

A Framework for e-Government Interoperability in Indian Perspective

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Abstract: Globally Governments are taking efforts for their interoperable e-Government (e-Govt) system to provide one stop services to its stakeholders. In India, it will be more complex than other countries due to the multi-tire administrative structure, diversity of culture, and dissimilar process management methods in various Govt departments. The e-Govt interoperability (e-GI) among administrative structure of a country comply one stop service delivery. Many of the global tigers have successfully used Enterprise Architecture (EA) paradigm for their e-GI and Service Oriented Architecture (SOA) for integration of their e-Governance (e-G) services across ownership boundaries. Government of India (GOI) has taken several initiatives to leverage e-G in the country with high importance given to citizen-centric service delivery and step forward with various triumphs in the e-GI arena. This paper: 1) analyzed the needs for e-GI in India and investigate the leeway of EA in Indian context and 2) proposed a framework and Service Oriented Government Enterprise Architecture to achieve the e-GI for one stop service delivery in Indian perspective. This effort is helpful to arrive at a mature e-Govt system in India that is expected by GOI in 2020.

Keywords: e-Governance; e-Government Interoperability; Enterprise Architecture; Government Enterprise Architecture Framework; e-Government Interoperability in India; Service Oriented Government Enterprise Architecture.

I. Introduction

Since the late nineties the traditional governments started using modern Information and Communications Technology (ICT) like Internet, in their governance process, results the electronic government or e-Government (e-Govt)¹ and the electronic governance or e-Governance (e-G)² [24]. The e-Govt is defined as “the application of electronic means in transactional exchanges of government services and information between government, employee, citizen, and business” [15], [46]. The e-G is the automated administration processes accessible on-line [17]. It aims to provide effective and efficient services to its stakeholders in a single window. This necessitate the e-Govt become a seamless government [20]. All the Govt agencies in a country working together as a single entity to generate response to stakeholders will leads to

a seamless e-Govt [19]. It is evolving through different maturity stages, from disseminating the digitized information to integrate these information silos [28]. The final stages require a seamless exchange of information across governmental departments, it is apparent with the e-Govt Interoperability (e-GI)³ [26]. It is the ability of diverse e-Govt systems to work together [9], [32]. It can be achieved through the two methodological tools, e-Govt Interoperability Framework (e-GIF)⁴ and National Enterprise Architecture (NEA)⁵ or Government Enterprise Architecture (GEA)⁶ [38], [22], [29]. Many of the Govts have developed their own e-GIF and NEA [36], [3].

Government of India (GoI)⁷ recognizes that e-G is a strategic tool for transforming Govt, for improving the quality of services provided to its citizenry [52], [4], [25]. The developing nation like India with diversity of people, demography, cultural backgrounds, and income has a very complex administrative structure with departments or Govt agencies at central, state and local level [41]. Accordingly, e-G is a complex process and the distance from e-Govt to seamless government is too long and more complex [40] in India. There are many e-G initiatives in India, but they are islands of attempts at different administrative levels, resulted with multiple systems and duplication of data and efforts [43], [52], [34], [45]. So that e-GI is required to integrate these initiatives. The ICT department of India envisages that Enterprise Architecture (EA)⁸ is a solution for this dilemma [55], [6], [11]. In view of this, India step forward with various triumphs in the e-GI arena [4], still more efforts are needed to place an EA. In this paper, we analyzed the needs for e-GI in India and investigate the leeway of EA in Indian context, based on publicly available documents and literatures.

EA deals with the infrastructure and business components of an enterprise [36]. It doesn't do much on business functionality or services within an enterprise system [31]. Hence, EA alone is not enough for a multifaceted service-centric system like e-Govt [33]. It requires the

¹ e-Govt - e-Government

² e-G e-Governance

³ e-GI - e-Govt Interoperability

⁴ e-GIF - Government Interoperability Framework

⁵ NEA - National Enterprise Architecture

⁶ GEA - Governance Enterprise Architecture

⁷ GoI - Government of India

⁸ EA - Enterprise Architecture

potential to interact with system components like people, process, and technology [8]. The Service Oriented Architecture (SOA)⁹ has the ability to interoperate with other system components within a single ownership enterprise and also across different ownership domains [44], [7], [8]. Consequently, the application of SOA technology in EA paradigm executes the integration of enterprise applications [8], [51]. As per IBM, the concurrent use of comparable technologies EA and SOA resulted overlapping of architecture domains but tricky use of this is most beneficial for a multifaceted administrative system [31]. We highlighted this opening in our proposed framework.

