

Challenges and future trends in e-Governance

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Abstract— E-governance is the application of information and communication 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. The strategic importance of E-Governance Standards is now widely recognized globally. Standards and specifications with well defined formats help to achieve interoperability of information and communication systems. This paper discusses about the software architectures deployed in the design of e-governance that is broadly classified into architectural framework and conceptual framework. The discussion is also extended to the usage of e-governance in civil services in different countries followed by future trends.

Keywords; e-Governance, e-Services, Software Architecture, Civil Services

I. INTRODUCTION

Electronic-Governance [1] is a subtle novel concept referred to the use of information and communication technology to furnish and enhance government services, transactions and interactions with citizens, businesses, and other arms of government. Architectural design model is a model, which assists software architects and software designers in designing software systems. The architectural design model we propose is useful, in architecting, designing and implementing e-Governance systems. It should be remembered that the model we propose is not a complete solution to the design of e-Governance systems. It can be used as a reference model. Aim of Standards formulation for e-Governance applications [2]

- To ensure smooth flow of information between citizen, business and Governments (State and Central) by having interoperable systems which are scalable for future transaction volumes and frequencies.
- To make requirements and specifications available in the public domain
- To promote reduction of effort (cost by variety reduction) and risk leading to economic solution.

- To protect consumer interests by facilitating adequate and consistent quality of Information and Services with human centric design of systems.
- To provide users a common terminology and a framework for communicating technologies across different domains.
- To avoid Vendor lock-in.

It is beyond doubt that e-Governance can smoothen the working procedure of Government machinery by providing transparency, effective working, instant response and availability of information of Government machinery to end users, time to time. The existing e- Governance is very much server centric, cost effective in nature and finds itself unable to address all categories of users starting from rural urban to metropolitan citizens. The success of e-Governance lies on wiping out of this discrimination by providing accessibility of different web services of e-Governance irrespective of geographical and language barriers. There are a couple of other problems with developing countries, including absence of infrastructure, resistance to change, lack of education, natural disasters, power shortage, unavailable internet facility which hampers the implementation of electronic governance severely. For example, improper standardization of Bengali software, absence of effective legal framework, discontinuous human resource support affects the e-governance implementation greatly. It is quite rare in the developing countries that, the government is stable. In most cases the activities of ruling side are meaninglessly opposed by the counter parties which often makes potential concepts nipped in the bud. E-governance may also face the same fate in such developing countries like Bangladesh. More importantly, corruption is a great barrier to have any better and transparent step in developing countries.

Section 2 discusses about the e-governance structure followed by discussion about the conceptual framework in Section 3 and Service Oriented E-Governance structure in Section 4. Discussions on various significant e-governance executions in different countries are discussed briefly in Section 5 and Section 6 discusses about its integration to various departments. Section 7 discusses about the challenges in e-governance followed by future trend discussion on Section 8. Summary of the paper is highlighted on section 9.

II. DESIGN OF E-GOVERNANCE STRUCTURE

A public sector organisation planning to adopt an e-government initiative and formulate its IT strategies must evaluate its business models and select appropriate technology solutions that deliver on central government policy. Although there are significant differences in the composition of organizations, there are a number of technologies and systems infrastructure that many organizations need to adopt in common to provide facilities for the integration of their systems in a way that enables them to build a platform for sharing their knowledge resources. For example, an e-government portal requires a common and integrated architecture framework that allows different organizations, provinces, and municipalities to share and exchange data, independent of formats, devices and underlying architecture [3]. Therefore, organisation must have a clear understating of architecture frameworks from both the technical and information management level. The e-government architecture defines the standards, infrastructure components, applications, technologies, business model and guidelines for electronic commerce among and between organizations that facilitates the interaction of the government and promotes group productivity. Since e-government is a relatively new research area, its architecture and adoption strategy have not been widely discussed in the literature. Therefore, the authors review and study these concepts from other relevant areas such as e-business, e-services, and e-commerce. Notwithstanding, a number of studies have discussed the architecture or components of e-government [4] [5] [6]. However, these studies did not address the aspect of business management model and how it is aligned with the IT infrastructure. Since e-government goes beyond the IT infrastructure, the contribution of this study is to provide an integrated architecture framework for e-government that represent the alignment of IT infrastructure with business process management in public sector organizations. The authors discuss the required business process for the successful implementation and management of e-government activities. The authors also develop the framework architecture to incorporate it with integration applications and interaction tools. The reason for this is that they already play a significant role in enhances business process within organizations and their applications such as e-business, e-commerce, enterprise application integration (EAI), web services, etc. so, their inclusion was considered necessary. The significance of integration technologies have been discussed and classified under the e-business layer section since these technologies and approaches are often and need to be used in e-government projects. The reason is that they are designed to support e-business and e-commerce applications. The framework is structured into four layers connected through two-direction arrows which present the hierarchical level of e-government implementation and portray the logical connection of each relevant layer that allow two-way transmission of data and services. The top level of the framework represents the access

layer that illustrates who might use the government services and what are the channels of access. Throughout these channels, the e-government portal should integrate all government information and services from disparate departments and organizations, which represent the e-government layer. In connection to the e-government layer, the e-business layer is emerged to manipulate and integrate government data sources across government bodies and make information and services available to the e-government portal in real-time. In the bottom level of the framework, the ICT infrastructure of e-government should be built to reach out all parts of government and hence, support the e-government operation and provide effective and reliable e-government services.

