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A Study on Challenges and Benefits of Cloud Based E-Government

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Abstract – The use of Information and Communication Technology (ICT) has good impact on performance of businesses. Keeping a successful implementation of e-business in mind, governments decided to use ICT in public affairs in order to improve the performance of public sector organizations in the form of providing best possible information and services to citizens, businesses and other governments. With the passage of time computing technologies have made advancement and governments around the world were thinking to make good use of advanced computing technologies in government organizations. Today most of the countries are facing financial crises and as a result they are cutting extra spending and as a result governments are shrinking ICT budget. E-government is a huge project which requires good amount of money from the government. Some of the new inventions in computing technologies made it possible to reduce costs and increase efficiency and flexibility according to the needs of government sectors. One of the new inventions is cloud computing where information and computing services are provided as utilities. The use of cloud based e-government is to help the governments in providing best possible services to the citizens and businesses, and to reduce the costs as in cloud based e-government they will not require to purchase and install the ICT equipments on their own premises. In this paper we analyzed cloud computing and its applications in the context of e-government.

Keywords: Challenges, Benefits, Cloud, E-Government, ICT, E-Business, Public, Information, Services, Computing Technologies, etc.

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INTRODUCTION

E-Governance is rapidly finding favor with government across the world. Keeping up with the external pace of e-Governance adoption, India has not been late to roll out National e-Governance Plan (NeGP) (Karunanithi and Kiruthika, 2011).

In the past few decades, e-government has been considered “a powerful enabling tool” (Kumar, 2011) that has aided governments in utilizing information and communication technologies (ICTs) in achieving administrative reform goals to save operational costs for themselves and the transaction cost for citizens and businesses.

We also know that India is a vast country in terms of area and population, government can hope to reach the higher number of population with internet enabled services. E-Governance has been proven itself as an important tool for transformation of information. Large number of projects has been undertaken in India in last decade. E-government service development is contributing positively to the fight against corruption, administration reform and improving business environment competitiveness.

Enabling e-Governance is also necessary because it enable the government and the people of the country to become more usable towards the new technology. This implementation bridge the gap between developed and developing countries. Therefore, e-government is no longer just an option but a necessity for countries aiming for better governance (Computer & Communications Industry Association, 2011).

We are hereby proposed the model of e-Governance based on cloud computing. Cloud computing has the capabilities to offer solution for e-Governance. Cloud computing provides service oriented architecture without and security compromises. It provides excellent environment to host e-Governance services. Currently (when this study begins) there are quite a few approaches (that do have very limited scope) or initiative that provide the details for

implementing cloud in e-Governance in country like India.

REVIEW OF LITERATURE:

We are proposing cloud based e-Governance model through this research work. Our work will definitely provide a framework for implementing e-Governance services through cloud computing.

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, provisioned and released with minimal management effort or service provider interaction" (Department of Finance and Deregulations, Australian Government, 2011).

In this research we analyze various aspects of cloud computing and its use in e-Governance. We also identify the advantages and disadvantages of cloud based architecture.

Cloud computing offers three delivery models SaaS, PaaS & IaaS and four deployment models i.e. public cloud, private cloud, hybrid cloud and community cloud (Department of Finance and Deregulations, Australian Government, 2011).

In this research work we proposed the model for all these delivery models with e-governance integration. We also study the pros and cons of all these delivery and deployment models and then propose the models for all channels.

Various e-Governance service delivery channels like G2C, G2B, and G2G are also studied and their implementation through cloud computing is suggested in the research. Limitation of e-Governance and their cloud solutions has been studied and discussed in the study.

Indian Government is come up with NeGP (National e-Governance plan) for successful implementation of e-Governance. This NeGP plan comprises of various entities like SDC (State Data Centres), CSC (Common Service Centre), SWAN (State Wide area Network), NSDG (National e-Governance Service Delivery Gateway) etc. We also study in detail the above mentioned framework and also integrate it with our cloud based framework. This framework provides the necessary infrastructure needed for the cloud computing framework.

Security is the main concern of any government services. Huge number of users, their trusts etc are also some of the concern seen in e-Governance service delivery models. Cloud came up with the advantage over this difficulties/concern. Our main focus in this research is to analyze the issues in e-Governance and their cloud counterpart's advantages.

This thesis also studies the various projects being carried out in India under ICT. A brief introduction of all projects run by Indian Government have been studied and provided in the thesis. We will also propose the services, projects or applications of e-Governance supported at Cloud platform.