India implemented many e-GI initiatives like, a national web portal, common support Infrastructures including national and state service delivery gateways [6]. It starts its journey to a NEA by setting e-GI standards for a national e-GIF named, Interoperability Framework for e-Governance (IFEG)¹⁰ [52]. Therefore the commencement of EA paradigm is possible in India with the existing amenities. But it requires a strong policy changes and mindsets of administrative people in different levels of Govt structures in India. A conceptual framework for e-GI for integration of e-G services is perfectly adequate in this context. Still, there is no attempt to develop a comprehensive framework by using EA and SOA for the existing Indian scenario. This paper tried to presents a Service Oriented Government Enterprise Architecture (SOGEA)¹¹ for e-GI in India based on the framework which was presented in our previous work [12].

This paper is organized as follows. The introductory section follows description of e-GI. This section analysed the needs of e-GI in India and investigate the leeway of EA in Indian context as a possible solution for e-GI. Next section explains the EA, EA Frameworks (EAF)¹² and Government EAF (GEAF)¹³ in a broad perspective and list out the globally developed EAF models for e-Govt. Subsequently the related works and proposed framework with description of main components has presented. Next section explains the SOGEA, it includes the activities of an SOGE with a case study. The paper concludes with the potentials and pitfalls of the framework, and future work.

II. The e-Government Interoperability

The e-GI is the ability and agreement between the fragmented administrative reforms of e-Govt system to communicate each other [33]. It is defined as the “ability of two or more diverse e-Government systems or components to meaningfully and seamlessly exchange information and use the information that has been exchanged” [27]. This leads to the interoperation across e-Govt system [20], [48]. Achieving e-GI is not a single step process, it is evolved in a numerous incremental activities span over time and a noteworthy infrastructure of people, process, technology and knowledge required being in place [26], [49]. It can be accomplished through the methodological tools e-GIF and NEA [29], [47]. The e-GIF is a catalogue of standards and guidelines that should be adopted

by different e-Govt agencies for the interoperation [22], [44]. NEA is a national wide architecture, consists of a comprehensive description of key elements and its relationships of Govt enterprise [21], [36], [32].

A. The e-Govt Interoperability in Indian Perspective

India started using ICT during seventies with in-house Govt applications to manage data intensive functions related to elections, census, tax administration etc. It progressed towards the technological infrastructure for delivering the services and information processing [25]. GOI carried on its e-G journey with important policy initiatives in 1999 as a major milestone and go ahead with the introduction of national strategy, National e-Governance Plan (NeGP)¹⁴ in 2006 [41]. NeGP stipulated a model for e-G initiatives with the evolutionary stages like Information, Communication, Transaction, and Transformation [14]. India has crossed the first two stages i.e., almost all the Govt departments/ministries have hosted their own websites. The stakeholders can collect information, contact officials and can communicate to the Govt through these windows [34], [43]. Currently India is on the verge of the third stage and planning for the final stage. In the third stage the scattered systems at different levels (vertical) of Govt have to be integrated for inter-and-intra-departmental transaction. In the transformation stage, different functions and services (horizontal) of isolated e-Govt systems have to be integrated [35]. The last stages require seamless exchange of information across e-Govt departments and it is apparent with the e-GI.

There are several initiatives by different e-Govt agencies in the central, state and grass-root level and many of them providing excellent services to their stakeholders, but some are still using legacy systems and manual process [16], [42]. To share these islands of excellence across the country, a national wide e-GI is required in India. The e-Govt agencies are developing their own systems to provide better services to their consumers, without knowing other department’s systems and also without considering the integration. As a result multiple applications have generated with the duplication of data and efforts [16], [52], [54]. It increases cost and complexity. The solution is the reusability of these software components in the e-G applications across the country. It is possible only through e-GI within the country.

Thus, e-GI in India is needed to:

- Reach the final stages transaction and transformation
- Share the island of excellent systems across the country
- Integrate the independent applications developed by different governmental agencies in the country
- Avoid the duplication of data and efforts
- Reuse the components of applications among different e-Govt agencies
- Achieve life-events requirements of citizens without directly visit to the Govt offices in different locations.

