Use of Cloud Computing & Automation for E-Government in India: Challenges and Benefits

Dr. Pavitra patil1, Sameer Patil2, Niraj Chaudhari3
1,2,3School of Management Studies, NMU, Jalgaon, INDIA

ABSTRACT
Cloud computing is a style of computing which is formed from the aggregation and development of technologies such as grid computing distributed computing, parallel computing and service-oriented architecture like automation. And its aim is to provide computing, communication and storage resources in a safe environment based on service, as quick process, which is virtually provided via International platform. Considering that the provided Services in e-government are available via the Internet, thus cloud computing and automation can be used in the implementation of e-government architecture and provide better service with the lowest economic cost using its benefits. In this paper, the Methods of using cloud computing in e-government has been studied and it’s been attempted to identify the challenges and benefits which is useful in the e-government and proposals have been offered to overcome its shortcomings, encourage governments and people to use this economical and new technology.

Keywords— Cloud computing, automation, benefits, Challenges, E-Government, and Participation.

I. INTRODUCTION
Over the past 10 years Internet and Web-based services have grown rapidly been used by many companies. However, the cost of data storage and the power consumption by the hardware is increased. At the same time major companies started extensive studies to reduce costs, better utilizing of existing resources and also to support business. In these studies, they found a new solution to answer their challenges, to use and benefit from the resources and it was nothing but cloud computing. Yes, this new technology is what which can answer thousands of their hardware and software needs. Today, the unique characteristics of cloud computing and automation, has turned it to a valuable technology. Such that is considered the hottest topic in Research centers related to the field of Information technology. Every day the expansion and complexity of the e-governments is being observed, So that the Size of their computational data is increasing daily. Thus, a suitable model for implementing e-government is required to include System efficiency and user satisfaction. As it mentioned before, Cloud Computing was introduced in other styles, such as Grid computing and service-oriented architecture which goal of these styles is processing large quantities of data using clusters of computers. Such high-volume computational problems can be solved easily and in an appropriate manner with the expansion and evolution of cloud computing. The other benefits of cloud computing in e-government should not be ignored of course. Which cost Reduction, integration and reusability of services can be noted? Due to the cloud computing’s novelty, in order to identify cloud computing’s benefits and weaknesses, it is necessary that this technology get completely identified for the development and use of it in e-government architecture, and its different domains should be considered much as possible to be used in the e-government and should’ve tried to overcome its shortcomings

II. CLOUD COMPUTING
Cloud computing have various definitions which some have been brought here. The definition of the national institute of standard and technology of America is as follows [1]. “Cloud computing is a model for enabling 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.” On other common & acceptable definition is of Mater et al. [1]-[2] “A very exact scalable instrument, capable of technology-enabled service, which is available easily on the internet when needed.”
Following the definition of cloud computing, we should comprehend their important features, developed models, the way of using services and also the way of protecting it, in order to know well and accept it [3]. Here are the five key features of cloud computing and automation

- **Service demanding by it.** Using this feature when needed the customer can easily and automatically access to computing facilities like server, net, storage and soon from any provider.

- **Network access.** It implies that the facilities are accessible on the net and they can be used following standard methods. The methods which support weak and strong clients like laptop and mobile phones.

- **Place -independent resource center.** This features pools different customers needed resources in the same place dynamically by the providers. These resources can include the storage, memory, the bandwidth of net and virtual machines.

- **Flexibility.** Using this feature, the facilities can be provided rapidly and with high elasticity and can be expanded or release fast. In other words the services can always be updated and improved and accessible for the users.

- **Result service.** This feature enables monitoring, control and reporting of the resources, and can apparently control and report the amount and quantity of resource using for both customer and the provider of the Development models include the aim and identity of cloud and development models are of the following four types [1].

- **Public cloud:** The substructure of public cloud is for the public use and accessible to all in which the resources, applications and web-services are provided through internet and public organizations help to provide and supply the substructures [4]. Indeed a cloud service provider organization owns the public cloud.

