of the documents only. Nobody has the prior knowledge about contents placed on the cloud therefore PBSS achieves sentence privacy.**

***Index Terms*—PBSS, indexing unstructured data, searchable encryption, searchable cloud environment, ranking based encrypted search, position based sentence search.**

I. INTRODUCTION

With the commencement of cloud computing composite data management systems from local sites are transformed to viable public cloud. Data owners are encouraged to outsource the data management systems to public cloud to achieve flexible and commercial benefits [1]. Cloud computing is all about transferring services, applications and data. Also attaining commercial assistances, location transparency, and centralized facilitation are the significant resources in cloud computing. On a shared collective platform like cloud data can be retrieved easily with less revenue and improved assistance [2].

Cloud storage has the capability to save a bulk of data for a large number of users. This minimizes the storage capacity problem. To provide different competences multiple isolated applications and services are disseminated over the internet in cloud environment [3]. When sensitive data storage is done on the cloud, existence of large number of users can cause cloud security to be affected. Thus for achieving data privacy complex data has to be outsourced on the cloud after encryption. Therefore to hide data from hackers and malicious attackers a protected system is needed.

Searchable encryption is a technique by which the outsourced data placed on cloud can be kept private. Searchable encryption will let this data to be difficult to hack when searched. With searchable encryption techniques encrypted data is placed on the cloud server on which search can be performed. Processing of encrypted data placed on cloud server is done without decrypting it. The encrypted data is placed on the cloud in the form of code words which are difficult to hack by untrusted user or hackers [4]. The encrypted data will be accessible by authenticated and authorized users only. These users will be able to perform search on this data and retrieve desired results.

This paper presents a search technique Position Based Sentence Search (PBSS) for unstructured data in cloud environment. Using this technique on the basis of sentence being searched the user is able to retrieve the corresponding document which contains that sentence. In PBSS during search a sentence match is done by finding the positions of the specific keywords searched in the document index. The close positions indicate the sentence match. PBSS retrieves documents with high frequency of occurrences and minimum standard deviation of positions on the top. Unstructured data is indexed at first by collecting distinct keywords words from the original document with their specific positions. After index generation the data is placed on the cloud server in the form of codewords. The codewords are generated using hash algorithms which enhance the security and privacy of the document index.

To generate secure searchable encrypted index of unstructured data documents bloom filters are used. Bloom filter is a data structure which is used for fast set membership test with the possible false positives. A Bloom filter is stored as an array of bits. All the bits are initialized to ‗0'. After the addition of an element different hash functions are performed on that element. The input to each hash function is the element to be added in the array and the output from each hash function is the index into the array which is different for each hash. After the calculation of the hash algorithms each bit in the filter at the indexes which are specified by the hash outputs is set to

1. For checking a specific element in the bit array it is tested that if any of the bit is set to ‗0'. If it is set to ‗0' it means that this particular element is not present in the bit array [5]. As an example in the Fig.1 the bloom filter using three hash functions as shown.

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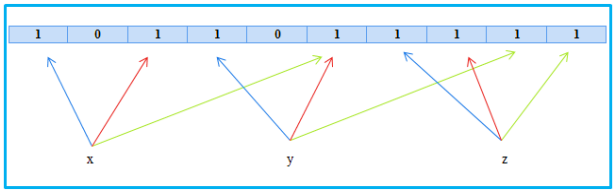

Fig.1. Bloom filter using three hash functions

In Fig.1 three words x, y and z have been added as members to the array in such a way that three hash functions have been applied on each of the word.
The summarized contributions are as follows:

- Distinct words from each document are extracted and indexed.
- The retrieved searched documents are in the ranked order based on term frequency and position standard deviation.
- Bloom filters are used for distinct words indexing to ensuring security.
- The paper introduces a new technique named PBSS which facilitates user to have position based sentence searching with punctuation marks.
- Overhead of decryption before searches is reduced.
- The content identity is not revealed to any of data user or cloud server.
- PBSS provides efficient and accurate sentence search as compared to the keyword based search.

The remaining paper is structured in such a way that section II states the problem statement. Section III describes the literature review. Proposed framework has been shown in section IV. In Section V the proposed technique along with its working scenario has been described. Section VI comprises conclusion and future work.

II. Problem Statement

For sentence based search the encrypted documents located on the cloud server are difficult to search proficiently. From these documents search can only be performed after downloading and decryption of these documents. The motive to implement PBSS technique is to retrieve documents in the descending order of their ranks from the whole set of encrypted documents placed on the cloud. The problem statement is as follows:

- How sentence based search can be achieved using positions of keywords in the documents?
- How to index unstructured data for sentence based searching?
- How the proposed technique achieves data privacy?