India implemented various initiatives in the e-GI arena. It envisages a set of core policies and infrastructure facilities to provide an integrated service delivery [6]. India developed a national web portal called e-India Portal, and state portals [4]. GoI developed a national e-GIF, named Interoperability Framework for e-Governance (IFEG) in India [9] and sets

⁹ SOA - Service Oriented Architecture

¹⁰ IFEG - Interoperability Framework for e-Governance

¹¹ SOGEA - Service Oriented Government Enterprise Architecture

¹² EAF - Enterprise Architecture Framework

¹³ GEAF - Government Enterprise Architecture Framework

¹⁴ NeGP - National e-Governance Plan

policies and standards for various domains. It includes a national policy on open standards [5]; standards for technical areas and non-technical areas [58]. India initiated the Common Support Infrastructure such as State Data Centers (SDC), State Wide Area Network (SWAN) and Common Service Centers (CSCs) [6] and then setting up the Gateways for connecting e-G services on multiple technologies/platforms under different administrative domains across the centre, state and local governments as, National e-Governance Service Delivery Gateway (NSDG)¹⁵; State e-Governance Service Delivery Gateways (SSDG)¹⁶; and Department/Ministry/Domain Gateways (DSDG)¹⁷ [59].

Standardization is a valid entry point into the EA journey for many countries [36]. GOI envisages NEA as a tool for e-GI [6], [55]. India also starts its journey to EA by implementing many initiatives discussed above. Thus, the commencement of EA is possible in India with the existing amenities which are mentioned above.

III. Enterprise Architecture

An Enterprise is a cross-organizational entity that supports a defined business scope and mission [44]. The interdependent entities like people, process, and technology are work together and share information for a common mission [50], [37], [56]. The architecture is defined as “the fundamental organization of a system embodied by its components and their relationships to each other and to the environment, and the principles guiding its design and activity” [21], [10], [8].

The structural design of an enterprise is called Enterprise Architecture [10]. It comprises the enterprise components or business components with its properties and relationship [36]. CIO Council of US defined EA as “a strategic information asset base, which defines the mission, the information and technologies necessary to perform the mission, and the transitional processes for implementing new technologies in response to the changing mission needs” [1].

EA has been rapidly evolving since the early 1990s [37]. EA is a tool for standardization issues, integration and interoperability [38], [21], [32]. There are many perspectives and views on single EA and this leads to individual domain-specific holistic description called layers [33]. The main layers of an EA are: Business Architecture, Application Architecture, Data Architecture and Technical Architecture [11], [36]. The person who is responsible for developing the EA, using various business methods, analytical techniques and conceptual tools, is an Enterprise Architect. They produce lists, drawings, documents and models, together called artifacts. Architects use any appropriate framework to design the enterprise [37], [2], [40].

A. Enterprise Architecture Framework

Framework is defined as “It is a logical structure for classifying and organizing complex information systems” [1], [37], [21]. An EAF is a means for structuring and classifying information of an enterprise in the form of architecture models and views [56], [10]. The framework does not contain the EA itself, EA is distinct from EAF [37]. Many organizations can use the same EAF, but each EA with its

content is organization-specific [1], [10]. Figure 1 shows an EAF.

The EA concept was introduced by John Zachman and published an EAF as an Information System Architecture Framework in 1987, republished a revision of it on 1992 [37]. There are several EAFs were developed by different agencies for interoperability issues for their enterprises in nineties [30], [36], [26]. All of these have either referred to or used Zachman’s framework [40], [56].

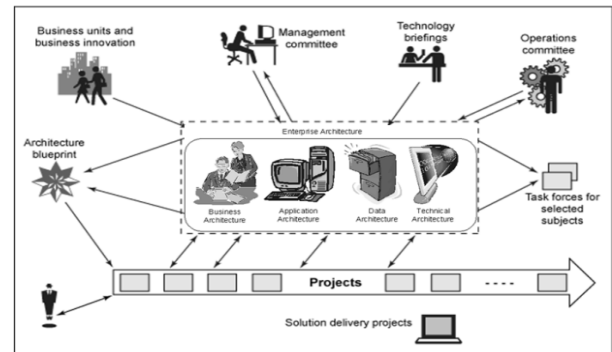


Figure 1. Enterprise Architecture Framework

A. Government Enterprise Architecture Framework

A Govt can be considered as a multifaceted enterprise [32], [40], [38]. The framework for e-Govt means that the logical structure of the e-Govt system and is known as GEAF [44], [38]. A proper EAF can be used for the e-Govt to fit all the elements together and work well with minimal investment. It facilitates Govts and departments as a whole, to provide citizen-centered service delivery [50], [36], [40].

There were several EAFs developed by different agencies, though there were no efforts for e-Govt still 2002. U.S. Office of Management and Budget (OMB) made the first attempt by their Federal Enterprise Architecture (FEA) in 2002 [37]. It was a business-based framework for a Govt-wide, cross-agency improvement with five reference models [29].