- **Private cloud:** Private cloud is for the exclusive use and only for an organization, so everyone in the organization can access data, services and applications but others out of organization can’t [4].

- **Mix cloud:** The last models are Hybrid ones which are combination of two or more (public, private and community) clouds. It is in fact an environment which

Uses some internal and external cloud providers [4].

In this section the definitions of cloud computing, cloud models and types of services provided by it have been described. In the next section the concept of e-government will be introduced to give the opportunity to discuss the challenges facing the implementation of e-government with cloud computing with a proper Automation.

**III. E-GOVERNMENT**

Indian Governments throughout the world are promoting services in the best possible way to perform daily activities, especially in government’s offices that have direct interaction with citizens. The use of the latest technologies is critical to reduce required time for the processing processes and in order to improve interaction with citizens through providing efficient and effective services [5]. E-government can change the provided services to citizens. Provide access to information for citizens, and enable them to participate in the economic and social opportunities So that they can make a better life for themselves and future generations [5]. Today, the use of ICT in order to improve efficiency and effectiveness, transparency and comparability of financial and information exchanges within the government, between the government and its subordinate organizations,

Implementation E-government projects are done aimed at achieving different goals observe the following principles [6]:

- Improve and increase providing governmental services quickly.
- Empower citizens through access to information and the government’s ability to interact public in whole country
- Achieving target towards greater transparency and accountability of government
- Improvement of internal relationship between the

Government and the citizens’ by automation

Many countries have attempted to implement e-government to realize their goals with the principles mentioned above. Some of these countries have achieved remarkable successes in this area. Based on the Waseda University Institute ranking which is presented in March 25, 2013 Singapore is at the forefront of the most successful countries in implementation of e-government. The top 15 countries in implementation of e-government ranked by the Waseda University Institute are listed in Table I.

**TABLE I**

**THE TOP 15 COUNTRIES IN IMPLEMENTATION OF E-GOVERNMENT [7]**

<table>
<thead>
<tr>
<th>No</th>
<th>Final Ranking</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Singapore</td>
<td>94.00</td>
</tr>
<tr>
<td>2</td>
<td>Finland</td>
<td>93.18</td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>93.12</td>
</tr>
<tr>
<td>4</td>
<td>Korea</td>
<td>92.29</td>
</tr>
<tr>
<td>5</td>
<td>UK</td>
<td>88.76</td>
</tr>
<tr>
<td>6</td>
<td>Japan</td>
<td>88.30</td>
</tr>
<tr>
<td>7</td>
<td>Sweden</td>
<td>87.80</td>
</tr>
<tr>
<td>8</td>
<td>Denmark</td>
<td>83.52</td>
</tr>
<tr>
<td>9</td>
<td>Taiwan</td>
<td>83.52</td>
</tr>
<tr>
<td>10</td>
<td>Netherlands</td>
<td>82.54</td>
</tr>
</tbody>
</table>
Effective challenges in e-government are classified into three groups that include social, economic and political barriers. These barriers limit the scope of policymakers’ activity for effective use of new technologies. There are number of technical challenges such as data scaling, auditing and logging, replication and migration, disaster recovery, management policies, system integration, legacy software, Obsoleted technologies and migration to new technologies. Cloud computing is appropriate to respond to these challenges. Cloud Database provides on-demand and high scalability. Which holds a large number of records that is the basic need in government. Cloud provides the ability to audit event, Login and report information about the tenant and based on program which recognizes fraud and corruption in government agencies. This can help in creating mechanisms for security incensement. There for reliable and accessible applications can be created. Facilitate proliferation and migration of applications is possible with virtualization technologies in the cloud which is useful in disaster recovery and reduction of time to establishment new software’s. Cloud provides tools and technology which simples and Eases the disaster recovery.