A. Access layer

It involves the channels that government users can access the various government services. Government users can be citizens, business, employees, other governments, and other community members. Access channels are critical components of e-government. As shown in Figure 1, they consist of online and offline channels or routes of distribution through which products, services and information are used, accessed and communicated by multiple technologies. For example, web sites accessible from PCs, kiosks, mobile phone (WAP), digital TV, and call and contact centres. This layer considers of the simplest level of e-government architecture, since it is controlled and managed by government users. However, it is essential that public sector organizations provide a common way of finding all government information and services, maintain channel coordination, create a common look and feel across different channels, and comply with the guidelines of technical standards [4].

B. E-government layer

This layer is about integrating digital data of various organizations into a web-portal of government services, in the form of a one-stop e-government portal. This may result in improved access to government resources, reduces service-processing costs, and enables organizations to provide a higher quality of service [7][8]. Government web-portals are emerging as a key priority for public sector organizations, as they develop their e-government initiative and create electronic interaction between government and citizens (G-to-C), government and business (G-to-B), government and its employees (G-to-E), and government and government (G-to-G). According to the authors in [9], this layer allows the user to use the web browser to get all corporate information needed through a single window. The portal has a web-based front-end application that allows dispersed sources of information to be linked together. Governments can access and manage all data and information while providing users with the opportunity to customize what they need from information sources.

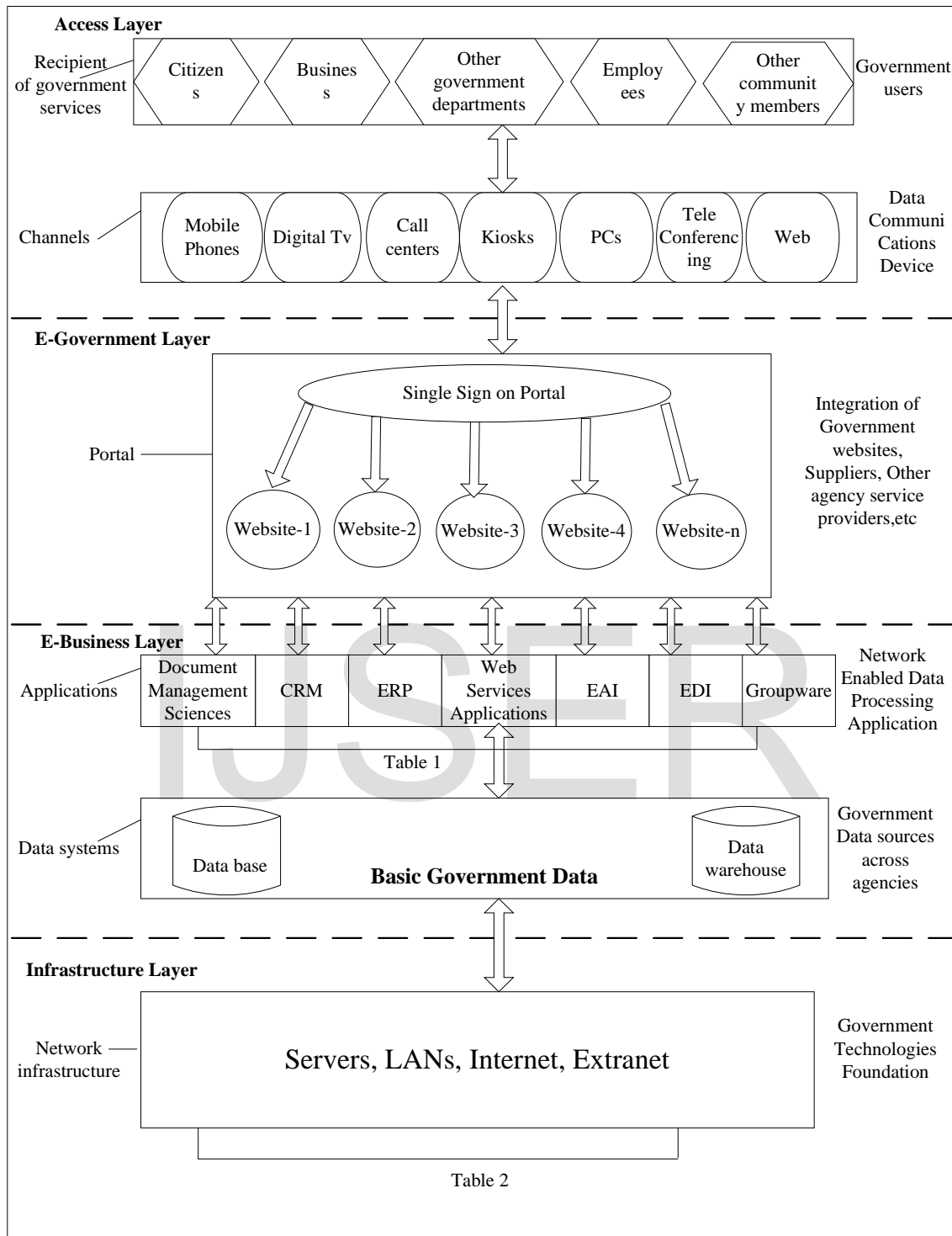


Figure 1 Framework of e-government architecture

For example, when a citizen moves from his/her residence, there is no need to update this information to all organizations that require a current address. The use of an integrated portal will reduce overhead and improve information flow. Without such a resource, citizens will need to identify relevant

organizations to contact, complete and submit change of address forms for each, which is clearly time consuming and non-value adding. So the use of an integrated web-portal is increasingly becoming an important component of e-government infrastructure, since it allows citizens to reduce

this cumbersome process to a single step. Since governments are very complex organizations with hundreds of agencies, departments, directorates, commissions, and regulatory bodies, a single government portal is still in its infancy stage. One of the reasons is that it is difficult to determine which features and applications are most appropriate for creating a high-functioning e-government portal. Another reason is technical; providing integrated services can only be realized if all public authorities are interconnected and their systems are interoperable. It needs comprehensive technology, systems integration and project management skills as will be explained in e-business layer. Reputed Organization like IBM [10] reports three levels of complexity: information publishing and linking of existing web sites, single organisation transactions, and transactions requiring integration of multiple organizations. From a portal management perspective, it is necessary to maintain user interface construction abilities to increase user control, such as search capabilities, interactive media, and graphics design; and other key features such as e-mail, calendars, instant messaging, and chat areas. As well as including tools to register, dynamically recognize and classify users; and giving the organisation the ability to customize content, information access, and structure to meet the specific needs of employees. Security is another key element of this layer, through deploying government authentication and privacy standards to secure online transactions and protect the portal contents.