After that, there were several initiatives in this direction by different e-Govt agencies in different countries. The other frameworks developed for e-Govt are: Department Of Defense Architecture Framework (DODAF), The Open Group Architectural Framework (TOGAF), Treasury Enterprise Architecture Framework (TEAF), National Association of State CIOs EA (NASCIO), Federal Enterprise Architecture Framework (FEAF) of the U.S. government, e-services development framework of UK, IBM EA framework, and National Institute of Standards and Technology (NIST) EA Model [30], [31], [40], [26].

IV. Related Work

Globally there have been several attempts to analyze applicability of EA and SOA to the e-Govt system in recent years. We considered such a literature which highlighted the Indian context and summarize in Table 1. Some of them analyzed the existing EA concepts and methodologies and proposed a framework for e-Govt in India [11], [40]. Some literature proposes SOA instead of EA for e-Govt [23], [16]. IBM proposes the concurrent use of comparable technologies EA and SOA in an administrative system. From their practical

¹⁵ NSDG - National e-Governance Service Delivery Gateway

¹⁶ SSDG - State e-Governance Service Delivery Gateways

¹⁷ DSDG - Department/ Ministry/ Domain specific Gateways

experience, they concluded that this resulted overlapping of architecture domains but tricky use of these two in an IT based business enterprise is most beneficial [31].

EA focuses on enterprise components and its relationships; it doesn't do much on business services. Thus, EA alone is not enough to manage e-Govt system. As per IBM the use of SOA concepts in an EA framework can solve the interoperability issues and thus integration of business services in an enterprise will become a reality. We highlighted this opening in our proposed framework for e-GI to the integration of e-G services in the context of India. Still, there is no attempt to develop a comprehensive framework by using EA and SOA technologies in the existing Indian scenario. In this paper we elaborated our proposed framework [12] with a SOGEA in the perspective of India.

Table 1. Summary of Related Works

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| <p>Mahapatra, R. et.al. 2007: They analyzed the barriers of e-G in India and suggest a solution as the initiation of EA. The existing EA concepts and methodologies have been analysed and then emulate the Zachman's framework by finding the answers of six linguistic interrogatives: Who, What, Where, When, Why and How in different perspectives of Indian context.</p> |
| <p>Ahuja, A. et.al. 2007: This paper discusses various issues related to lack of EA by collated feedback from various Govt departments in India. Based on this they recommended the required reference models towards an EA enabled e-G in India and suggest EA is a promising tool for e-Govt.</p> |
| <p>Chakravarti, B., 2008: This paper analysed the existing e-G service delivery scenario (AS IS assessment) in four states of India and locate the requirements of a common platform for all govt services. By these requirements they proposed a SOA based portal and designed an overall architecture for this.</p> |
| <p>Behara, G.K., 2009: This paper highlights the benefits of the Service Oriented E-Governance (SOE) based solution in India. They suggest that SOE transforms the existing applications, data, and content into web services without reengineering the applications and describing the steps to achieve SOE.</p> |
| <p>IBM, 2009: The architecture and organizations structures of SOA and EA based governance process were compared from their practical experience of managing the IT projects. EA focuses on strategic level governance like defining business components to achieve an overall enterprise goal while SOA focuses only on the tactical level of business services. SOA addresses only a subset of EA domains and its scope limited to business services and their management. They concluded that even if there is an overlap in EA and SOA for the scope of influence, organizations structure, processes, and architectural domains, application of SOA in an enterprise where EA has been established is most beneficial.</p> |

V. Framework for e-GI in India

A. Background

The administrative structure of India is far different from other countries. It is more complex with multi-tire constitution of departments or Govt agencies at central, state and local level [41]. There are several e-G initiatives by different e-Govt agencies and some of these provide excellent services to its stakeholders through their own websites [40]. But these are islands of attempts at different administrative levels resulted with multiple systems and duplication of data and efforts [16], [42], [52]. One stop service delivery by integrating these application silos with reusing the software components is the only solution to this dilemma. This

integration is possible only through the e-GI in all levels across the country. In India it becomes difficult due to its multifaceted administrative structure, diversity of culture, and dissimilar process management methods in various departments [41]. Though, GOI wholeheartedly tried for the hi-tech Govt system in a step-by-step process. This system brings the Govt and its services closer to its citizenry.

GOI envisages EA paradigm is a tool for the e-GI to deliver integrated e-G services through a single window [6], [55]. EA mainly focuses on defining business components, addressing integration patterns, and dealing with infrastructure. It doesn't do much on business services [51]. Hence, EA alone is not enough for a multifaceted service-centric system with multilevel Govt agencies under distinct ownership like e-Govt [32]. SOA is not concerned with the development of business architecture in an enterprise. Instead, it uses the outcome of business processes and other business architecture artifacts as input to identify business services [51]. SOA has the potential for organizing and utilizing distributed business functionality that may be under the control of different ownership domains [8], [2]. SOA technology is also required for the service management within e-Govt enterprise structure [39], [53]. So that EA based e-Govt system can make use of SOA as a sub domain to exchange value between independently acting participants. This leads to a SOGE system.