III. Literature Review

Critical complex data when placed on the cloud server can undergo security complications. Therefore this data when searched by users should be present in encrypted form to vanish the hacking inference. In literature different techniques for data protection, indexing, and searching have been discussed. These techniques serve as a foundation towards the implementation of proposed technique for sentence based searching.

N. Cao et.al proposed a technique to enable searchable encryption having secured ranked search [6]. Accurate retrieval of results have been obtained using relevance ranking of search results. The technique has used a statistical measuring approach from the point of information retrieval to building secure index. Keyword privacy has been ensured providing no information leakage on cloud server. Experimental evaluation has been done showing improved efficiency as compared to the previous techniques. No implementation details have been shown in this study and only mathematical proofs have been given to validate the results. The technique is comprised of two phases which are setup phase and retrieval phase. In setup phase key generation and index generation is done followed by the retrieval phase. In retrieval phase trapdoor generation and index search is performed. This search is based on single keyword search only. Only theoretical details have been given. No analysis is performed on security and performance of keyword to be searched.

Curtmola et.al proposed improved search techniques on the basis of literature reviewed in searchable encryption domain [7]. New security definitions have been discussed by authors along with highlighting limitations in the existing literature for security definition. The authors presented such constructive definitions which are comparatively efficient w.r.t to existing searching techniques. Key generation, build index, trapdoor generation and index searching are basic steps which have been proposed to carry out search. The proposed technique has been constructed on the basis of combination of a lookup table and an array. A linked list is generated for saving the list of document identifiers in which the word is found. Th problem associated with the implementation of this technique is a need to update the array and the trapdoor whenever the document is added or removed.

Park et.al proposed a technique comprising two approaches which are efficiency and searching in cloud data center [8]. At first for efficiency and search two techniques of index search-I and II have been proposed. Secondly for these two techniques the analysis has been performed. The encrypted database has also been evaluated for efficiency. The basic steps involved in the proposed technique are SysPara, KeyGen, IndGen, DocEnc, TrapGen, Retrieval and Dec. The indexes produced as a result of this technique are not secure and the index contents may be deduced by hackers. Any third party malicious user can trace the common keywords from any of two documents.

Im-Yeong Lee and Sun-Ho Lee presented a technique based on re-encryption concept [9]. Searchable indexes have been generated in order to share data safely. In the first step key generation is performed. Then the re-encryption keys are generated. In the second step keyword search is done by generating trapdoor with secret key. Authenticated users can only decrypt the data. There is not technical and experimental proof for the validation for this technique. Only theoretical evaluation has been done.

N. Cao et.al proposed a searchable encryption technique for facilitating multiple keyword searches from the data placed on the cloud server [1]. Accurate retrieval of results is obtained by using relevance ranking concept. The coordinate matching approach has been used to achieve multi keyword based search. Similarity measure has been calculated by using inner product similarity concept. In order to ensure security two techniques have been proposed for carrying out multi keyword ranked search. These techniques are as follows: Privacy preserving scheme in known cipher text model and privacy preserving scheme in known background model. Basic process for performing both of the techniques is same. This process constitutes four steps which are Setup, BuildIndex, Trapdoor and Query. Mathematical designs and statistical proofs have been given in order to validate the results. The proposed technique has less communication and computation overhead. Existing Boolean keyword searchable encryption schemes do not support multi keyword ranked search over encrypted cloud data while preserving privacy. The limitation of this technique is the linear traversing of the whole index of all the documents for every search request.

Tamboli et.al proposed a technique of fuzzy keyword search for retrieving exactly matched documents [10]. It provides the ability to search the closest possible matching document if the exact match does not exist. For quantification of keyword similarity the idea of edit distance has been used. This system provides the facility to encrypt the text files, image files, and video files. Security has been ensured by the encryption of the data to be searched by the user. Various algorithms have been proposed for the creation of fuzzy set. The basic technique follows the process such that at first the keyword is taken as an input and in a database fuzzy set is maintained. The documents which are matched are returned by the database. A private key id is used for the decryption of searched document. The technique provides an efficient search and concept of exact search is also introduced. Experimental results have been shown which are not truly demonstrating the analytical scenario of the experiments.

Traditional schemes for searchable encryption have only permitted the Boolean search without checking the relevant files during search [7], [12], [13], [14], [15]. These schemes lack the ability of large data set searching and exact match search. The user had to have pre knowledge of encrypted data placed on the cloud. Therefore accurate file retrieval was a major issue in traditional searchable systems. Hence in this paper a new model has been proposed for position based sentence searching based on relevant ranking using bloom filters and hashing algorithms.