V. BENEFITS OF USING CLOUD COMPUTING AND AUTOMATION FOR E-GOVERNMENT

Cloud computing technologies have many benefits in different parts of e-government. These benefits are not limited to the contents discussed in this section.

A. Flexibility

Cloud computing is designed to provide services with unlimited scalability which is regarded as one of its basic features. Therefore, performance and economic stability is balanced. In addition, cloud computing resources can be purchased automatically in any quantity at any time.

B. Protection by Technical Support

Cloud computing service providers are hosts to applications and purchased servers. They are also responsible for updating software and provide technical support. The beauty of Cloud is appearing here to solve problems of e-government especially for small government department’s outskirts of cities because employment of trained troops is not economical and also Professionals preferring not to work in such remote areas. Moreover, in the cloud technology it is not necessary to update the software applications over a single computer. This work will lead to save cost and time, and requires less trained personnel for developing countries and will increase system efficiency (by preventing maintenance errors) and its effectiveness.

C. Costing

The service models of cloud computing have focused to provide economical services to companies and Government agencies. It creates an opportunity to change from costs of investment to operating costs by reducing the cost of purchasing very expensive systems and employ professional employees to manage and maintain. Hence one of the major barriers of having a huge and expensive technology infrastructure will be reduced and new opportunities for investment in developing countries will increase further.

D. Track Recording

Traceability any change to contains of information is necessary in e-government services. Corruption in government agencies can be controlled with using information technology services and by responsibilities of service providers. Auditing process, security audits should be performed periodically to ensure system security. Cloud can help in analyzing huge volumes of data and detecting any fraud. This can help to build defense mechanisms to enhance the security, therefore applications are made available and reliable.

E. Recovery / Backup

This is really a critical issue for the survival of many organizations to ensure whether have the ability to survive at events Caused by their IT infrastructure or not. Disaster recovery programs in clouds provide more options than traditional disaster recovery model for organizations to restore information very quickly and effectively. At this type of disaster recovery costs and recovery time are reduced. Governments can store a backup of the server using the cloud as a backup for disaster recovery, daily basis and also can store it off-site using a third party storage service provider that has the ability to save in a different location.

G. Policies Management

E-government applications have to implement Policies raised by the government facing citizens. These policies should be implemented Along with infrastructures and data centers to improve the daily performance. Cloud architecture is helping to implement this policy in a data center. Security-related policies deploy applications, etc. Can be designed and implemented in the data center.

H. Systems Integration TO new technology

Not only applications and offered services are transferred...
to the cloud, it also integrates with cloud-based applications [10]. Powers of IT are data correlation across applications and messages transmit in different systems to provide faster services to end users. Cloud is built based on the principles of SOA and can provide excellent solutions to integrate various applications. Also, applications can be seamlessly easily transferred into cloud [8].

1. **Old technologies to New Technologies**

   Transition from an old technology to a new one is always challenging. Using different versions of software, programs and security packages, is one of the nuances in the data center’s security maintain in e-government [10]. E-government applications due to existence of Security and adaptability, Can manage the proposed policies using cloud. Different types of e-government applications are simply integrated [6]. Cloud architecture provides ability to run different versions of software at same time. After testing these applications they can enter the production phase [10]

2. **K. Security**

   The cloud computing which is presented after technologies such as service oriented architecture brings not only the benefits of these technologies, but it is trying to fix their flaws as well. To implement e-government, One of the major challenges of governments, was security issue particularly data security which before cloud computing created many problems including disruption of servers or data centers, lack of access to certain services at certain times of year, such as voting and election days for governments and users but Implementation of cloud computing includes advanced security technologies. Having a pool of resources enables cloud providers concentrate on all of the security resources in order to secure the environment. Also the automation within the cloud along with focused security resources creates advanced security features. Nevertheless no system can fully ensure the security.

