International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 9 (2015) pp. 23609-23620

http://www.ripublication.com

E-Governance Service Delivery Platform – Platform To Optimize SDLC, Re-Engineering Application Architecture And Elimination of Processes

V.S. Raghunathan[1], S. Dinesh Kumar[2], G. Thamaraiselvi[3]
[1] Department of Information Technology, National Informatics Centre, Chennai, Tamil Nadu
[2] Department of Computer Applications, Jaya Engineering College, Chennai, Tamil Nadu
[3]Department of Computer Applications, Ganadipathy Tulsi's Jain Engineering College, Vellore, Tamil Nadu
Email - ragunathan.vs@nic.in
E-mail -dineshvasanmca@gmail.com
Email – thamarai284@gmail.com

Abstract

e-Governance need to be build-up on the top of Good Governance inorder to provide effective Service Delivery to citizens. In this paper a new model called e-Governance Service Delivery Platform (eSDP) by offering affordable services as being proposed. The proposed eSDP model is an integrated and unified Service Delivery Platform(SDP) of e-Governance for delivering effective Government services to the society. The platform enables Interoperable services cutting across individual ministries and line Departments. The objective is to deliver optimized services to the enduser by re-engineering the way that services are offered using Construction by Configuration (CbC) and Agile Methodologies. The eSDP enables re-usable services to be registered, authored and made available in a secured way with proper authentication, authorization, permissions and privileges. eSDP optimizes the Service Delivery Life Cycle of each domain by way of re-using the shared common poll of service and components. The paper attempts to propose eSDP platform along with the measures of efficiency such as Cost, Resources and Time.

Keywords: e-Governance, Service Delivery Platform, Software Development Life Cycle, Construction by Configuration, Agile Methodologies.

Introduction

Information and Communication Technologies can enhance the transformation of work culture by serving a variety of ends, better delivery of government services to citizens, improved government interactions with business and industry, citizen empowerment through access to information and participation for decision-making and more efficient Government management [1].

In India, e-Governance started with National Informatics Centre's (NICs) efforts at connecting district headquarters through computers in the 1980s and through establishment of pan-India Government to Government, Government to Citizen network. This has provided the backbone to implement several solutions and services around G2G, G2E & G2C. To further utilize the potential of e-Governance to improve the quality of life of the vast population of the country, Government of India has formulated a national programme – the National e- Governance Plan (NeGP) [2]. Today Digital India Programme is being planned with three key vision areas 1) Digital Infrastructure & Services 2) e-Governance Services on demand 3) Digital Empowerment of Citizens. eSDP plays a critical role in implementing the Digital India Programme.

A. Drawbacks of The Existing Model of Service Delivery:

i) Citizen Based

- Citizen information and data is spread across different systems in multiple formats.
- The various stages and status of the services are not readily available to Citizens.
- Complete Workflow is not build-in and there is a gap between Inter-Departmental services.
- Citizens are required to furnish the same set of information at different point of times for availing various services.
- Non-standardized interfaces to common services like payment, document verification etc,.
- Longer Service Delivery Cycle Time.

ii) Technology Based

- System not flexible for cross sharing of services.
- Tightly Coupled Architecture induces complexity and more time for delivering services.
- The present solution architecture does not allow easy implementation of policy changes.
- High cost of maintenance & integration

B. Need For A Unified ESDP

The current state of service delivery be taken to the next level and facilitate the information systems to communicate and interoperate with each other efficiently and

effectively. The following features are envisaged as a part of the changed service delivery:

- To establish an integrated single interface for service delivery.
- To promote cross sharing of information.
- To facilitate easy accessibility of services
- To have a single and central point of authentication and verification.
- Sharing re-usable Services and Components.
- Re-engineering Applications to adopt Construction by Configuration and Agility.

C. Benefits of A Unified ESDP

The following are the benefits that can be realized with a unified eSDP:

1. Shorter service delivery life cycle.
2. Sharing of inter-departmental federated and State services.
3. Availability of Hosted Services based on,
    - Software as a Service (SaaS)
    - e-Governance Standards
4. Service Tracking and Accountability.
5. Enhanced integrated, federated services with Quality, Scalability, Performance and Maintainability.
6. Unified SMS & E-Mail alerts.
7. Saving on Resources, Cost and Time.
8. Service availability from anywhere and anytime.