C. *E-business layer*

This layer is focused on using ICT applications and tools to harness a networks of trust, knowledge sharing and information processing that takes place both within and between organizations [11]. Practically, it integrates front-end e-government layer applications, such as online catalogues and transaction interfaces in the government portal with back-end activities such as existing databases and data warehouses. The implementation of this layer will make a strong foundation to build single e-government portal as stated in e-government layer and also support the relationship and interaction between G-to-G and G-to-E. It provides a seamless, automatic and real-time communication between their systems at both a data and process level. In terms of G-to-E, it enables employees to interact efficiently with other departments and agencies concerning human resource information, retirement plan, latest news releases, and drawing on the available resources in an optimal way. This results in supporting decision-making in the formation of new value chains, and reinforces the existing business partner's relationship in form of electronic procurement. The integration of various IT applications and components inside and outside the organizational boundary remains costly and time consuming, due to the heterogeneity of the computing environments involved in public sector organizations [12]. As well, the legacy systems and applications across government organizations need to be

upgraded to a web-enabled level to extend their functionalities beyond organizational boundaries and to achieve full communication between all the information systems and their processes.

Traditionally, government departments and organizations have maintained separate databases that are not connected to other government departments at the same level or even different level such as the local or central government level. This creates barriers between organizations systems and processes, in term of data transmission and communication, and therefore, makes implementation of e-government single portal not easy. Therefore, the integration of government database systems, processes and applications play a critical role in this layer since e-government relies to a significant degree on existing basic government data, existing systems and existing processes. This layer implies computer systems and applications of different public departments and organizations are being connected to or at least communicating with each other. As a result, the transaction from one system can be interchanged with another system. For instance, if a citizen performs a certain transaction at a local department or agency, the information and results of the transaction will be propagated to the city or central counterpart. Consequently, this connection will result in easier, more flexible and reliable access to government data, as well as improves the business processes and operations of organisation and management of government IT resources. This should result in significant financial savings, by eliminating redundant data collection, increase the speed of transactions, improve the consistency of outcomes, and increase opportunities for cost-sharing partnership.

D. *Infrastructure layer*

Building an information community by using e-business layer applications in an efficient manner requires a technology infrastructure that reaches out to all parts of public sector organisation. However, electronic communication within and between public sector organizations is expensive and inefficient without an effective infrastructure and agreed standards and protocols between communicating systems. Therefore, this layer focuses on technologies that should be in place before e-government services can be offered reliably and effectively to the public. The potential of these technologies is to support and integrate the operations of information systems and applications in e-business layer across organizations (Figure 1) by offering the necessary standards and protocols through network and communication infrastructure approaches (e.g. intranet, extranet, and internet). It is already known that the incorporation of distributed network infrastructure approaches supports the organisation knowledge infrastructure, such as, a customer database on a client server system providing information required for CRM application. This layer provides basic technologies, such as LAN that allow integration with current hardware resources such as PCs,

laptops, and mobile phones straightforward and without complications which supporting the organisation existing IT provision. As well as they should support the provision of user-friendly and innovative online services involving the transmission of data of various formats such as text, graphics, audio and video. Company like IBM [10] concluded that to have a successful e-government strategy, the public sector must create an IT infrastructure that is optimized to support new information systems and applications that are necessary for e-government – as shown in Figure 1. They suggest that an e-government IT infrastructure may comprise of a number of technologies with a network infrastructure at its genesis; including an application IBM [10] indicates that the key component of IT infrastructure in government organizations is the application server. It is consisting of server hardware, server operating system, and different applications server software that runs three-government application logic and manages the user interaction. These servers are operated through efficient network technology and internet connectivity, which improves communication and information transmission within and between organizations, resulting in new ways of dealing with business partners and users such as online transactions and procurement services.

However, security of infrastructure is still one of the most crucial and least understood issues associated with internet-based communication and applications [13]. Security is an ongoing risk associates with most of IT projects and in term of e-government, the degree of risk is escalating as the use of public networks increases together with databases that hold citizens profiles and government information. Therefore, this layer needs to incorporate advanced security approaches and technologies such as PKI, reliable firewall, biometrics, digital signature and certificate, and sophisticated encryption technique, which secure e-government interoperation, government electronic transactions, and delivery systems to ensure protection against fraud and other vulnerabilities at all levels of the government information infrastructure.

The significance of e-government architecture framework is about the integration between government existing technologies and essential applications and information systems required for e-government operations. As well as, the consistency of layers should be given the required attention during the implementation of e-government, as Figure 1 shows that each layer connected to the adjacent layer, which poor implementation of one layer could affect the performance of the rest of layers, and therefore, will degrade the performance of e-government

III. THEORETICAL FRAMEWORK

E-government portals have been a subject of many studies in the last few years. Several instances of e-government portal implementation have been lauded in academic papers as well as analyst reports. Cordella [14] has posited that a comprehensive information systems (IS) design framework

should consist of technical as well as social and political aspects of technology adoption. However, literature on e-government portal effectiveness is fragmented, and available frameworks focus mainly on the technical aspects of portal design and development. For example, Zhang & von Dran [15] argued that e-government portals are similar to e-commerce websites in terms of benefits to users. They posit that website attributes such as ease of navigation, clear layout of information, up-to-date information, search tool, and accuracy of information play important roles in providing benefits to users in terms of website quality. Fig.2 shows the e-government portal effectiveness framework.