GOI developed e-India portal, which envisages single window access of Govt information and services in a multilingual form. Set a national e-GIF called IFEG, which is a catalogue of standards, policies, specifications and guidelines for governing the information flow across various Govt sector agencies. India introduced the e-Governance Service Delivery Gateways for common interface between service consumers and service providers of e-Govt system. In this context, a comprehensive conceptual framework is adequate in India. Hence, in our previous work [12], we proposed a framework for e-GI through EA and SOA by using the existing amenities in India.

B. The Proposed Framework

The proposed framework is a GEAF for India; intend to deliver integrated e-Govt services to its stakeholders. GEAF includes all the elements of a Govt enterprise like strategic plans, business processes, resources, systems, infrastructure, architectural domains, and principles and guidelines for the inter-operations. This elucidates the cross-organizational interdependent entities and their relationship of an IT oriented, service-centric Govt enterprise system. The components of the GEAF work together and share information for a common mission and a defined business scope [44]. An e-Govt is a multifaceted IT oriented enterprise [38], [10], [32], [8]. The entities of e-Govt system operate together towards the delivery of services to its stakeholders [53], [2], [8]. The e-Govt system addresses the interaction between service consumers and service providers in different administrative level to deliver efficient and effective governmental services to its citizenry.

The proposed framework aims the seamless exchange of data and information between Govt agencies in different geographical locations across India by means of the e-GI. In this framework, the service-centric EA based e-Govt system made use of SOA as a sub domain. This comprises a SOA

based portal which is a platform for all the stakeholders to interact with the e-Govt agencies or the Govt departments. The stakeholders are the service consumers and these departments are the service providers. The e-India portal is a logical front-end of the overall GEAF. The framework executes the interoperation between the service-consumers and the service-providers through the portal. The basic mechanism for delivering Govt services in the proposed framework is shown in Figure 2.

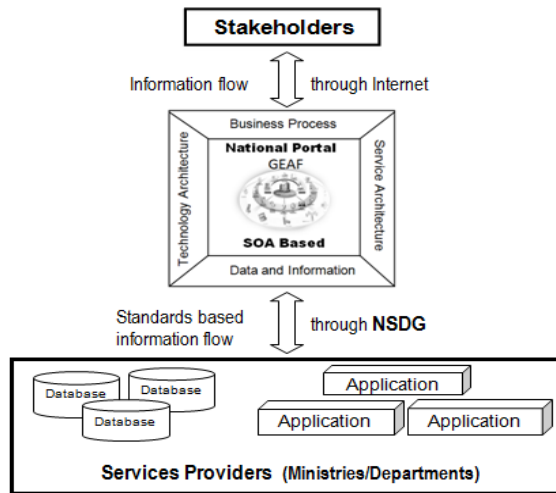


Figure 2. Framework for e-Govt Interoperability in India

C. The Components

The main entities of the proposed framework are:

- Stakeholders
- National Portal
- Service providers
- Architectural domains
- Service Delivery Gateways

1) The stakeholders

The stakeholders: The main stakeholders of e-Govt system in India are citizen, business, employees and governments. Thus the main functions of e-Govt system are the communication between Govt and these stakeholders i.e. G2C, G2B, G2E and G2G [14], [6]. The communication channel is internet and they can requests for the Govt services through a common platform, a national portal, as the web-based services. The stakeholders are the service consumers.

2) National Portal

A SOA based national portal is an easy means for availing Govt services [16], [53]. This national portal has the efficiency to act as the front-end of the overall GEAF. It operates as the mediator between the stakeholders and the e-Govt agencies or departments [16]. This help to provide integrated Govt services by quickly combine, build and deploy new services across different departments. It is a platform for plug-in reusable components which are defined and published as service repositories.

The e-India portal is currently a router to other websites [4], [42]. This is static in nature so that they do not allow online transactions. But the proposed portal provides a single window online access to the information and services of

e-Govt agencies, at different levels in a multi-lingual form. It is expected to become central repository over 6500 Govt websites of various categories of content namely forms, acts, rules, services, schemes and documents. Currently, the National Portal Coordinators (NPCs) are nominated from each of the State to contribute the contents [4]. The e-India portal can be uplifted to online portal in a matured e-Govt system.