D. Service Life Cycle Model

Every e-Governance application enables variety of application services to the citizens over the counters, touch screens, offices at the village, taluk, block, districts and state levels. The application services in turn use the system services in an integrated way to deliver the application services [2]. In service life cycle model fig.1 has the following four steps in the service life cycle namely Service Creation, Service Execution, Service Integration and Service Maintenance[5].

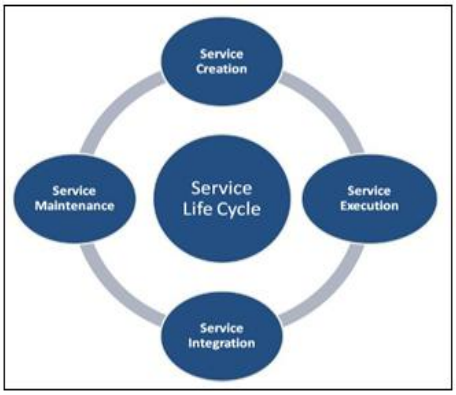

Figure 1: Service Life Cycle Model

Every service is autonomous, has explicit boundaries and abide the policies or Rules.

E-Governance Service Delivery Platform

e-Governance Service Delivery Platform (eSDP) is an evolutionary approach to Loosely Coupled Integration of services from variety of applications and systems. With the advent of the highly scalable RESTful Services under Service Oriented Architecture (SOA), eSDP establishes interoperability and scalability. Many solutions Implemented are using industry standard Web services and can be easily consumed by eSDP [2]. eSDP architecture allows isolated and loosely connected applications to exist together and exchange information by making their services available to one another [2]. It should be modular to allow integration with heterogeneous technologies.

A. *Loosely Coupled Architecture*

Tightly Coupled Infrastructure and services are constrained by underlying monolithic applications that require long period to implement a change. Hence loosely coupled architecture with distinct services is recommended to be more open to changes and bringing flexibility in the system. A Loosely Coupled is an attribute of systems, referring to an approach to design interfaces across several layers (modules) to reduce the interdependencies across modules or components – in particular, reducing the risk that changes within one module will create unanticipated changes within other modules [wiki]. In the Architecture we included the several application layer and each layer are separately operable.

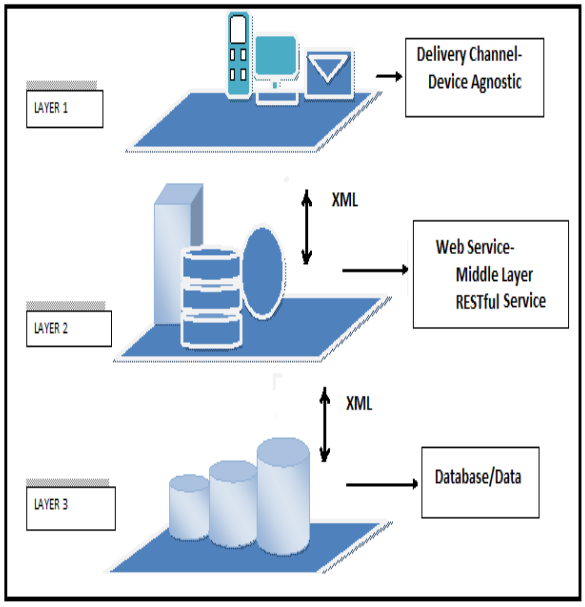

Figure 2: ESDP Loosely Coupled Architecture

In Loosely Coupled Architecture fig.2 has different layers and each layer can have different technology. The layers are made interoperable using Open Standard RESTful web services following Service Oriented Architecture. The payload uses XML which can be consumed by every layer using multiple technologies. The XML schema supports the features that are offered by eSDP model.

B. ESDP Model Architecture

Fig.3 eSDP model architecture has the participating domains on one side, the deliver channel and consumers on the other side. The participating domains include Federal and State Departments who register and share services in eSDP. The delivery channels include call centers, citizen touch point, portals, IVRS, Service counters etc,. The Business Accounts Manager (BAM) layers between the delivery channel and core elements.