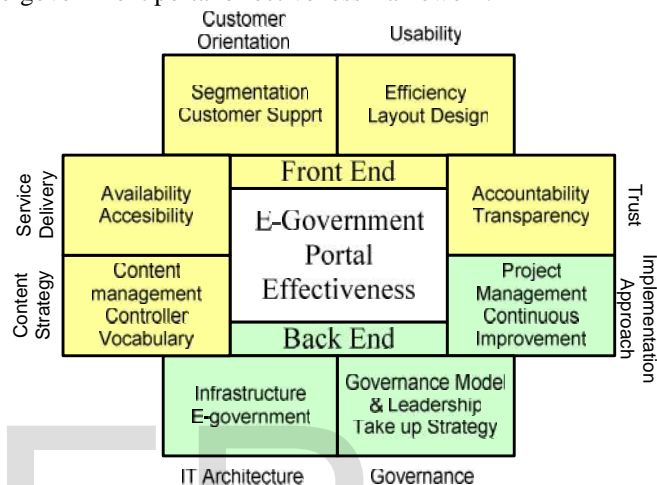


Figure 2: E-government portal Effectiveness Framework

In another study, Fang [16] has proposed ten attributes of an e-government portal. He posits that an e-government portal should be comprehensive, integrated, ubiquitous, transparent/easy to use, accessible, secure, private, re-engineered, interoperable, and should have developed e-governance systems. However, e-government portal initiatives are expected to offer seamless, integrated information and service delivery [8], where integration across departments, transparency and accountability [17], and effective governance and organization [18] are equally important considerations. A careful investigation and analysis of the available frameworks reveals that they only consider the social and technical aspects of IS i.e. front-end attributes of the e-government portals.

However, none of them is concerned about the political aspects of IS which also contribute towards the adoption and use of the portals. The conceptual framework proposed in this study, seeks to build upon the previous frameworks and models by incorporating the political aspects of IS also by including attributes such portal governance, leadership, and implementation approach. Our proposed framework (figure 1) consists of eight key e-government portal design and development attributes that have been categorized into front-end and back-end attributes that consist of administrative, technical, and political issues concerned with e-government portals.

A. Front-End Attributes

Front-end design and development attributes are those that are visible on the client-side of a system. We have identified four key front end attributes as crucial inputs towards portal effectiveness: service delivery; customer orientation, usability, and trustworthiness.

1. Service Delivery

Service delivery refers to the process of offering government services through e-government portals. Services offered through an e-government portal are one of the key motivating factors for stakeholders to adopt and subsequently use the portal. The types and number of services offered through e-government portals depend, to a large extent, on the underlying system capabilities and integration of functional departments providing those services at the back-end. However, adoption of a portal by citizen/customers is directly related to a) the availability, and b) accessibility of various services offered on the e-government portal. This has prompted us to classify services as a front-end administrative attribute.

Availability

Availability refers to the types, levels, and number of services offered via an e-government portal. A vast number of services are already being offered via e-government portals in several jurisdictions [19]. The study conducted by Martin [20] classifies the types and number of services offered through e-government portals into five levels: emerging, enhanced, interactive, transactional, and integrated. We argue that availability of a threshold minimum number of services is important for take-up of e-government portals as stakeholders may not find the portal effective if important services are not available on the portal.

Accessibility

Accessibility refers to the ease of attaining information and services offered through an e-government portal [21]. These services need to be accessible to all citizens/customers equally to ensure wider reach and subsequent adoption of the portal. Disability and foreign language access are some of the attributes that ensure wider reach and hence must be taken into consideration for e-government portal development project.

- **Accessibility on Multiple Channels:** Accessibility of government services through multiple channels enables wider reach and increased take-up of an e-government portal [22]. Lately, other devices such as digital TVs, personal digital assistants (PDAs), and mobile phones are also being used to access Internet. Thus, several governments are enhancing their portal technology to make their portals compatible for access through multiple devices.
- **Disability Access:** If an e-government portal is ill-equipped to provide information and services to people with some kind of handicap, it fails in its attempt to reach

out to as many people as possible. Disability access features offered through an e-government portal not only ensures increased take-up of the portal, but also makes the portal a more universal media. For example, a feature such as Bobby [23], could help making portal services accessible to the visually or hearing impaired.

- **Foreign Language Access:** Accessibility of services offered through an e-government portal in foreign languages extends wider reach and more take-up of the portal. Foreign language features on the portal allows access to non-native language speaking individuals. Foreign language access could be generally enabled through accessibility features such as text translation of the information into a language of choice.

2. Customer Orientation

Customer orientation is a key imperative for attracting more citizens/customers to an e-government portal and improving service quality. We believe that a) better segmentation, and b) improved customer support enables portal managers to improve the portal take-up by making it more citizen/customer-centric.

Segmentation

Segmentation enables managers to target information and services towards specific customers. It is an important attribute for ensuring increased take-up of an e-government portal [24]. The following three ways of segmenting e-government portals were used by some of the leading e-government jurisdictions we studied in this research:

- **By Beneficiary:** This way of segmentation enables e-government portals to target its audience by offering services for a particular group such as citizen/customer (G2C), businesses (G2B), employees (G2E), and other governments (G2G), who can find and use the services that they need [25].
- **By Department/Agency:** This way of segmentation enables e-government portals to target citizens/customers by services offered by departments. This eliminates any confusion regarding the jurisdiction of departments over e-government service as the services are listed in under the department that offers them.
- **By Life Events:** This way of segmentation enables e-government portals to target customers/citizens by the stage of their life-cycle. Singapore's eCitizen Central Portal [26] is a successful example which displays government services according to stages in customers' lives (called "Life Journey" on the portal), beginning with registering a birth, through seeking employment, opening up a business, and retirement [27].