IV. Proposed Framework

The proposed framework for PBSS is shown in Fig 1. There entities are involved in complete operations 1) Data Owner, 2) Data User and 3) Cloud Server. For all documents of the data owner indexing is performed. When data owner uploads the document to the server its encrypted index is created and the original document after encryption (asymmetric or symmetric) is uploaded to the cloud. Now the cloud has encrypted indexes of documents and the encrypted documents. During search of sentences two possible scenarios can be used to achieve security and privacy of search sentence. The sentence which data user want to search can be sent directly to cloud after converting to codewords similar to those generated in indexing step. For this case the data owner has to share the codeword generation steps with data user and the secret keys as well. In second case the data users can send the searched sentence to the data owner who will convert them to codewords and will send to cloud server to perform search.

When sentence in form of codewords is sent to the cloud the cloud server check the documents indexes and select those documents which contain the codewords. After the data selection from indexes PBSS algorithm is performed and matches the searched sentences in the selected documents data. On basis of standard deviation (SD) and term frequency (TF) the documents are ranked. The ranked documents are then decrypted and original documents are returned to data user on request.

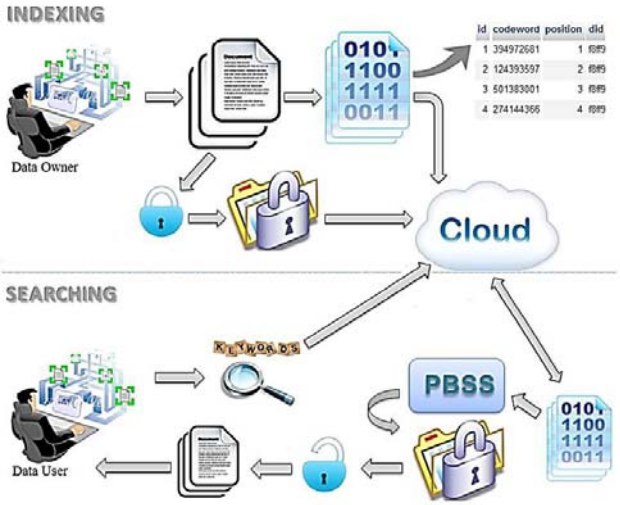

Fig.1. Proposed Framework for PBSS

V. Proposed Technique

Proposed technique for PBSS comprises of two steps: A) Indexing and B) Searching.

A. Indexing

The steps invloved in indexing are described below:

1. Input Document: Distinct keywords are extracted from the document after removing stop words as shown in Table I.

TABLE I. INPUT DOCUMENT

Input	Document
Output	Distinct keywords
Results	Array ([1] => searchable, [2] => encryption)

2. Generate Master Key and Split: Master key is generated from password and split into eight equal distinct keys as shown in Table II.

TABLE II. GENERATE MASTER KEY AND SPLIT

Input	Password
Output	Eight split keys
Results	Array ([0] => e6c83b282aeb2e02, [1] => 2844595721cc00bb [2] => da47cb24537c1779 , [3] => f9bb84f04039e167 [4] => 6e6ba8573e588da1, [5] => 052510e3aa0a32a9 [6] => e55879ae22b0c2d6, [7] => 2136fc0a3e85f8bb)

3. Generate Trapdoor: Concatinate each word of the document with all eight keys and apply hash (e.g. SHA1). Concatinate all eight hashed values by putting coma after each value as shown in Table III.

TABLE III. GENERATE TRAPDOOR

Input	Words, eight splits keys, hash algorithm
Output	Trapdoor
Results	a104f3e24f622acbdb11b1480c21677b19eacf92,544967dc88058fe1 8c3e0ba135a6647216fadf82,958452b98248835b769cf0846dfd0b3 790a943ad,3a08c7f1b1009ff3fe0ebdddd381c243875ef00a,296708c 2666e5e15024031948 85f8648719b4467,5e6f0bb55d70f70d0ae30e 9b6ff1e0e745e0a408,794cc63d32fb86d6e20fd08f563a8756106b3c cf,394a339521ebc2dea91730501860e7ca02bbbe33

4. Generate Codeword: Add all trapdoors to bloom filters which will return five bit position for each trapdoor. Concatination of five bit positions yeilds codewords as shown in Table IV.

TABLE IV. GENERATE CODEWORD

Input	Trapdoor, hash algorithm (crc32)
Output	Codeword
Results	31632262926588645882214 8

5. Find positions: Find postions of the keywords of extracted form the document. Codewords of all keywords will have their position in document as shown in Table V.

TABLE V. FIND POSITIONS

Input	Codeword
Output	Codeword with position
Results	Array ([1] => 31632262926588645882214 8, [1655438882658667901362 63)

6. Uplaod to Cloud: Upload encrypted document index, encrypted document and documents id‘s.

The document index generated form the above steps is shown in as shown in Table VI.