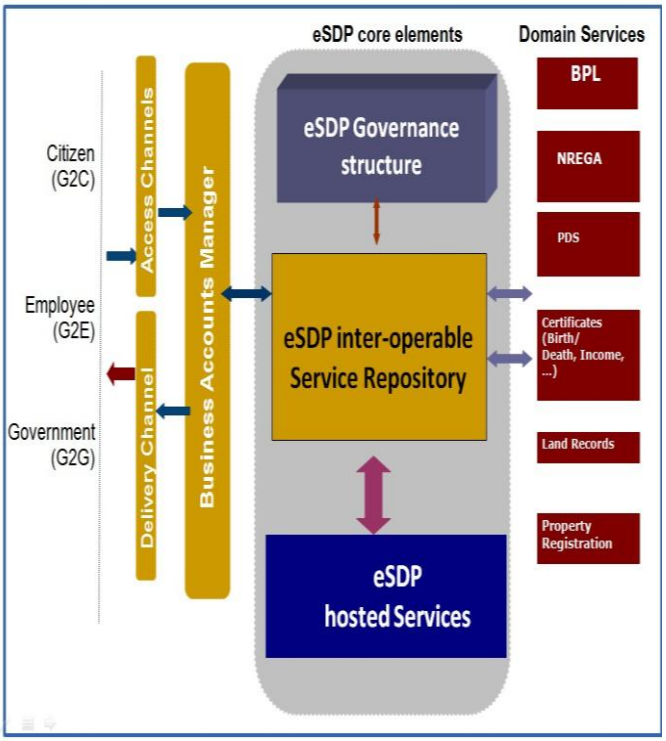

Figure 3: ESDP model Architecture

ESDP Model Architecture Has The Following Core Elements.

1. *ESDP Inter-operable service repository*: All re-usablbe services from different domains are registered here with relevant policy for sharing. This includes Registration Services, Authentication Services, Authorization Services, Verification Services, Barcode verification services, Alert based services, Web Map Services, Dashlet Services, OTP Services, Digital Signature Services[10][11], BI Services, BAM Services[7], Locational Services etc,.

These services will grow over time as they will be added as and when a new requirement comes up.

2. *ESDP Hosted Services including SaaS: The* Hosted services include the applications which follow the SaaS model. It also includes the common elements which are shared across domain such as Land Region, Biometrics Standards, Digital preservation Standards, Localizations and Language Technology Standards, Metadata and Data Standards. All these code directories and standards are made available as hosted services in eSDP to enable application interoperability.
3. *ESDP Governance Structure and policy:* It includes Authentication, privileges, Payment terms, sharing policy etc,. This also includes the governance structure which will drive the model implementation and moderate policies.

C. Innovate Services Using ESDP Service Registry

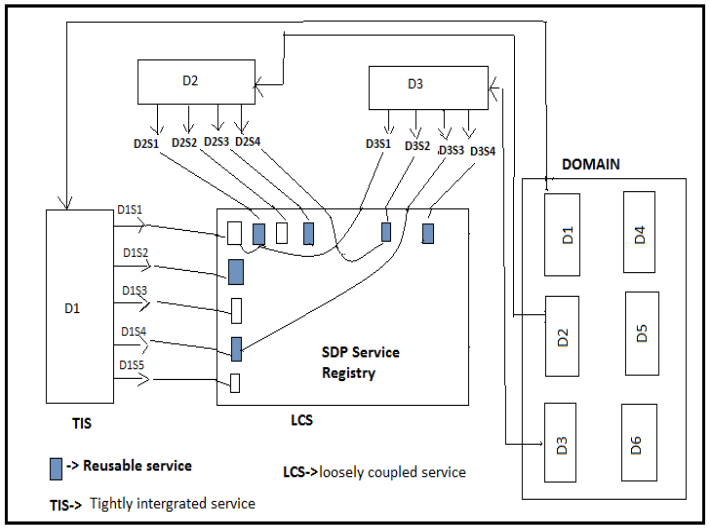

Figure 4: ESDP service registry

In the above Fig.4 describes the some of the domain process and their services offered to the departments. At first, the services are Re-defined as per the Service Oriented Architecture and provide RESTful services for interoperability. Once the service has been re-defined and registered in the eSDP service registry then those services will re-usable. The Re-usable services will be registered in eSDP service registry for maximum reusability and to deliver optimized services to every department by re-engineering the way the services are offered. Every domain application is re-engineered to offer/adopt RESTful services which are Interoperable.

