Impact of Cloud Computing in Implementing Cost Effective E-governance Operations

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Abstract

Today the government of every state in India is maneuvering and implementing its operations through the CAPS "Computer Aided Paperless System" i.e. incorporating its operations through realistic and cost effective IT model so that the schemes can be reached to the masses. As of now every state government has its own E-Governance model, and with the deployment of multi-perspective features of Cloud computing, E-Governance operations can be built up as Cost effective Technology solutions and can be geographically distributed to heterogeneous resources thereby making it as information and platform centric with enhanced quality of service. This paper is focused on the impact of cloud computing on the E-Governance operations.

Index Terms— Cloud computing, E-governance, Operations.

INTRODUCTION

Government forms the backbone of a community. Public welfare is the key agenda of any sane government, be it socialist, capitalist or otherwise. It has to ensure that the services and benefits reach to the needy. However this sounds simple, but in practically it is not. The state needs to run its affairs in a transparent and efficient way to reach and be reachable to its citizens. E-Governance has the ability to lend the required efficiency and transparency. The right blend of political will and technology is what it takes to make E-Governance a success.

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E-Governance rides on advances of information and communication technologies like the internet, local area networks and mobiles to improve effectiveness, efficiency and service delivery thereby promising speedy information dissemination, higher administrative efficiency and improved public services. As the era of digital economy evolves, the need for good governance assumes a greater significance. E-Governance has been around for more than a decade now. E-Governance is the effective use of Information and Communication Technology to improve the system of governance that in place and thus provide better services to the citizens. E-Governance is concerned with transforming Government from 'Procedure and Power Centered' to 'Citizen and Service Centered' using technology as a tool. According to OECE, the term E-Government focuses on the use of new ICTs by government as applied to the full range of government functions (OECD, nd). E-Governance is a process of reform in the way and delivers services to external and internal clients for the benefit of both government and the clients that they serve. Governments have innumerable applications that can be automated. Government spending on IT would increase the productivity of the government and would help in decision making and policy enforcement etc. Applications in the government fall into the broad categories like Government to Government (G2G), Government to Enterprise (G2E), Government to Business (G2B), and Government to Consumers (G2C). A technology that has the potential to offer solutions for E-Governance is cloud computing. Cloud computing provides service oriented access to users without compromising on security. This makes cloud an excellent platform to host E-Governance services.

WHAT IS CLOUD COMPUTING

What is cloud computing? Everyone in the technology world is talking about it… and a lot of people in the world are asking the same question, "What is cloud computing, and what does it mean?" Cloud computing platforms are growing in popularity, but why? What unique advantages does a cloud computing architecture offer in today's economic climate? And what just what is cloud computing, anyway?

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, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction[2].

In other worlds Cloud computing provides computation, software, data access, and storage services that do not require end-user knowledge of the physical location and configuration of the system that delivers the services. Parallels to this concept can be drawn with the electricity grid, wherein end-users consume power without needing to understand the component devices or infrastructure required to provide the service. Cloud computing describes a new supplement, consumption, and delivery model for IT services based on Internet protocols, and it typically involves provisioning of dynamically scalable and often virtualized resources.

Cloud computing as it implements Virtualization and Distributed computing model, it offers us variety of services, and some of these include:

- Pay per as you go.
- Service on demand.
- Shared resources.
- Enhanced security.
- Centralized Monitoring and Control

Apart from the services that government has to render, Information management is one of the intensive factors in its operations. The integration of all e-solutions under the head of E-Governance services, can be made centralized as information centric, centralized control and with its interjection with the Cloud computing can impact extensively in deploying the E-Governance operations and integrating custom applications faster, timely, and cost effectively thereby its Monitoring and Evaluation can be reviewed and analyzed for any decision making. The information can be available on e-Mode and will be content centric.

The Government’s current e-Governance practices can be enhanced by an effective deployment of Cloud Computing environment that can be characterized by high asset utilization, a continuum demand for resources, universal systems, and platforms, environments which are easier to manage, and on-time procurement may lead less time. These efficiencies positively impact any Government’s ability to serve the public and masses.

India's UIDAI project, i.e. Unique Identification Authority of India will not sit on e-Governance Cloud platform. According to Unique Identification Authority of India (UIDAI), the UID application will be architected for the cloud and will sit on an "e-Governance cloud platform," that will be assembled using open architecture and components.

Providing UID application overview and requirements, the authority observes that cloud computing is fast emerging as the next generation computing paradigm to build and deploy Internet applications targeting large sets of geographically dispersed users (Deccan Herald).

India's National Informatics Centre (NIC), a division of the department of information technology, has selected and deployed the open source eucalyptus software as the foundation for its cloud project, which calls for the execution of cloud-based e-governance projects on a broad scale. Nic is providing the network backbone and a wide range of ICT (information and communication technologies) services to government organizations throughout India, including a nationwide communication network for decentralized planning, improvement in government services and wider transparency of national and local government institutions.