TABLE VI. DOCUMENT INDEX

Codeword	Position	Did	enc_doc_name
31632262 92658864 58822148	1	3586c170e3e426 2f0eb95a0cc24c 5ebb3de14504	hfyGhJXholF3gSTb4g ==
16554388 82658667 90136263	2	3586c170e3e426 2f0eb95a0cc24c 5ebb3de14504	hfyGhJXholF3gSTb4g ==

The graphical representation of indexing step is shown in Fig. 2.

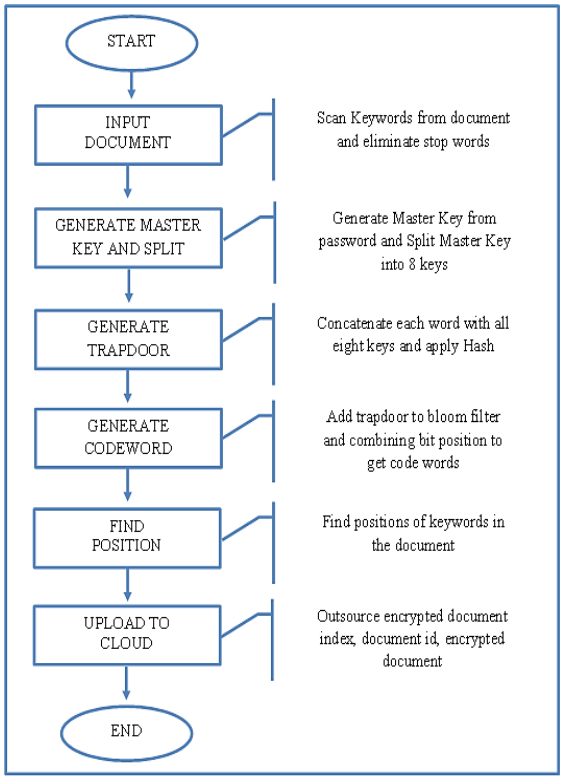

Fig.2. Graphical representation of Indexing

B. Searching

During search process the data user will send sentence to be searched from encrypted index. Stop words will be eliminated from the searched sentence. The extracted keywords will be then matched in the document index. If extracted keywords are present at consecutive positions in the document then it is returned. If extracted keywords are present at different positions then SD of all positions is calculated and TF of the extracted keywords is calculated in the documents. The documents are ranked by given formula:

VI. Conclusion and Future Work

In this paper a technique for position based sentence searching has been proposed. The technique is implemented for encrypted unstructured data place in cloud environment. Encrypted indexes have been created for the distinct keywords extracted from the unstructured data. PBSS provides an efficient sentence search without revealing the documents' content identity. PBSS reduces the overhead of decryption before searches. Documents are decrypted only on retrieval by the data user. If exact sentence is not found and keywords of searched sentence are present in the documents then the spread of keywords is calculated as SD and TF of searched keywords is calculated to rank documents as most relevant. The prepressed index provides efficient and accurate search. The PBSS can be extended for more complex quires, sub match search and other pattern recognition algorithms.

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E-Government Adoption in Developing Countries: The Case of South Africa

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***Abstract*—The rapid proliferation and pervasiveness of information communication technology (ICT) across the world with its huge potential to transform government entities to become efficient, has witnessed huge e-Government (E-Gov) projects being undertaken by the South African government to strategically gear itself for the twenty first century. These ICT initiatives based on the internet and the World Wide Web (WWW) are intended to capacitate the government through digitization to respond well to its immense challenges namely: efficient public service delivery, efficient working, effective communication with its citizens and the business community, improve managerial effectiveness of public offices and promote democratic values and mechanisms. This paper focus on exploring the implementation of e-Gov initiatives taking place in three specific frontiers in South Africa: e-Administrative (G2G – Government-to-Government), e-Citizen (G2C - Government-to-Citizen) and e-Society (G2B – Government-to-Business) and give an analysis of the success and constrains of such endeavours. In this paper we extensively explore contemporary research undertaken in this field and explore the actual e-Government websites for in-depth comprehension of the developments. The study found that South Africa has made tremendous positive achievements in its e-Government endeavours to digitize the delivery of its services and all governance processes occurring at its various governmental levels. However, great concerted effort from all involved parties is required to overcome the considerable challenges being faced. In conclusion, e-Gov process requires a coherent strategy, commencing with an examination of the nation's political will, resources, regulatory environment, and the ability of the population to make use of planned technologies.**

The study provides vital information and recommendations for policy makers for shaping the future of e-Gov in all government entities.

Keywords-e-Government; initiatives; adoption; ict; South Africa.