The eSDP service registry which is part of eSDP Inter-operable service repository is depicted in Fig.4 The service registry includes registering services along with the key for Interoperability enabling innovation of new services to the endusers. The service registry has the federal services, state services , re-usable components and

query builders. The interoperability of services can be established using the common and standardized key elements could be based on geography(state code, district code, taluks, block code, village code etc,.), time(year, quarter, month etc,.), metadata standards, standardized domain key fields such as Aadhar number, vehicle number, voter ID, PAN ID,PIN number, deriving license number, Ration card number, Telephone number, Mobile number, email ID, Bank account number etc,. Using standardized key elements innovated new service can be made available using query builders.

NIC has built more than 4,000 e-Government services that are installed across the country. This knowledge library allows us to customize and rapidly redeploy proven e-Government solutions rather than designing every solution from the ground up [8]. The national e-Transaction count as on 1st January 2015 exceeds 93 crores with growth rate of 3.3 crores per month. Service innovation using 93+ crores will lead to variety (diversified response) and velocity(timely response)of new services. The classical example is citizen digital locker containing all reference documents using Aadhar ID announced by government of India. Identification mechanism, G2C Verification Service G2CVerification service and Person Identification mechanism, G2G Service request to be filled online/offline and submitted with one or more verifiable/non verifiable attachments G2C can make use of citizen digital locker. Standard re-usable components of eSDP consumed as a service by the departments G2G SMS Services G2C Payment Services G2G & G2C [6]. The re-usable components such as 2D Barcode can also be used to eliminate the typo graphical error, Automatic Input, Genuiness of the data and Re-usability thereby improving service quality as well.

Reenginerring Application Architecture

Government process re-engineering is a radical improvement approach that critically examines, rethinks and re-designs mission product and service processes within e-Governance space [9]. e-Governance becomes an important technological input and tool while undergoing this process.

The applications that make use of eSDP are reengineered for optimizing resources, cost and time. The reengineered application is based on Agile SDLC model and redefined making the best use of eSDP service repository containing the eSDP re-usable domain services, eSDP generic components, eSDP hosted services, eSDP new innovated services.

Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Every iteration involves cross functional teams working simultaneously on various areas like planning, requirements analysis, design, coding, unit testing, and acceptance testing.

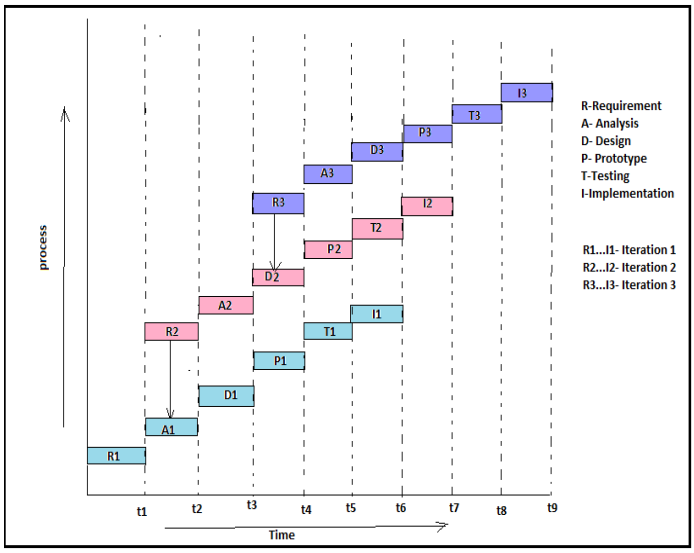

Figure 5: ESDP Implementation model for an application

The above Fig.5 defines the Agile model processes. The application has several processes, In each process Once the request has arrived, it has to start the process again and fulfill the project based on the last request[4]. As per the Agile method each process has been develop. Once the requirements are specified, then based on such requirements the project has been developed in an iterative form.