Customer Support

E-governments portals that are equipped with customer support features are able to respond to citizen/customer better with respect to help and support requests. Customer support

features put citizens/customers firmly at the center and help portal architects by organizing all the necessary information and services around use patterns and habits [23].

- **Automated:** Automated help and support features are installed in an e-government portal by default and are available to the citizens/customers automatically all the time. They act as guide for accessing information and services on the portal.
- **Human Intervened:** Sometimes the automated customer support features are not able to guide or help the customers/citizens and human intervened customer support is required. Human intervened customer support can be provided online through integrated chat or email programs or over the phone through call centers.

3. Usability

Usability refers to the degree of ease and feasibility with which citizens/customers are able to use an e-government portal. Portal acceptance suffers if the citizens/customers do not perceive a system as easy to use and useful. We propose a) efficiency and, b) layout and design of the portal as key considerations that enhance the usability of an e-government portal.

Efficiency

Efficiency of an e-government portal refers to the accuracy and completeness with which its users can achieve specific goals. An e-government portal is termed efficient if customers/citizens/government employees feel that their output and job performance increases by using the portal.

- **Search and Help Features:** Easy to use search feature on the e-government portal that has the ability to provide relevant and accurate search results (information) to users with a lower response time amounts to higher efficiency.
- **Other Efficiency Mechanisms:** Other efficiency enhancing mechanisms include online interaction, faster download time, error prevention, faster recovery time, and session back-ups [28].

Layout & Design

Symmetrical organization of the content, links and navigational features, along with use of better aesthetics improve the layout and design of an e-government portal. An e-government portal must have a consistent design to be able to appeal to the citizen/customer. We think that to achieve consistency, the portal should have certain features which are as follows:

- **Aesthetics:** The aesthetics of the website comprise of graphics and layout, colors, multimedia and other features that are critical to the success of an e-government portal. Consistency of the logo, web page design, colors, and icons, however, have been found to be the most important factors that can improve site design and layout [29].
- **Navigation:** Navigation is defined as “the process whereby people determine where they are, where everything else is, and how to get to particular objects or

places” [30]. A well articulated navigation system for an e-government portal, that is designed according to user needs and has proper menu systems, site maps, and moderated/non-moderated spaces for the presentation of content, greatly enhances the usability of the portal.

4. Trustworthiness

Trustworthiness is the perception of confidence in an e-government portal’s reliability and integrity [31]. While citizens’ reluctance to use e-government portals is a major challenge in their adoption, citizen trust is an important catalyst of e-government adoption. We have identified a) accountability, b) transparency, c) security, and d) privacy, as ways to increase trustworthiness in e-government portals.

Accountability

Accountability is the relationship between an e-government portal and citizens/customers in which the portal is held to account for its performance by the citizens/customers). Accountability with respect to e-government portals is divided into internal and external accountability [32]. Internal accountability exists within the bureaucracy of the organization whereby the portal is accountable to the higher echelons of the organization for the information and services it offers. External accountability exceeds the boundaries of the organization where the portal is accountable to citizens/customers for the information and services it offers.

Transparency

Transparency refers to the organization of information on the e-government portal that reveals the depth of access it allows, the depths of knowledge about processes it is willing to reveal, and the level of attention to citizen response it provides. Transparency in functioning can lead to increased trustworthiness in e-government portals [8].

Security

Security has been defined as the protection against threats such as a situation, condition, or incident with the potential to cause economic hardship to data or network resources in the form of destruction, non-protection, modification, denial of services, fraud, mismanagement and abuse. Several studies have found that security is a potential indicator for consumers to take online purchasing decisions [15]. With regards to e-government portals security can be conceived as transactional security, authentication, and protection against functional risks. Better security in e-government portals leads to increased trustworthiness i.e. if citizens/customers are assured that the personal or financial information that they entering in an e-government portal is secure and cannot be tampered or misused, their trust in the portal’s reliability and integrity is increased.

Privacy

Privacy breaches can shatter public trust in e-government as e-government portals hold vast amount of personal information. Citizens/customers are always concerned about privacy issues

such as disclosure and misuse of personal information [33]. These issues influence citizens' attitude towards the portal and can impede the adoption of the portal. If the citizens/customers are sure that their personal and financial information is kept private and cannot be used without their authorization, their confidence in the portal's reliability and integrity increases and trust is generated.

B. Back-End Attributes

The back-end design and development attributes of an e-government portal are those that are not generally visible on the client-side of the system. These attributes include implementation approach, governance, IT architecture, and content strategy.

1. Implementation Approach

Implementation approach refers to the process through which an e-government portal is built and implemented. With a high number of services being offered and critical information provided, the task of implementing e-government becomes very challenging and often an ongoing process. Several issues such as security of on-line transactions, consistency of applications, and integration of all the functional departments must be taken care of before the implementation project is rolled on [34]. An e-government implementation project requires a) project management and b) continuous improvement for enhancing portal effectiveness.

Project Management

Project management is a key factor in ensuring that an e-government portal implementation project is carried out successfully since the implementation project requires careful planning, management, and development.