**VI. EVALUATING CLOUD COMPUTING RELATED TO E-GOVERNMENT**

**TABLE II**  
**EVALUATING CLOUD COMPUTING RELATED TO E-GOVERNMENT**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPLEMENTATION</td>
<td>Improve the quality of services and applications availability of services and resources on-demand and Increased access</td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td>Reduce implementation costs Reduce the time and easy access to</td>
</tr>
</tbody>
</table>

**RESULTS**  
Integration and better interaction Between organizations Create better services along with low cost

**A. Singapore**

   The Singapore Government acknowledges that each model of cloud computing provides its own level of assurance and benefits. As such, strategy of the cloud for Singapore Government is to leverage the proper cloud for the proper need by adopting a multi-prong approach to cloud computing as follows [11], [12]:
   - Leverage commercially-available public cloud offerings for proper needs so as to benefit from lower cost of computing resources.
   - Implement a private government cloud (G-Cloud) for whole-of-government use where security and governance requirements cannot be met by public clouds.
   - Enable interoperability between G-Cloud and agency

   Clouds through a set of internal G-Cloud standards. The Singapore Government Cloud or G-Cloud is the next generation whole-of-government infrastructure. It will provide efficient, scalable and resilient resources for cloud computing and will be designed to meet different levels of security and governance requirements [12]:
   - **High Assurance Zone** – a physically dedicated computing resource pool which will only be used by Government to serve its high assurance needs Medium Assurance Zone – a computing resource pool which will be shared with non-government cloud users to lower cost of computing resources for Government.
   - **Basic Assurance Zone** – a computing resource pool which is shared with public cloud users

**B. USA**

   When there is no high demand to access the web portal [10]. It also uses more power and requires additional security features such as multifactor authentication and physical on-site security at the data center building. The time required to upgrade this site was up to nine months. The General Services Administration (GSA) was paying about two million American dollars for software licenses and hardware upgrades in addition to 350,000 US dollars for staff costs each year [10].

   Vivek Kundra has suggested a better approach; United States first federal Chief Information Officer (CIO) to migrate to the clouds was selected for the following considerations [10]:
   1) The cloud computing platform’s flexibility: the benefit of paying for a baseline capacity for normal traffic periods, but it can accommodate large traffic when needed and save cost when it’s not being used.
   2) Minimal time for migration: because of the provided services sensitivity, it needs the minimum time to complete
the migration. The actual migration process took 10 days only, while the test validation occurred in one week.

3) Additional security elements: all the security requirements for the website administration are met such as multifactor authentication (MFA) to access the portal, packet flow analysis, 128-bit encryption for traffic, and resource tracking. Furthermore, according to the Ministry of Defense standards; a special data center has been built to meet the security specifications of the physical building.

The outcome of migration to the cloud resulted in reducing cost (up to 90%), improved capabilities, system flexibility and complete process automation. Thus, customer requests are handled in real time and allowed users to access data to integrate with other websites [12]. Cloud-based solution made upgrades to the site takes only a single day, which previously took nine months to accomplish [13]. Thus, the availability of the website increased up to 99.99 % with almost zero downtime monthly. The allocated budget to www.usa.gov reduced to only 650,000 American dollars per year.

C. United Kingdom (UK)

The UK government has made the creation of the “G-cloud,” which is to be a government-wide cloud computing network, a strategic priority. The Digital Britain Report, issued jointly in June 2009 by the Department for Business Innovation & Skills and the Department for Culture, Media and Sport [13], calls for the UK government to take the lead in a wide-ranging digital strategy for the country. As Prime Minister Gordon Brown announced the issuance of the report: “Digital Britain is about giving the country the tools to succeed and lead the way in the economy of the future” [10]. An important aspect of the Digital Britain strategy is to improve IT use in government and allow for more services to online migration. To support this action, the UK’s IT procurement efforts will be focused on enabling the government to become a leading force in the use of cloud computing. The report states that: “The Government’s impact on the digital economy goes way beyond its role as policy maker. In delivering public services, as a large customer of ICT products and services and as the owner of data systems, the public sector has enormous influence on the market. In many areas, such as education, health and defense, Government can use its position as the leading procurer of services, to drive up standards (in some cases to set standards) and to provide an investment framework for research and development”. The Digital Britain team from both cabinet offices has an official forum, where interested parties can learn more about the plan and comment on it, located at http://digitalbritainforum.org.uk/.