Benefits of The Model: Analysis

eSDP minimizes the processes optimizing the resources, cost and time associated with each process by making the best use of eSDP service repository containing the eSDP re-usable domain services, eSDP generic components, eSDP hosted services, eSDP new innovated services.

Optimize (Processes ~ Resource, cost, time)

An e-Governance application goes through the Software Development Life Cycle that defines all the tasks required for developing and maintaining the software. In SDLC each step has a process and cost, time and resources associated to it [3]. Fig.6 is an example online passport service with the SDLC steps Requirement, Analysis, Design, Development, Testing, Implementation etc. by making use of the eSDP resources application is re-engineered and the processes are redefined. Assuming that there are m processes $p_1,p_2,p_3 \ldots p_m$ and each process take time $t_1,t_2,t_3 \ldots t_m$ then the effective time taken for the existing application is

$$\sum_{i=1}^{m} pi * ti.$$

If we re-engineer the application using eSDP model and reduce the number of processes from m to n , then the time taken for the new application is

$$\sum_{j=1}^{n} pj * tj,\ n<m$$

The effective time saved in reengineering the application is

$$\sum_{i=1}^{m} pi * ti - \sum_{j=1}^{n} pj * tj\ n<m$$

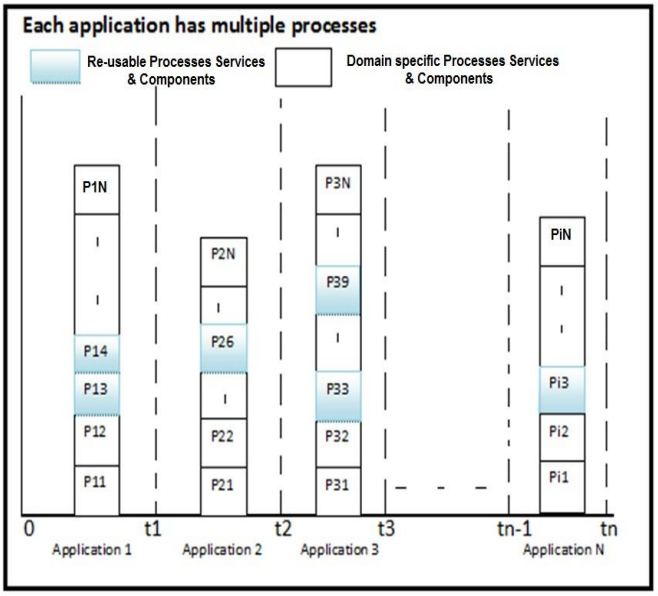

Figure 6: Re-Usable Processes In E-Governance

Common Integrated Police Record Update System (CIPRUS) means software being developed by NIC for implementation in TN Police instead of Centre provided CAS(State) suite. CIPRUS is a comprehensive software solution in monitoring the day-to-day activities of the police station. Under this project, FIRs in police stations concerned and case details will be uploaded online. This system can use many of the re-usable domain services from Jail Application System and Court Application

System at every stage of the case processing right from the case registration to all the prison activities and court activities.

In general every application under eSDP will Make use of re-usable domain services, components and hosted services. In the fig.6 re-usable services and components are indicated for N number of applications. Thus effective time saved for reengineering N number of applications of eSDP is

$$\sum_{l=1}^{n} \left(\sum_{i=1}^{m} pi * ti - \sum_{j=1}^{n} pj * tj \; n<m \right)$$

If we consider an example of an application taking 24 months normally can now be analyzed using the eSDP components, services and hosted services. Assuming that these are released during different quarters over two year period, the following table depicts the data of distribution of the release of these components, services and hosted services.