Examples of Government Embracing/Investing in Cloud	
European Commission	Cloud computing facilitates public procurement among different member states' administrations and enables small & medium enterprises to gain access to public services
Japan	A nation-wide "Kasumigaseki Cloud" is being developed to enable various Ministries to collaborate. At the local level, the "Jichitai Cloud" is being built to provide interoperability among local governments
Singapore	Cloud Computing is viewed as a major source of economic development

Source: Cross-government call on cloud computing, The World Economic Forum, December 2009 Workshop.

Advantages of Cloud Computing:

The advantages of the cloud computing approach include:

Flexibility: Cloud computing offers flexibility and independence from resources. Any staff can access the files and data that they need even when they're working remotely and/or outside office hours. Documents can be concurrently be viewed and abridged from various locations.

Lower Total Cost of Ownership: The need to pay for extensive disk space is also removed. With cloud computing, one can subscribe to the software, rather than buying it outright. This means that pay only when in need and offers flexibility in the sense that it can be quickly and easily scaled up and down according to demand.

Pay as You Go Model: The end user canister unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interface with each service's provider.

Extensive network admittance: Capabilities are obtainable over the network and can be accessed all over standard mechanisms that endorse use by client platforms (e.g., mobile phones, laptops, and PDAs

Pooled resourcing: The provider's computing possessions are pooled to serve multiple clients using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. A sense of location independence exists because the customer generally has no control over or knowledge of the provided resources' exact location but may be able to specify location at a higher level of abstraction.(e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

Time effective integration of applications: The applications which are providing the services across various locations can be integrated at one platform and thereby that will enhance viable monitoring of the processes and would impact more on overhead of resources management and infrastructure management.

Robust Security: The robustness any in platform is the key feature of any security packs implemented on the application. Not only the licensing concerns are easy manageable and all web threats can be easily accounted for in deployment of cloud model.

Impact of Cloud Computing on E-Governance

The impact of cloud computing on E-Governance will ensure us:

Performance and Scalability: The architecture and technology adopted for the E-Governance initiatives should be scalable and universal across delivery channels. As scalability is inbuilt in cloud architectures, the e-governance portals can become the largest beneficiaries of Information and Communication Technology.

Data Scaling: As cloud deployment offers unprecedented level of scaling without effecting the performance, the databases can be scalable, to deal with large data over the years for E-Governance applications. Cloud databases must be considered if the foremost concern is on-demand, high-end scalability; i.e. large scale, distributed scalability, the kind that can't be achieved simply by scaling up.

Auditing and logging: Traceability to any changes to information content in E-Governance services is required. Process audits, security audits must be done periodically to ensure the security of the system. Corruption in government organizations can be controlled by using Information Technology services, by keeping the providers of the services accountable. Cloud can help in analyzing huge volumes of data and detecting any fraud. It can help in building and placing defense mechanisms to enhance the security, thereby making the applications reliable and available.

Progressing out innovative Instances, Replication and Exodus: Traditionally, applications in E-Governance work for department states and municipalities and hence take more time, effort, resources and budget. Capabilities must exist to replicate these to include another municipality or e-court as part of E-Governance. Cloud architectures offer excellent features to create an instance of application for rolling out a new municipality. Cloud can reduce the time to deploy new application instances.

Disaster Recovery: Natural disasters like floods, earthquakes, wars and internal disturbances could cause the E-Governance applications not only loose data, but also make services unavailable. Multiple installations in geographically separated locations with complete backup and recovery solutions must exist could create huge problems. Applications and data must be redundant and should be available on a short notice to switch from one data center to center. Cloud virtualization technologies allow backups and restoring. It offers application migration seamlessly compared to traditional data center. Cloud helps to increase the number of resources dynamically to maintain quality of service intact even at the times of high load, which generally happens in E-Governance (IIIT, nd).

Instinct Reporting and Astuteness: Data center usage (CPU, storage, network etc), peak loads, consumption levels, power usage along with time are some of the factors that needs to be monitored and reported for better utilization of resources. Cloud offers better Business Intelligence infrastructure compared to traditional ones because of its sheer size and capabilities. Applications can mine huge volumes of real time and historic data to make better decisions to offer better services.

Policy management: E-Governance applications have to stick on and implement policies of the governments in terms of dealing with citizens. Along with the infrastructure and data center policies has to be enforced for day to day operations. Cloud architectures help a great deal in implementing policies in data center. Policies with respect to security, application deployment etc can be formalized and enforced in the data center.

Systems Incorporation and Legacy Software: Not only the applications that are already deployed and providing services are to be moved to the cloud, but also integrate with applications deployed in the cloud. As Cloud is built on SOA principles and can offer excellent solutions for integration of various applications. Also, applications can be seamlessly easily moved into cloud.

Archaic Technologies and Migration to New-fangled Technologies: Technology migration is the biggest challenge. With cloud, E-Governance applications can manage the policies well by providing security and adoptability. Cloud architecture efficiently enables different versions and releases of the software at the same time. Once these applications are tested, they can be migrated into production with ease.

e-Green Governance: Nowadays more prominence is laid in requisites of data centers that can create. The power consumption, air electronic waste could create bio-hazard. This could be one of the reasons for stirring to governance. Instead of replicating these facilities, with deployment of cloud, one can offer centralized infrastructure resource management that can be resourcefully worn to curtail pollution.