I. INTRODUCTION

The ICT for Development driving force has taken developing countries by storm, leaving them with great desire to adopt e-Gov in all their entities to realize efficient operations and quality services to its citizens and business world. This is especially so to the South African government, were the digital divide between the rural and urban setups is the norm, rather than exception. Reference [8] stated that government services which have been impressed by rigid bureaucratic and recently by then ICT can be replaced with e-government to be more flexible, and more oriented to user satisfaction. The ICT revolution in the past decade has positively impacted the way the South African government has geared itself to respond to numerous challenges it is facing in-line with fulfilling the objective of providing efficient public services to its citizens and the business world. This has resulted in the adoption of a resounding electronic government strategies aimed at revitalizing services through provision of a twenty-fours-hours-per-day-and-seven-days-per week (24/7 service) access to information. Reference [7] stated that online forms of government are non-discriminatory, faceless and consistent. Furthermore, the author stated that online information would result in the affirmation of previously disadvantaged groups.

Given this background, this paper explores the major e-Gov initiatives implemented by the South African government, their success stories, challenges, and analysis of the achievements in-line with other developing countries in the African Continent and the world at large. The next section of the paper outlines the rationale for and goals of e-Gov in South Africa. This is then followed by detailed outline of the major e-Gov initiatives undertaken by the South African government and an analysis of constrains of the projects. The paper conclude by postulating recommendations for future directions to vertically and horizontally enhance e-Gov services to policy makers in South Africa and other developing countries facing the same digital-divide predicament.

II. RATIONAL AND GOALS FOR E-GOVERNMENT ADOPTION IN SOUTH AFRICA

Government work is very information intensive [2] and effective information flow is crucial for effective management of the government's routine business services to its citizens. Therefore, information constitutes a valuable national asset to the government. According to report by [2] and [3], information "provides the public with knowledge of

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the government, society, and economy – past, present, and future. It is a means to ensure the accountability of government, to manage the government's operations, to maintain the healthy performance of the economy... The free flow of information between the government and the public is essential to a democratic society."

In the context of South Africa, the goals of e-government adoption are to ensure that government activities are transparent; there is accountability, openness in public administration and regulations, and public services to its clients and other stakeholders like Non-Governmental Organization (NGO's). Over and above this, such initiatives should guarantee its democratic society quality and timely service delivery; and quality information. Information quality means putting management systems and controls in place to ensure that information is accurate, relevant, complete, economical, verifiable, accessible, simple, and secure. It is noteworthy that such quality information is captured and managed at minimal costs to ensure maximum use at affordable and sometimes no costs at all to citizens. According to [1], most developing countries in the world pursue almost similar e-Government objectives, varying slightly depending on their political, social and economic priorities and these are to improve access to and delivery of public services and information; to enhance transparency, openness of, and engagement with the administration; to increase productivity of businesses, citizens, and employees; to improve efficiency in the design and delivery of government services; and to contribute to broader government economic and social outcomes.

III. MAJOR E-GOVERNMENT INITIATIVES IN SOUTH AFRICA

The South African government has made tremendous efforts in ensuring that e-Government adoption is gradually implemented in all the three major e-Government types, namely e-Administrative, e-Citizen and e-Society. According to information management principles for open government adoption, a prime factor for adoption is creating awareness among the stakeholders [4]. Outlined below are the prominent implemented e-Gov projects:

A. Batho Pele National Gateway Portal

This project was kick-started by the Department of Public Services and Administration (DPSA) in conjunction with the State Information and Technology Agency (SITA) in 2003/2005. This integrated one-stop-service e-Gov portal offers round-the-clock G2C services to its citizens via its government website: www.gov.za. This website has evolved from the initial emerging presence phase to current transactional phases and consented efforts are at very advanced stage to reach the networked presence phase – the most sophisticated level in the online government initiatives characterised by an integration of G2G, G2C and G2B (and reverse) transactions [5]. The South African Communications and Information Systems is mandated with the task of content updated, language translation of the content to many languages used in South Africa and migrating the portal into the networked presence phase of e-Gov. The portal offers citizen-centric services categorized to, 'Service for People', 'Services for Organizations' and 'Services for Foreign Nationals' [6]. The portal offers the following key e-Gov services to citizens: access to all government departments, government documents, reports and forms; information on various acts, bills, draft bills, visa and passport applications; birth, death and marriage certificates; temporary and permanent residence permits, registering and deregistering as voter; and registering for unemployment insurance funds [6].

B. South African Revenue Services (SARS) e-Filling

E-Filing is one of the successes of e-Gov projects in South Africa initiated by SARS in 2001. The major goal of this G2C and G2B initiative is to facilitate electronic submission of tax returns and payments by taxpayers and tax practitioners, as well as extension use on collection of value added tax (VAT) [6]. Customers can electronically file their tax returns online and thus greatly avoid the traditional "brick and mortar" long-winding queues at the SARS offices. The SARS e-Gov project realized its Return-on-Investment (ROI) in just two months of implementation. The SARS e-Gov system enjoys commendable success due to the following factors [6]:

- Provision of clear step-by-step guidelines on its website on how to file tax applications and returns – offering real-time taxpayer information and online services at lower operational costs.
- Strong government support that enforces zero-tolerance approach to corruption in the SARS electronic operations – thus resulting in the realization of billions of tax revenue.