- **Project Planning:** It includes the critical activities of planning, including information audit and standardization, process mapping and design, authority strategy and modernization, informatics strategy, risk assessment and cost-benefit analysis [34]. However, planning should also include considerations over key enablers of the internal value chain and supply chain of the e-government portal: for example, selection of partners for service delivery, selection of various channels for service delivery, and planning for the type of services the portal is going to offer.
- **Execution and change management:** This factor is concerned with the governance part of the e-government portal implementation project. Management of e-government portal implementation process is often vast, not managed within the internally available resources, hence adoption of established protocols and standards are needed to minimize customization [35]. Availability of strong project management skills in the organization is important to tackle the issues arising due to project execution and change management.

Continuous Improvement

There is an ongoing debate in the literature on whether to term an e-government portal initiative a project or an ongoing program. However, in practice we found that many e-government portal projects are never ending as they become a way of doing business. Several governments are trying to enhance their IT capabilities for providing long term value to their clients and stakeholders through e-government portals. Even when treated as projects, successfully implemented portals depend heavily on the continuous improvement process for greater effectiveness. Most of the desired potential business benefits are achieved through this ongoing process, where along with some fine tuning of the technology, the organization modifies its work practices, skill-sets, business processes, and norms to develop a better fit, utility, and value [35].

2. Governance

Governance is key factor which is required to provide a framework for decision rights and accountabilities to encourage desirable behaviour in the use of an e-government portal [36]. It includes the use of institutional structures of authority and collaboration for allocating resources and controlling activities of an e-government portal project. Governance can be categorized into a) governance model and leadership that is concerned with the authority or decision rights of e-government portals, and b) take-up strategy that is concerned with devising strategies in order to increase take-up of e-government portals.

Governance Model & Leadership

The objective of portal governance is to identify roles and relationships needed for policy setting, control, and monitoring the use of the e-government portal. Successful portals depend heavily on a sound governance model. Weill [36] proposes five IT governance models. Most of the leading jurisdictions studied for this research used IT Duopoly governance models in line with recommendations made in the literature [36]. The governance models require strong executive leadership that can guide the whole decision making process with respect to the e-government portal project. Several papers suggest use of an IT governance council that assumes responsibility across all business functions for policy setting, control (budget approval, project authorization, performance appraisal), and performance management and reporting may be important for providing leadership for projects of such magnitudes.

3. IT Architecture

IT architecture refers to the underlying technological architecture of an e-government portal. Its stability and scalability are critical for successfully implementing an e-government portal.

Infrastructure Layer

Infrastructural layer is the foundation layer of a e-government portal's IT architecture. This layer provides a reliable

foundation for the rest of layers, such as access layer, e-government layer, and e-business layer.

E-Government Layer

The E-government layer defines the approaches to improve channel coordination and integration of different services offered by public sector organizations into a one-stop e-government portal. This layer also defines the e-government portal segments such as which services are targeted toward which constituencies

IV. CIVIL SERVICES ARCHITECTURE BY SOE

The main objective of e-governance is to allow the public sector to provide citizens with information based on their need, hence increasing their effectiveness, efficiency, and quality of service. An SOA approach [37] to e-governance aligns IT with service delivery goals and enables various government departments to re-use developed assets. The goal is to provide a flexible SOA solution for governing, integrating, deploying, securing, and managing services, irrespective of the platforms on which they were created. A Service Oriented E-governance (SOE) based solution needs to rapidly transform existing applications, data, and content into web services using a completely non intrusive approach that requires no changes to the existing applications. An SOA based solution reduces the dependency on back-end applications and the need to write code every time there is a change in policy, and introduces new software that promotes the direct collaboration of citizens and government departments irrespective of the delivery model. The various steps involved in executing SOE are (1) service identification, (2) identification of forms, (3) business process modeling/re-engineering, (4) services solution architecture, (5) integrating various departments, (6) deployment (centralized or decentralized). The following diagram depicts the activities associated with the each step for executing complete SOE (See Fig. 3).

V. PRACTICES OF CIVIL SERVICES

This section presents brief elaboration of the practices of e-governance in various countries in relation with civil/administrative services.

Jordan: Omari [38] explains architecture for the E-Government system; its main concepts, objectives, most common applications, famous worldwide experiences and the E-Government in Jordan. Jordan varies in its preparedness to undertake E-Government services to businesses, citizens and within government institutions themselves. It introduces the E-Government model as a modern evolution of Information and Communication Technology (ICT) and how to convert the life of societies to the communication and networked age. It presents the experiences of countries like USA, UK, Singapore, UAE and Egypt. The study focuses on launching the E-Government project in Jordan, the main planning and implementation features noticed there and the main obstacles. It proposes a simplified model for some of the Jordan E-Government Portal Online services.

State of Missouri: The State of Missouri's e-government must be more than a collection of technologies and products. It will require the combination of several architectural styles, much like a city plan. The focus of this analysis in [39] is on the operational (infrastructure) architecture. Concurrent with this analysis, the State of Missouri is analyzing the functional (business processes) architecture. The seven-step process, consisted of the following steps:

- Document business drivers and strategy (Executive Interviews).
- Document current I/T environment, the application models, infrastructure and technologies (Technical Interviews)
- Identification of significant current solution patterns (Workshops)
- Establish an application reference architecture
- Establish a technical reference architecture
- Define I/T services (logical nodes)
- Delivery of an e-government Architecture Plan report and presentation to Missouri state government IT management

India: Tripathi et. al. [40] attempt to elaborate the selected aspects of interoperability related to the one-stop government portal for India. One-stop Government portal demands integration and interoperability. Though various technologies like SOA and web services help in achieving interoperability, yet there are several issues such as technology; organisation; semantic; legal and political matters in which the researchers are facing challenges and that need to be solved over the coming years. Dwivedi [41] discussed various e-governance projects in India as:

Bhoomi – Automation of Land Records [42] (State Government of Karnataka) It provides computerized Record of Rights Tenancy & Crops (RTC) - needed by farmer to obtain bank loans, settle land disputes etc. It has also ensured increased transparency and reliability, significant reduction in corruption, exploitation and oppression of farmers. This project has benefited 20 million rural land records covering 6.7 million farmers.