CHALLENGES IN E-GOVERNANCE OPERATIONS

The prime challenges in E-Governance operations are the following:

- **On time effective delivery of services**: To cater to the need of rising demands of society and legislative entities, on time with 0% tolerance is required for effective delivery of services.
- **Ensuring compliance:** Ensuring conformity within the within the system with all the grievances of the citizens.
- **Flexibility, Scalability & Robustness:** E-Governance should offer flexibility and easiness to scale up the applications as and when required.
- **Integrated services**: E-governance should act as collaborative and one stop hub for its citizens.
- **Document repository management**: Centralized repository and availability that enables the documents accessibility from anywhere any time and across multiple locations.
- **Time and controlled cost effective solutions:** E-governance needs to offer its applications to be operated from centralized location and domain specific area and centralized infrastructure enables less demand of resources and hence making it as Cost and time effective solutions.
- **Monitoring and Evaluation:** All e-Governance initiatives involve timely monitoring and evaluation for its smooth functioning along with Cost Benefit Analysis.
- **Management Information System:** MIS enables all the features relating to Inventory control and management, Invoice processing etc. to be centrally managed and visualized from any hierarchy or level in the government.

- **Statement of expenditures:** Justification of statement of expenditures and the finance spent on e-Governance activities by the government can be efficiently audited at central level rather than at different locations.
- **Security:** The issue concerns security of E-Governance data and infrastructure and the services that demands the privacy of data for the citizens.

BENEFITS OF CLOUD COMPUTING FOR E-GOVERNANCE

The domain where the E-Governance cloud computing services would be beneficial are:

- **UIDAI (**Unique Identification Authority of India): It is as integrated centralized project initiated by Government of India to have all the details of the citizens of the country in one repository.
- **Centralized Auditing:** Since cloud offers its application to be centrally operated, the Auditing of the proofs and expenditure could be done with less cost and more effectiveness.
- **Management Information System:** It offers integrated decision making platform for any Electronic Procurement, Invoice Processing and Stock.
- **Deployment of Citizen Services:** Deployment of citizen's services can be implemented by adoption of cloud computing in less time and more effectively.
- **Agriculture:** Farmers forms the strength of any country. Agriculture is that domain where cloud computing can efficiently act as mediator or source of information for the practices and research that are being carried out in other countries by the farmers.
- **Education:** Enabling cloud for education will provide us the best trainings and practices adopted by overseas Educational hubs thereby making practical and productive learning.
- **Crime management:** Crime management, if made on cloud, the information about the various crimes and types of crimes and the research done on them and the centralized repository can efficiently help to curb the crime.
- **Health and Land Records:** Health and land records are the areas which are numerous in numbers and consume lot of papers. If converted on cloud in e-Formats can enable efficient handling and more effective healthcare services.

- **Case Management and Legal Records:** e-Courts can be established on Cloud and from where all the cases can be referred and studied for effectiveness of solving the issued. Legal records if kept on cloud for reference can stop the unauthorized services or activities happening anywhere.
- **Food & Drug Administration:** Food and Drugs Administration is being given all the times, when any epidemic or disaster due to natural calamity, but no one is accounted for its expenses, monitoring and budget. Cloud computing can ensure the effective analytics of the disaster and can help the decision makers to optimally work on the crises management.
- **Postal Services:** The postal service's if made on cloud can help reach its services anywhere any time instantly without any mediators thereby making it as time-effective postal services. The centralized postal services portal will not only help to monitor and trace-out the status of the services taken from but also will embrace the notifications published by UPSC (Union Public Service Commission) in time and to masses.
- **Centralized Monitoring and Evaluation:** Cloud enables centralized monitoring and evaluation of the services and facilities offered to the public.

CONCLUSION

Cloud computing is an emerging technology in which every services are available in the cloud. E-Governance needs in conjunction with Cloud Computing will focus on the needs of the Citizens by delivering integrated functionality across the masses and the Web can be accessed through a wide variety of devices anywhere anytime. Cloud is the collection of distributed computing devices. Cloud provides a solid foundation for the introduction of widespread provision of services to various stakeholders. Cloud provides service through public and private clouds with the help of required technology like, system approach, distributed system, service oriented architecture, grid computing and virtualization. To cater to all the constituencies' needs, forward-looking e-solutions will utilize their existing investments and scale out across the sectors and imply the Web to balance devices, servers, and services. Cloud Computing provides a great opportunity for governments across the globe, to provide reliable E-Governance quickly, at lower costs. Cloud computing features like application virtualization, end-to-end service management, instant deployment and

ease of maintenance are catalysts that jumpstart application deployment on the Cloud. With proper planning, execution, training and good management, the Cloud infrastructure can greatly reduce overall costs for government departments maintaining and managing E-Services for E-Governance, and help in efficiently utilizing the tax payer's money.

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