C. Cape e-Government Strategy

The Cape Online Strategy is a state-of-the-art service-driven and citizen-centric e-Gov brain child of the Western Cape Province of South Africa commissioned in 2003. The main goal of the Cape e-Gov Strategy is to improve the internal efficiency of the Provincial Administration and service delivery to the community. This is supported in [8] stating that e-government allows the public service to be more efficient since the service should not be conducted by face-to-face communication. It offers three key major services:

- Digital delivery – this is intended at offering efficient and effective digital service delivery and updated online information to both individuals and businesses that deals with the government.
- Digital democracy – this is an e-Gov strategy to incorporate great accountability, transparency and legitimacy in the operations of the local government. In the local context of Cape e-Gov, it entails posting of government tenders, reports and crucial biddings over the internet.

- Digital development – this is an endeavor to promote public access of the e-Gov, progress citizen ICT skills and advance regional ICT.

Accessed through www.westerncape.gov.za", the portal is amongst the widely accessed e-citizen online service in South Africa.

D. Other Major Notable e-Government Projects

E-Justice System and e-National Traffic Information System (e-Natis) are the other noticeable e-Gov initiatives undertaken by the South African government. The e-Justice System seeks to transform the justice administration system from a manual to an automated system [7]. This will be made possible by the use of video conferencing over Multiprotocol Label Switching (MPLS) Virtual Private Network leveraging Telkom's existing platforms to linkup remand prisons to courts across the country [15]. This e-Gov initiative would greatly reduce current backlogs in the justice system, drastically cut huge cost of moving prisoners between remand-cells and courts, curtail incidents of escaping prisoners in-transit to court, shortage of human capacity in the justice system and issues to do with overcrowding of prisoners [7].

The e-Natis uses a state-of-the-art technology in providing essential e-services related to the South African Department of Transport. It is meant to handle services related to road-traffic law enforcement, specialized transactions like payment for the services over the internet and on automated teller machines, online car registration of cars by financial institutions, issuing and handling driving licenses and online real-time booking for learners' licenses.

National e-Health Informatics is provided by the National Department of Health through the Provincial Departments of Health and Private actors. This is an initiative intended to bridge the digital divide by the rural poor and underprivileged community with its urban counterparts. The District Health Information Systems (DHIS) and e-TB Register are the two major successful e-Gov initiatives in South Africa thriving on the established Telkom and established mobile networks. These systems are used by health practitioners deep in the rural areas to collect health-related patient data and sent it for further processing in well-equipped major laboratories in major hospitals and feedback is relayed back immediately. Mindset [14] e-Health Network is another e-Gov informational initiative, aimed at offering digital health educational content in video, computer-based multimedia and print formats in five of the eleven official languages [13] through direct broadcasting in televisions in all major hospitals and clinics outpatient waiting rooms across South Africa. The Mindset is intended to bring health-care awareness to patients and how they can take prevent and protect certain disease and seek medical attention.

IV. ANALYSIS OF THE SUCCESS AND CONSTRAINTS OF E-GOV INITIATIVES

A close analysis of the national and provincial e-Gov initiatives revealed that all of them accept the SARS e-Filling and Botho Pele National Gateway systems are in the formative development stage – purely informational with no room for transacting online with the government. This is a great stride in all urbanized provinces with good literacy rate, which can benefit from the online available information regarding key government services and posted job advertisements. The SARS e-Filing is a typical e-Gov success story which has reached the transactional stage – offering comprehensive real-time financial transactions and services online to citizens and businesses. Other achievements have been realized in the area of ICT and mobile internet accessibility.

The Botho Pele National Gateway e-Gov system is another notable success offering online transactions on visa and passport applications; birth, death and marriage certificates; temporary and permanent residence permits, registering and deregistering as voter; and registering for unemployment insurance funds [6].

South Africa's Information Technology market is the largest in Africa, ranking 20th in the world in overall market size and 8th in IT spending as a proportion of GDP [9]. This is supported by the United Nations e-Government survey carried out in 2012 as indicated in Fig. 1. Overall, South Africa ranks 3 out of 54 countries in Africa and 101 out of 190 across the globe [10] in terms of e-government adoption. This is a resounding achievement.

Internet accessibility and use is the backborn for the thriving of e-Gov. Studies carried out in Table 1[11] showes that South Africa have the highest Internet penetration rate among all the countries under investigation, with 33.7% of the population 15 years or older using the Internet. Internet is accessed through a mobile phone by 70% of internet users [11]. This means even those in the disadvantaged rural remote areas of South Africa can access required e-Gov information without necessarily having to travel very long distances to urban areas – thus tremendously cutting travelling costs.