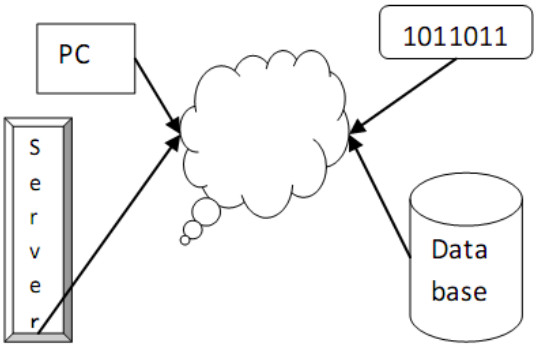

Figure 1: Model of cloud computing applications

Cloud computing is a relatively a new technology which is the outcome of research in virtualization, utility computing, elasticity, distributed computing, grid computing, storage, content outsourcing, security and web 2.0 (US Committee on Science, Technology and Space, 2012). IEEE Computer Society defines Cloud Computing as: "A Paradigm in which information is permanently stored in servers on the Internet and cached temporarily on clients that include desktops, entertainment centers, table computers, notebooks, wall computers, handhelds etc." (EU Directorate General for Public Policies, 2012). The United States National Institute of Standards and Technology (NIST) described some other important aspects of cloud computing - "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of services (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Alshomrani, 2012)." This cloud model promotes availability and consists of five essential characteristics, three delivery models and four deployment models.

Five characteristics of cloud computing are:

On-demand self-service: Consumers can use the cloud service i.e., computing capabilities, network storage and application 24/7 without any human interaction with cloud service provider.

Broad network access: Cloud computing capabilities are available on Internet which can be accessed through standard mechanism by both thick and thin clients (laptops, mobile phones, PDAs etc).

Resource pooling: Physical and virtual resources are assigned and re-assigned to the consumers according to their demand using multi-tenant model.

Rapid elasticity: Cloud computing has the ability to scale resources both up and down as needed. The cloud appears to be infinite to the consumers, and the consumer can purchase as much or as little computing power according to their need.

Measured service: Measured services are one of the essential characteristics of the cloud computing where services and resources usage is constantly monitored, controlled and reported for fair pay-as-you-go model implementation.

The three cloud delivery models are:

Cloud Software as a Service (SaaS): Cloud consumers use software applications, but do not control the operating system, hardware or network infrastructure on which they are running.

Cloud Platform as a Service (PaaS): Cloud consumers use the platform upon which applications can be developed and executed.

Cloud Infrastructure as a Service (IaaS): Cloud consumers use basic computing resources such as processing power, storage, networking components or middleware on demand.

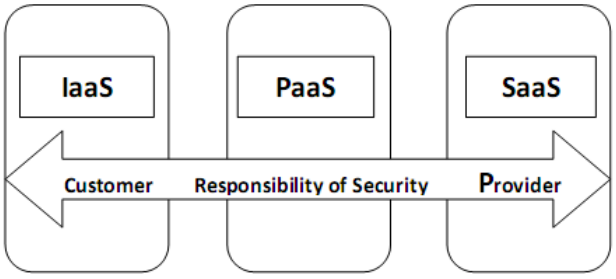

Figure 2: Cloud Architecture

Cloud computing has several potential benefits. By sharing ICT capabilities in the cloud**;** individuals, businesses and government agencies are able to leverage their resources more efficiently and effectively (Tripathi and Parihar, 2011). Individuals use cloud computing for email, content and information sharing; file storage and payment services etc. Businesses use cloud computing for basic office tools, project management, collaboration and design of custom applications. The government agencies use the cloud computing largely in same way as businesses, in addition to improve the quality of public services they provide to citizens through e-government solutions. Cloud computing offers several benefits over today's famous computing model in which organization purchases all the computer equipments and software and then operates them by itself (Tripathi and Parihar, 2011). One of the key benefits of cloud computing is usage based model, in which user would pay only for the resources they used. Also the individuals, businesses and governments would not install and configure the expensive machines and applications at their own premises which results into reduced capital expenses. Another key benefit of cloud computing is scalability- for example cloud based storage services can easily manage very huge amount of data which is difficult to manage in the traditional databases. The Cloud computing also offers flexibility and freedom, which means the customers can easily change the service providers without any hassles and will enjoy more up to date solutions.

E-GOVERNMENT AND ITS BENEFITS:

Electronic government or simply E-government means the use of ICT in order to provide public services by the government to citizens, businesses and other governments. The ultimate goal of the e-government is to improve public organization performance and provide best possible services to its stakeholders i.e., citizens, businesses and other governments. Efficiency and effectiveness of the public organizations are two main objectives of the e-government. The concept of e-government was first introduced in 1990s when public organizations were under pressure to use modern information and communication technologies in order achieve the two objectives i.e. efficiency and effectiveness. Today almost every county in the world is making good use of modern computing technologies in order to provide governmental services to its citizens and businesses, and also to interact with other governments. Like any other technology, e-government should also be innovative. Innovative in a sense that e-government should make good use of the latest ICTs, which ultimately increase the efficiency and effectiveness of the public sector. With the advances in ICT, it is possible to develop an effective and efficient e-government system. The traditional e-government model is also effective however its effectiveness can be further increased with the use of new innovative computing technologies like cloud computing.

LOUD COMPUTING BENEFITS FOR E-GOVERNMENT:

E-government service platform based on cloud computing takes advantages of cloud computing environment providing the following benefits to citizens and government.