3) Service providers

The entire Govt agencies under centre, state and local administrative body in the country are the service providers in this GEAF. The Govt agencies provide the public services by the request of the stakeholders through the national portal.

4) Architectural Domains

GEAF generally consists of individual architectural domains like Business Process Architecture (BPA), Services Architecture (SA), Data and Information Architecture (DIA), and Technology Architecture (TA) [11], [31], [2]. BPA concerns about listing various operational procedures of services, defines cross-agency services, enabling departmental communication, and standardizing the processes for interoperability and reuse. SA concerns about defining set of services, their relationship and dependencies and the processes to be followed for each services offered by the different Govt agencies. It also defines the application architecture of each service for different tiers as modules. DIA concerns enlisting all the data elements associated with services, the data and metadata associated with this and also the standards based open data systems facilitate integration and interoperability. TA defines the software and hardware technology platforms based on standards for flexibility, interoperability, security, and modularity and also describes how technology is supporting the delivery of service components and relevant standards for implementing the technology [11], [23]. The architectural domains can be the reference models over the periods.

5) Service Delivery Gateway

The heart of GEAF is a Government Service Bus (GSB)¹⁸ [16], [23] which is a platform for standard based information flow between the Govt departments in the country. It should have the ambience for a multi-platform backbone of the Govt portal and facilitate the interface for messaging, communication, and security of the portal. The foundation for a GSB is a services gateway and acts as a service broker between service consumers and providers [53]. It provides access to all known services of various administrative departments through the national portal. Thus a gateway helps to provide single window access for a consumer who wants to get the public services from any of the Govt department.

GOI initiated e-G Service Delivery Gateways to accomplish a standard based interoperability among heterogeneous entities in the Centre, State or Local bodies of the Government [6]. It acts as messaging middleware and intelligent hub for e-G services and provides seamless interoperation by exchanging data and information between e-G application silos. It routes service requests from various stakeholders to the service providers and return services back to the stakeholders as web

¹⁸ GSB - Government Service Bus

services [57]. The central gateway, NSDG acting as a nerve centre for multiple Service Providers (SP), across the Centre, State, and local governments, i.e. all e-G service gateways in the country working together as a single network under this central gateway. State wide network, SSDG is providing standards-based message switching, seamless interoperability and exchange of data across independent and diverse entities of the States. The department specific gateways, DSDG facilitate the interoperability within a local administrative body [59].

VI. Service Oriented Government Enterprise Architecture

The proposed framework for e-GI leads to a SOGEA that enables the SOA based e-Govt system. Like any other enterprise, the e-Govt is also a platform for people to conduct their business. The business is any shared activity whose objective is to satisfy participant’s needs [8]. The enterprise system has the methods to fulfill defined set of needs, these are called the capabilities. A defined set of business aligned tasks of a business is the business functionality. Service is the mechanism by which the needs and capabilities brought together for the business functionalities [8]. So that services combine business functionality with implementation, including the artifacts needed and made available as IT resources [2]. The e-Govt system is a space in which people, processes and machines act together to deliver the capabilities in the form of services for particular needs. As a result the e-Govt is a SOGE and is an abstract realization of the elements and their relationships needed to enable SOA-based e-Govt system that is shown in Figure 3.

semi-automated agents are also involved to support a service consumer. Consumer Layer in the SOGEA acts as an interface of these agents. The services are provided by geographically distributed Govt departments under diverse ownership boundaries.

Service is delivered through the identification, design, implementation or organization, and utilization of service components. The central, state and local administrative level e-G services contain many common or public processes. Currently these are duplicated in multiple applications. In the proposed system, these generic processes could reuse with the help of central service registry. Service mediator invokes and uses other services in order to fulfill the needs. It might use a service registry to identify possible services. The Service Integration Layer in the framework aims the mechanism for service management. The enterprise includes the workflow management system for sequencing activities of business functionalities. The Business Service Layer in the SOGE includes this system.

A. SOGE Activities

Generally, in a system the entities act in order to fulfill a common objective. The main objective of the proposed framework and SOGE is to fulfill the needs of stakeholders. The entities of e-Govt system are act together to execute this objective through concurrent activities. An activity is made up of specific actions or other activities [8]. The SOGE System fulfills the needs of its stakeholders through a sequence of actions that deliver appropriate changes in the system functionality. The fundamental activities of this system are represented in Figure 4.