Despite South Africa's significant investment in ICT infrastructure, policy and regulatory framework to effectively roll out e-government services, the country faces a number of challenges [7]. The first major one is adequate awareness, especially in deep rural areas. As stated in [12], "a long history of government service shows that citizens and business organizations are traditionally habituated to use brick and mortar government services for information collection, interaction, and all types of transactions that are basically operated offline." Thus, e-Gov initiatives call for greater awareness by the government amongst all stakeholders.

Further compounding the e-Gov initiatives is the fact that an estimated 45 percent of South Africa's population lives in

rural areas with far less developed ICT Infrastructure, high rural-urban digital divide, high rural-internet and computer illiteracy due to use of many local vernacular languages in all provinces and very long travelling distances to service centers with such internet service facilities. E-Gov initiatives require competent in-house champions to spear-head planning, development, implementation and maintaining. Nevertheless, the South African government has immense challenges in recruiting and retaining competent ICT specialists to administer e-Gov projects mainly due to massive brain drain of skilled personnel to developed countries or to the better paying jobs in the private sector. Aggravating this shortage is the failure by the higher education system to produce adequate graduates with the necessary ICT and managerial skills demanded by the government. Another intriguing factor is the gender imbalance gap in e-Gov workers, with the weight scale biased towards more males than females – government should encourage many females to take-up ICT jobs as a profession.

With specific reference to e-Health endeavours in South Africa, [1] cited that there are "major challenges: broadband penetration is low, bandwidth is expensive, many health-workers are computer illiterate, there is not a culture of data acquisition and analysis, and there are too few informaticians and medical practitioners with e-health experience, insufficient people across all levels are being trained in the field, current plans do not appear to incorporate the private sector, and there is the danger that a top down approach to implementation will be taken." Nevertheless, there seems to be a light at the end of the tunnel, with the proposed e-Healthy Policy starting to be implemented and take effect, though limited human capacity and required specialized skills in the national health-care sector may be an impeding factor.

V. CONCLUSION

In conclusion, the study found out that the South Africa government has made huge endeavours in its e-Gov adoption. With the exception of the SARS e-Filing and Botho Pele National Gateway systems in their transactions phases, all of South Africa's e-Gov initiatives are in its presence stage - purely online information dissemination. Most of the e-Gov initiatives have been slow in achieving their full potential due to several drawbacks typical to all developing countries, chief amongst them are failure to create adequate awareness on e-Gov initiatives amongst all stakeholders, lack of computer self-efficiency and experience of internet usage by the majority of rural and peri-urban disadvantaged citizens, poor infrastructures, corruption, fragile education system that fail to produce adequate competent graduates to meet employers' expectations, a huge gap between e-services and demand, and failure to allocate adequate financial resources to champion e-Gov projects due to other more pressing issues. Despite all these challenges, it is commendable to realize that South Africa tops all countries in the African continent in its e-Gov endeavours. Furthermore, there is a huge political-will and substantial support and co-operation from the private sector and international donor argents.

VI. RECOMMENDATIONS

After gaining a profound insight from this study on E-Gov adoption in South Africa, the study recommend among other things to the government and any other policy makers and implementers, the following:

- To have in place an integrated impact evaluation and monitoring mechanism for all existing ICT Policies and implemented e-Gov endeavours, if possible at local government level – with the aim to have a clear picture of the impact of such initiatives on service delivery and customer satisfaction.
- The government should revamp the education system so that it will be aligned with the national ICT demands and make attractive working environment and packages to attract and retain scarce ICT skill, especially within the government institutions.
- Successful leaping-forward of e-Gov initiatives in South Africa from their current presence-phase to interaction, transactions or integration requires consented efforts and effectives synergies among the public and private sectors and the international partners like UN, World Bank and ITU.
- In addition to focusing on the technical aspects and infrastructure successes, the government must lay down clear policies on consumer protection and privacy, and cyber-attacks.

Once adequately addressed, the government will realize that the e-Gov initiatives could be a catalyst for the nation's inclusive development, poverty eradication and establishment of a democratic society.