A. ***Availability and Accessibility:*** Citizens are playing a vital role in the success of e-government projects. Citizens want the governmental information and services to be available 24/7 to them. In cloud computing applications and information are hosted online therefore it has high availability and citizens can use them at any time and from anywhere. One of the main aims of the

government in providing the governmental services online is that citizens and businesses can access these services around the clock. That's why the e-government system should be accessible at any time and from anywhere. Cloud computing is on the Internet therefore it is always available and consumers can access the e-services 24/7 with just one PC and Internet connectivity.

B. ***Cost Saving:*** In cloud based e-government system, public organizations do not need to purchase and install the ICT equipments and software on their own premises, which normally they do in traditional e-government system. The public sector organizations use applications provided to them by the cloud service providers which eliminates the upfront capital expenditure. The cost of ICT services for public organizations and individuals also reduces in cloud based e-government systems because they lease ICT resources and services according to their needs instead of investing in these resources. The cloud computing 'pay-as-you-go' approach also reduces the operation costs for the public sector organizations.

C. ***Flexibility:*** Different cloud deployment models ensure that the cloud based e-government implementations can be aligned closely with business needs and ICT strategies of the organizations. Public sector organizations can easily choose hybrid cloud computing model and get benefits from both private and public cloud models.

D. ***Efficiency:*** Providing public services efficiently and effectively to citizens and businesses is one of the main benefits of e-government. The use of cloud based e-government system makes the task easier for the government in order to improve e-services delivery. Also in such a system it is also possible to create new solutions which are not technically and economically feasible without the use of cloud services.

CHALLENGES IN CLOUD COMPUTING AND E-GOVERNMENT:

When third parties are storing and processing sensitive data, it is obvious that concerns related to trust would be there in the mind of e-government's stakeholders. Trust is an act of firm belief in truth, reliability, faith, confidence, or strength of someone or something. It is a belief in the capabilities and skills of others that you think you can reasonably rely on them to care for your valuable assets**.** Trust is playing an important role in the success of e-government system. It is important for the success of e-government that people should have trust in the e-government system.

Some of the challenges in cloud computing which can directly effecting e-government are discussed below:

A. ***Privacy:*** In Cloud Computing data and information is not stored and processed locally at the enterprise premises. In fact third parties are responsible for storing and processing of data at their own sites. In a situation like that individuals are concerned about the privacy of their personal data and information. When third parties are processing important data stored at remote machines at various locations it is obvious people would be worried about the privacy of their personal data because it is a human right to secure their private and sensitive information.

B. ***Lack of user control:*** The lack of user control and ownership are important issues in trust. When we have less control over our assets then we trust the system less. In cloud based e-government system data will be stored at third party data centers where we have less control over data and the cloud computing providers have complete access to sensitive data. In a situation like this the protection of intellectual property and personal information is very important.

C. ***System Failure:*** Service failure is also affecting the trust of the users in cloud computing. There are some public services which should be available to citizens 24/7 but these services are unavailable to the citizens at some times. Also the loss of data or security breach of data cannot be compensated by the cloud service providers as the data is irreplaceable.

D. ***Security:*** Cloud computing security concerns the "confidentiality, availability and integrity of data or information". Security plays an important role in establishing the trust of the users in cloud computing. If we look into cloud computing in context of e-government it is important that e-government based on cloud computing should be secure.

E. ***On Demand Self Service:*** On demand self-service is one of the important characteristics of cloud computing. This characteristic is achieved through virtual environment or management interface which is accessible to all cloud service users. It is the responsibility of the cloud service provider to keep the management interface secure from the unauthorized access because the management functionality should be accessible by few authorized administrators. Access authorization is required in order to give access to authentic users through claim base access control,

federated identity approaches and security assertion mark-up language.

F. ***Data Leakage*** Data leakage also affects the trust of citizens and public sector organization in cloud based e-government system. E-government system contains sensitive data and information about users and businesses therefore security of the sensitive data is important. Data leakage can be also the main source of discouragement for the government to use cloud based e-government system.

CONCLUSION:

The performance of cloud based e-government systems is better than the traditional e-government systems. The cloud based e-government provides several benefits over the traditional e-government. Since information and applications are hosted online in cloud computing that is why they are available and accessible from anywhere and at any time. In the light of current economic situation where governments around the world are under pressure to cut extra spending and they are shrinking the ICT budget as well. In this situation cloud based e-government is a good option in which governments do not need to purchase ICT equipment. In fact they lease ICT resources and services according to their need instead of investing huge amount of money in buying equipment. In short, capital costs are replaced by operational costs for the resources used by government organizations. Trust and security are also playing an important role in the success of e-government. One of the important stakeholders of the e-government is the citizens therefore they should have trust in e-government systems. In cloud computing data is stored and processed at third party premises therefore citizens and businesses are concerned about the confidentiality and security of their sensitive data and information. Similarly data leakage can also affect the trust of citizens and businesses because in some cases the data loss can be irreplaceable. But still the cloud based e-government system is providing more benefits in the form of efficiency, scalability, flexibility and cost effectiveness as compared to traditional e-government system.

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