- **CARD** – Registration Project [43] (State Government of Andhra Pradesh) Computer-Aided Administration of Registration Department (CARD) impacting 10 million citizens over a period of 3 years. It has completed registration of 2.8 million titles with title searches made in 1.4 million cases. The system ensures transparency in valuation of property and efficient document management system. The estimated saving of 70 million man-hours of citizen time valued at US\$ 35 mil (investment in CARD - US\$ 6million). Similar initiatives in other states like SARITA (State Government of Maharashtra) STAR (State Government of Tamil Nadu), etc. have further built upon this initiative. CARD was one of the ten finalists in the International Innovation awards program instituted by the Commonwealth Association for Public Administration and Management.

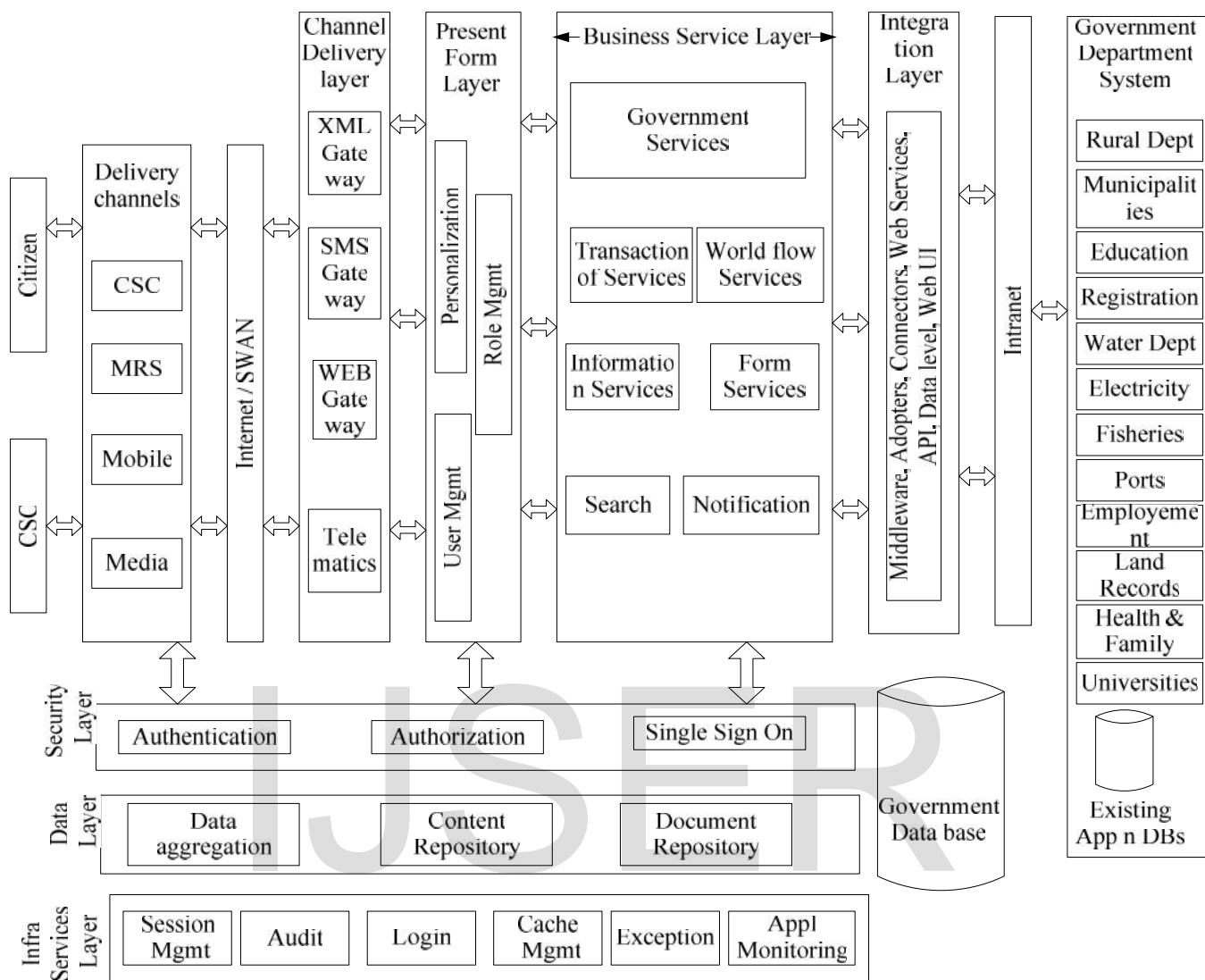


Figure 3 SOE Methodology

- Gyandoot: Intranet in Tribal District of Dhar [44] (State Government of Madhya Pradesh) This project offers e-governance services including online registration of applications, rural e-mail facility, village auction site etc. It also provides services such as Information on Mandi (farm products market) rates, On-line public grievance redressal, caste & income certificates and Rural Market (Gaon ka Bazaar). It was winner of Stockholm challenge IT Award 2000.
- Vahan & Sarathi: Vehicle registration, permit driving license project driving license project [45] (State Government of Tamil Nadu) The software developed by National Informatics Centre (NIC) for use at Regional Transport Offices is a workflow system to carry out the activities using Computers. Vahan is for processing all transactions related to Vehicles and Sarathi is for processing Driving License and related activities. Vahan

can be used to issue Registration Certificate, Fitness certificate and Permits. Sarathi can be used to issue a Learner’s License, Permanent Driving License and Conductor License to the applicant. The system was implemented on pilot basis in RTO Chennai (North). The system was then approved for implementation in all RTOs in Tamil Nadu. Vahan & Sarathi Systems have been implemented in 71 offices.