D. Japan

In Japan, the national government is undertaking a major cloud computing initiative, dubbed the “Kasumigaseki Cloud” (named for the section of Tokyo where many Japanese government ministerial offices are located) [13]. The initiative seeks to develop a private cloud environment that would host all of the Japanese government’s computing eventually. According to Japan’s Ministry of Internal Affairs and Communications (MIC) [13], the Kasumigaseki Cloud will provide greater information and resource sharing and promote more standardization and consolidation in the IT resources of government. By consolidating all governmental IT under a single cloud infrastructure, the Japanese government believes it will see not just reduced costs and operational benefits, but more “green,” environmentally friendly IT operations [13]. The Kasumigaseki Cloud is part of the Digital Japan Creation Project. This represents a governmental effort aimed at using IT investments (valued at just under 100 trillion yen) to help spur economic recovery by creating several hundred thousand new IT jobs in the next few years and doubling the size of Japan’s IT market by 2020. The MIC believes that “accelerating the use of ICT nationwide will require the government to take the initiative in implementing measures,” and that the national government’s promotion of cloud computing will not just help spur ICT development, but to help diminish the digital divide in that country [11].

E. Thailand

In Thailand, the Government Information Technology Service (GITS) is establishing a private cloud for use by Thai government agencies. The GITS has already established a cloud-based e-mail service, and it is planning to add SaaS offerings in the near future. GITS believes that such consolidation will improve service offerings for government agencies, while simultaneously cutting their overall IT costs “considerably” [13]-[14].

VII. RECOMMENDATIONS

Considering the expressed subjects and benefits of cloud computing technology and automation technology, this technology is currently the best option for e-government for India. Thus the best option for developing countries like India that have not yet fully implemented e-government is leading government towards cloud architecture. This will reduce costs and increase the efficiency and user satisfaction. Also the importance of benefits such as data integrity, acceleration of processes and the flexibility of cloud in government should not be ignored that these benefits can meet many challenges of governments to implement e-government. But significant challenge that perhaps governments are harassment to use cloud computing is laws and service level agreements because the countries laws are very different from each other. And in case government rent the service from cloud service provider in another country, it should accept not only the laws of the country of origin but also the laws of the country that is in the data transfer path if there is one. Thus the need to create new laws and regulations between countries is required in data transfer field, to use of
services provided by service providers to be possible for governments all over the world. In this regard, and according to the developed countries and some developing countries are separately executing the e-government projects like India and have less participation in this field together. The developing countries with cooperating and using each other’s experience to form a committee to investigate the cloud computing’s depth and applications in e-government and laws related to data transfer is proposed. To be able to provide needs and necessary platforms to the development and implementation of e-government and e-services with the achievements of the committee in a short time and instead of using separate operating teams for each country, the creation of such a committee can reduce many of the costs of research including financial and time in this field.

VIII. CONCLUSION

With the study was done in this paper the importance of using of new technologies like automation, cloud computing that are improving efficiency and reducing costs in government. Countless benefits like flexibility, cost effectiveness, integration in new technology, proper security that converted it to an appropriate option for use in e-government. From this paper it could be concluded that developing and even developed countries specially India have critical need to create e-Government to reduce costs and also having Sustainable Development in this economic and critical situations and the best way is the use of green and cheap technology which is the cloud computing and automation. Undoubtedly, the participation of countries with each other on technical and legal issues is code key for achieving e-government based on cloud computing and automation as soon as possible. And it can fix and or minimize the existing problems and challenges on the way and therefore an E-government is created which interest and participation of people to use its services is huge.

REFERENCES