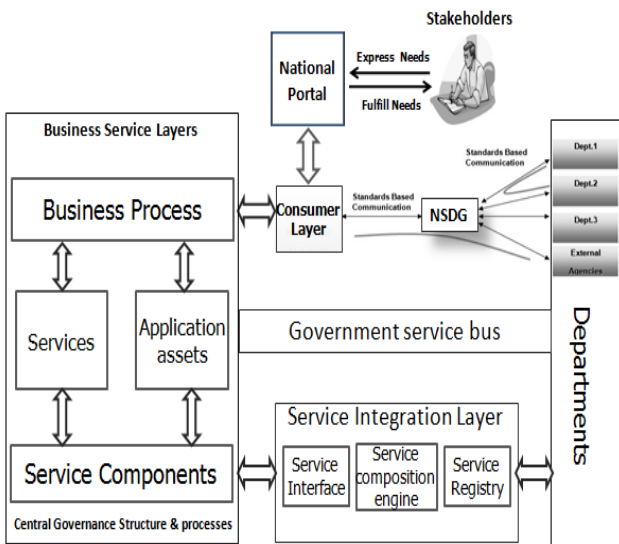


Figure 3. Service Oriented Govt Enterprise Architecture in Indian Perspective

This architecture is a solution to bridges the area between business, and IT resources with its artifacts which are distributed across ownership boundaries in the e-Govt system. So as to addresses the interaction between people and distributed systems using electronic means. The stakeholders are the persons as a citizen, employee, entrepreneur or Govt official. They consumes services directly and initiating the interactions. There are several human, automated or

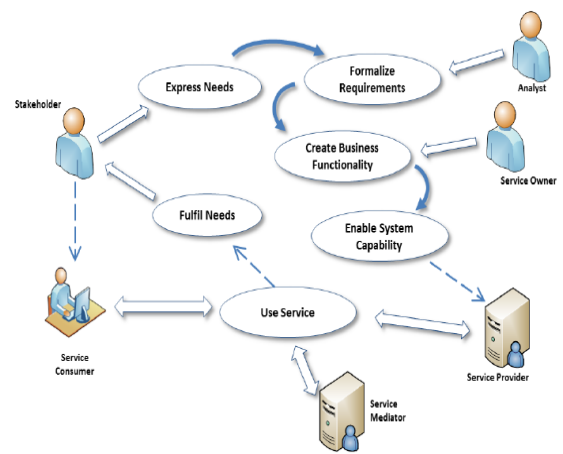


Figure 4. Basic Activity Diagram of SOGE System (OASIS, 2012)

In the proposed e-Govt system the stakeholders express their needs in a natural language through a centralized portal. Then the software agent in view of the system designer or Analyst formalizes this need into requirements. These requirements converted into business functionalities by the Business Analyst. The involvement of the system analyst and business analyst in the service design process for a central e-Govt system leads to reusability of service components for cost optimization and timely completion of e-G projects [13].

The Consumer Layer enables the system capability for the business functionality and interacts with the system. The

mediator like service delivery gateways initiates the service providers to interact with the portal through the consumer layer. The Service mediator does the service composition for the business functionalities. Target service is constructed by combining the services and service components that are provided by the concerned providers involved in the business. Then this target service is delivered to the stakeholder through the portal.

The activities of the SOGE system are sum up as follows:

- Stakeholder expresses needs in natural language
- System Designer/ Analyst formalize the needs into requirements
- Business Analyst create business functionality from the requirements
- Enable the system capabilities for the business functionality in the form of service delivery from the service providers
- Service mediator constructs the target service by the orchestration of service components or other services
- Service consumer layer act as an interface to structure the target service and fulfil the expressed needs

B. Case Study

‘Passport Service’ is a citizen-friendly e-Govt public service provided by GOI to its citizen. This is provided by the central administrative Govt agency Passport Department of India, established under the Ministry of External Affairs. The applicant’s identity is verified by the local Police Station which is come under the Ministry of Home Affairs and has no direct control by the central Department. The passport will issue as per the status of Police verification. It takes months to complete all the processes.

In an SOGE system, the passport can issue timely after completing all the formalities of issuing a Passport. This is possible by a single window service delivery system, with the coordination of the concerned departments involved in the process under the monitoring of the central e-Govt system. The activities of the SOGE system for this service will start by expressing the need in natural language. For e.g. a citizen express his need as “I want to issue a passport”. This need is formalized into requirements as Passport application processing, Citizen Identity verification, and passport issue.

The business functionalities are created by using these requirements as submission of application, scrutiny of application, Police verification, granting passport, preparation of passport, and dispatch of passport. These functionalities are implemented in the form of services and service components as processes. In this e-Govt public service, ‘Passport application processing’ is a service, and ‘submit filled application’; ‘file application form’; ‘application form verification’ etc. are the service components or the process. Some of these processes are public or generic in the e-Govt system and some are private to the concerned departments. The target service combines these public and private services and processes. As per D. K. Punia, the public and private process in the ‘Passport Service’ [18] is shows in Figure 5.