Nepal: Pokharel, [46] has considered the case of Nepalese context. In Nepal, 30 million US \$ is estimated for e-government system. This is huge amount for the country like Nepal. Issues found are:

- Not well defined standardization. Each organization develops the modules or units without making it compatible to others.

- Different way of representing data so that data from one organization cannot be used by other. There may be need of set of common data in all organizations but this system does not provide such facilities.
- Duplication of services. Same set of application programs is developed in different organization.
- Cost is very high in developing such distinct entities.
- Delay between commissioning a system and receiving is too long.

Enterprise Architecture is the solution for the interoperability. The Enterprise Architecture is not easy to implement and not also impossible. There are lot of possibility of sharing data, information, process and entire architecture. This makes the organizations to reduce the cost and increase the productivity. This method also increases the system reliability and reduces the time to market and ultimately satisfy the customer.

Bangladesh: Rahman [47] propose an effective framework for implementing electronic governance (e-governance) and e-services in developing countries like Bangladesh. As a developing country, it is not possible for Bangladesh to establish e-governance in all the sectors at a time. It is essential for Bangladesh to implement e-governance hierarchically. One of the main issues for implementing e-governance in developing countries is expense. The huge expense of implementing e-governance often turns the e-governance implementation project into an abandoned one. E-Governance requires proper infrastructure for implementation. This an inseparable major issue of the exercise of e-governance too. For developing countries, this is a dire point of concern. In order to facilitate e-governance, the essential infrastructure involving computer, internet and human resource is still now a great problem for Bangladesh.

China: Chen e.t. al. [48] propose a three-dimensional model for e-government development in this paper, based on existing theoretical and empirical studies, as well as our practice and experience in China's regional e-government development. A novel feature of our model is that it connects the three major influencing aspects: the stage of e-governance, the functionality of e-government, and the effectiveness of e-government.

VI. INTEGRATION TO VARIOUS DEPARTMENTS

Integration strategy in e-governance is very critical as most of the departments might have built their own application and run in silo form. These departments need to be integrated to the E-Governance Portal to achieve better citizen service. The E-Governance Portal works as a single source of information for all government content, and provides front end or start point for all the government services provided by the various government departments. The functionality of departmental applications and services provided by the departments is made accessible on E-Governance Portal as services using web services technologies. Web service based implementation of transactional government services will make them reusable, easy to integrate, interoperable and easily accessible. The

following diagram summarizes the various integration approaches to be adopted for integration to E-Governance Portal services.

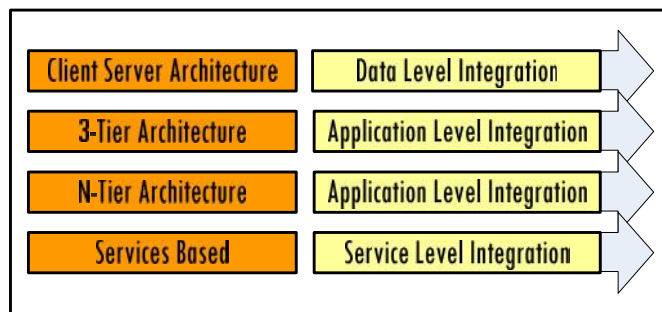


Figure 4 Integration Approaches

VII. CHALLENGES IN E-GOVERNANCE

The prime challenges in E-Governance in civil service 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 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.

VIII. VISUALIZING FUTURE TREND

Cloud computing provides a new service consumption and delivery model inspired by Consumer Internet Services. Cloud computing drives down costs and accelerates cost reduction benefit. Cloud is making rapid inroads. E-Governance with cloud computing offers integration management with automated problem resolution, manages security end to end, and helps budget based on actual usage of data. At a global level, Cloud architectures can benefit government to reduce duplicate efforts and increase effective utilization of resources. This in turn helps the government going green, reducing pollution and effective waste management. Enterprises and Small and Medium businesses are already reaping the benefits of cloud by using the pay-as-you-use service model, its massive scalability and ready availability. Since government requires a massive infrastructure it is important for government to use cloud computing on long term basis.

A unified e-government infrastructure, based on cloud and SOA architectures [49] is required, that paves the way for inter-agency information sharing and workflow and is enabling the delivery of seamless services to the public. Cloud architectures allow rapid deployment of turn key test environments with little or no customization.

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 are shown in Table 1.

Table 1 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" [52] is being developed to enable various Ministries to collaborate.
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 [50]

As majority of the commercial applications are now on cloud environment, so it can be potentially predicted that cloud computing is going to be one of the preferred platform in both developed and developing countries. Therefore, in line of

visualizing future of e-governance application, following advantage factors can be mentioned in the area of cloud computing. The domains 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 [53].
- **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.

IX. CONCLUSION

The current paper discusses about the related studies done in the past for illustrating various standard framework in e-governance related to the civil/administrative services. The discussion finally provides a comprehensive dimensionality of the theoretical and practical architectures in practice already for the design of e-government portals. The paper has discussed some of the key design considerations and certain significant practices connected with software architecture of e-governance. However, it can be said that the study for the exploration of an efficient e-governance for cost effectiveness and user friendliness will encounter lots of technical challenge incoming days due to increase of user base and tradeoff in software developed and services availability with the modernization of internet applications. Also, we will like to give a specially stress to the adoption of the cloud computing as an emerging technology that will exponentially increase the technical potentials of e-governance with large scope of adoption.

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