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TABLE 1. INDIVIDUAL INTERNET USE [11]

	15+ that use the Internet			Where the Internet was first used		Where did you use the Internet in the last 12 months?				
	2007/8	2011/12	Diff.	Computer	Mobile phone	Mobile phone	Work	Place of education	Another persons home	Internet Cafe
South Africa	15,0%	33,7%	18,7%	65,1%	34,9%	**70,6%**	35,8%	20,9%	14,3%	32,4%
Botswana	5,8%	29,0%	23,2%	70,6%	29,4%	**64,1%**	51,1%	32,2%	43,7%	58,3%
Kenya	15,0%	26,3%	11,3%	68,9%	31,1%	**77,8%**	31,4%	38,8%	38,9%	**72,4%**
Nigeria		18,4%		45,2%	**54,8%**	**74,9%**	29,3%	19,6%	30,3%	45,1%
Namibia	8,8%	16,2%	7,4%	50,1%	**49,9%**	**87,3%**	48,4%	36,0%	32,6%	22,5%
Cameroon	13,0%	14,1%	1,1%	82,1%	17,9%	29,7%	9,8%	20,1%	18,7%	**80,0%**
Ghana	5,6%	12,7%	7,1%	70,5%	29,5%	61,2%	34,6%	50,9%	34,5%	**84,7%**
Uganda	2,4%	7,9%	5,5%	28,2%	**71,8%**	**81,3%**	55,0%	51,2%	54,0%	**74,0%**
Rwanda	2,0%	6,0%	4%	70,8%	29,2%	**70,9%**	52,1%	30,7%	24,9%	50,2%
Tanzania	2,2%	3,5%	1,3%	45,8%	**54,2%**	**74,7%**	44,6%	24,4%	23,9%	62,8%
Ethiopia	0,7%	2,7%	2%	33,3%	**66,7%**	**80,9%**	17,4%	20,9%	3,5%	42,2%

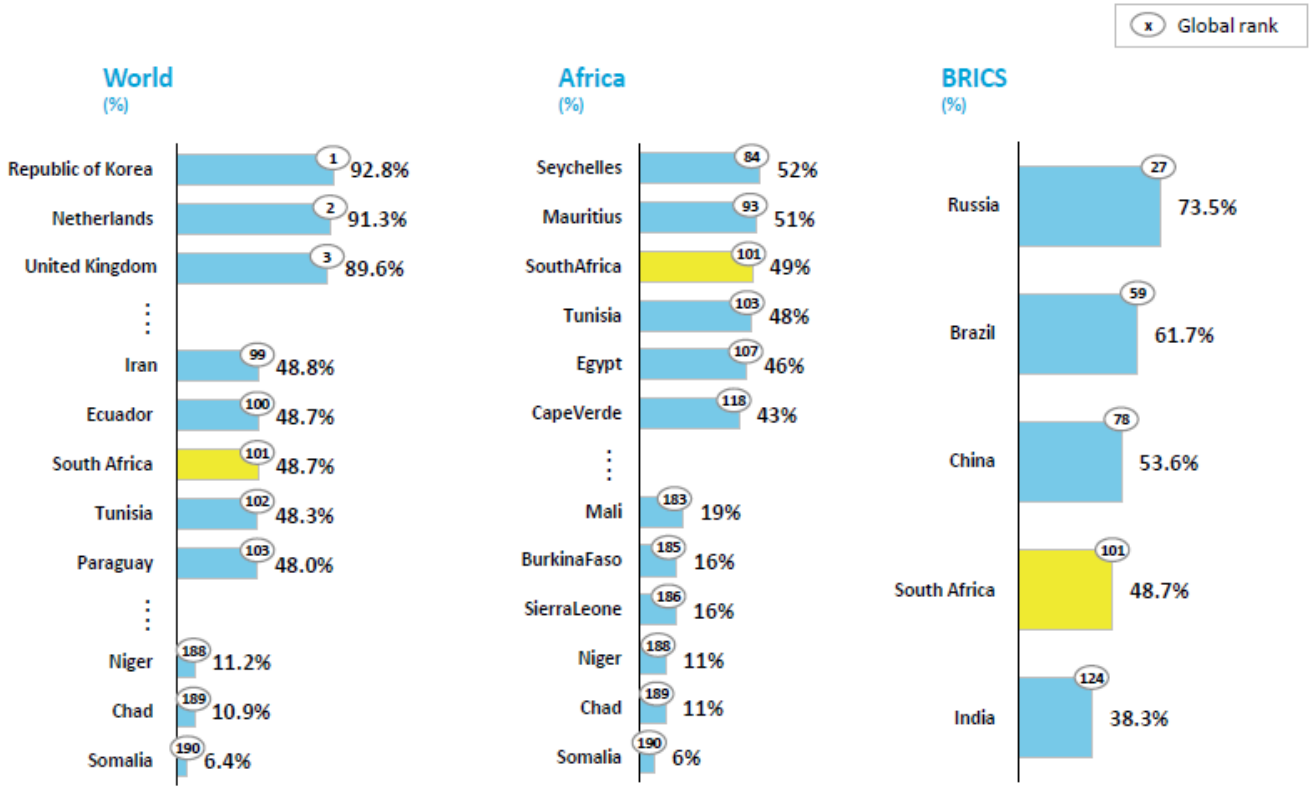

Figure 1. United Nations e-Government survey [10], [15]