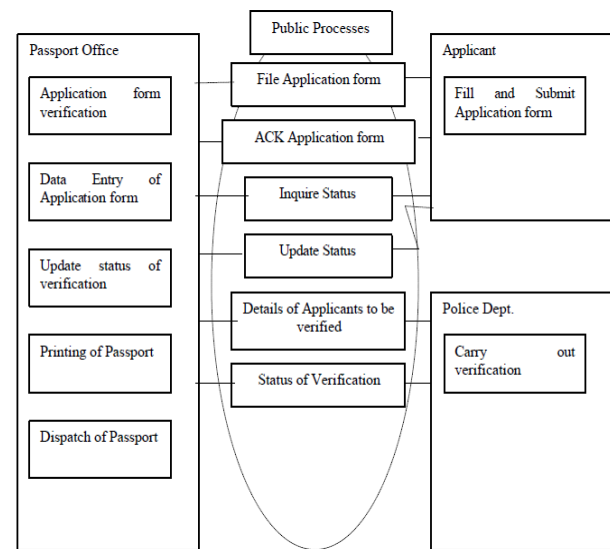


Figure 3. Public and private processes in the Passport Service

The SOGE will enable the system capabilities to execute these functionalities in the form of services from the service providers. The Service Integration Layer manages the composition and execution of the services and its components. The passport is issued to the citizen through the national portal. In the proposed framework, the passport service is executes by combining the private processes provided by the Passport Department and Police Department; and the public processes from the central service registry. For e.g., ‘Application processing’ is a service component in the Passport service. This is executed by combining the process like ‘submission of filled application’ from user interface; generic processes like ‘file application form’, ‘acknowledge application form’, and ‘application form verification’ from central service registry; and private processes like ‘application form verification’ and ‘data entry of application’ from Passport department.

VII. Potentials and Pitfalls of the Framework

The proposed framework act as a platform for connected Govt and it leads to citizen-centricity and service-centricity. By this GOI can align its IT resources to its strategic plan for enabling citizen services. This results reduction costs and complexity and also enabling business flexibility and process optimization. This framework helps to integrate present e-G applications developed by distributed administrative domains across the Centre, State, and local level. The repetition of the processes in the e-G applications causes the duplication of data and efforts. It can be avoided by a central repository of reusable service components in the SOA based e-Govt system. The portal based service delivery reduces service life cycle delivery time i.e. the stakeholders can avail the services from their homes or offices at any time. This leads to avoid awkwardness of waiting in a long queue in front of the Govt offices.

Many developing countries successfully implemented the EA paradigm in their e-Govt system. In India it is not an easy task because of many reasons including the lack of documentation in the existing system and segregation of responsibility into different levels of federal government [40]. There are many challenges while using SOA in Indian context

[39]. The initial cost for implementing SOA in large scale is very huge [16] and metadata management is very complex. Adopting a new paradigm gets a lot of resistance from the respective departments because they already running successful applications and have loathe in the supremacy of centre over the states in terms of decision making. Even though, India can diligently working towards achieving connected e-Govt system with an EA paradigm by a strong vision and policy changes in the country.

VIII. Conclusion

A developing country like India has a very complex administrative structure with diversity of people, demography, cultural backgrounds, and income through departments or governmental agencies at central, state and local level. There are many e-G initiatives in India, but they are islands of attempts at different administrative levels. The e-GI is required towards the integration of these information silos to get a single access point for e-G services. The NEA is one of the methodological tools to get this interoperability in the country. EA is a vital means to a successful delivery of e-G applications by ensuring standard based inter-operability with security and openness. India advances with many e-G initiatives and envisages integrated service delivery with a set of core policies and infrastructure facilities.

A comprehensive, conceptual framework for e-GI in India has proposed in our previous work. This highlights the concurrent use of EA and SOA in the e-Govt system to achieve interoperability and avoid duplication of efforts. The proposed framework leads to a SOGEA and is discussed in this paper. This helps to reach the transformation stage in India. The e-Governance maturity cannot be achieved in single steps; it is through years of effort. India expected this by 2020 and deliberates a micro level expansion within the country. Globally organizations are embracing a service-oriented culture within an enterprise paradigm for delivering quality services. This principle is also applied by different Govt agencies worldwide for their e-Govt system. The future work will be based on e-G service integration in the e-Govt system.

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