Table 1: Time Schedule of An Application Services

Released Quarter	Time for Component release	Time for Service release	Time for hosted service release	Time Before eSDP	Time After eSDP
Qr1	3	2	2	24	**24**
Qr2	5	4	1	24	**22**
Qr3	9	5	2	24	**17**
Qr4	15	10	4	24	**15**
Qr5	15	15	5	24	**15**
Qr6	18	10	6	24	**15**
Qr7	18	8	2	24	**13**
Qr8	18	9	2	24	**11**

*All data indicated are in months

Table-1 depicts typical release of the components, services and hosted services during different quarters. For example during first quarter a component is released after 3 months of development, service is released after 2 months of development and hosted service is released after 2 months of development. During quarter 5, the eSDP application which uses these re-usable components and services will take only 15 months and during quarter 7, the eSDP application takes only 13 months.

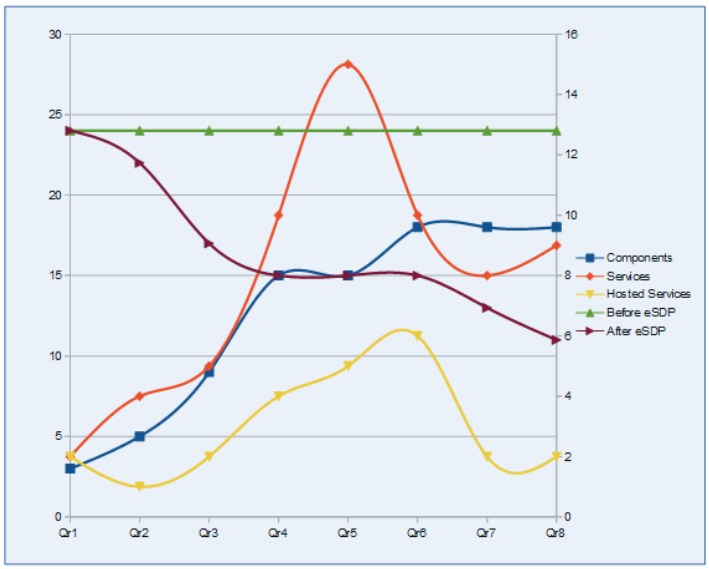

Figure 7: Time difference of an Application by using eSDP

Fig.7 is the graphical depiction if eSDP application development deployment time using the re-usable services and components. The Before eSDP series and after eSDP series clearly brings out the time gained using the eSDP model.

This ensures quick delivery of services for all applications under eSDP. When the domain services & technology components from eSDP Inter-operable service repository, eSDP hosted services are reused in the applications the resources and cost used for these services and components are fully saved. Thus the model ensures not only quick delivery of services but also reduces the resources used and cost to a large extent.

Assume that the total no. of services as Sa and Re-usable services as Sr. The total number of services (Sa) will be higher than the re-usable services (Sr) as all the services are not re-usable. And also, the total number of processes as Pa and Re-usable processes as Pr. For innovation services combining only the re-usable services and processes the cost is totally saved.

If we assume Cost of service i is (CS)i , Cost of process j is (CP)j and Cost of re-usable service i is (CRS)i , Cost of re-usable process j is (CRP)j, then the derived total cost for non-eSDP and eSDP cases can be written as

$$\text{Cost (Non-eSDP)} = \sum_{i=1}^{Sa} (CS)i + \sum_{j=1}^{Pa} (CP)j$$

$$\text{Cost(eSDP)} = \sum_{i=1}^{Sr} (CRS)i + \sum_{j=1}^{Pr} (CRP)j$$

where Sr < Sa and Pr < Pa

Conclusion

The usage of Loosely Coupled Architecture with eSDP model will minimize the workflow and optimize Cost, Time and Resources for the efficient services delivery to stakeholders through the e-Governance across various devices. Citizen enjoys quick services with less cost, reduced workflow and easy delivery of services by using Interoperable Components, services and offer eSDP service registry across various domains. And also enables service availability from anywhere anytime to the citizens. The Application Service Provider also drives benefits from eSDP by reducing the development life cycle and leveraging re-usable services and components. ASP can innovate new services by judiciously combining the available re-usable services and components. Central Ministries and State Departments can leverage eSDP by way of quickly designing and deploying the applications, quick implementation period within less time and lower cost. Information and services is anywhere, anytime monitorable. Proposed system also provides an effective tracking and accountable federated services with quality, scalable performance and maintainability of new services. Thus all Stakeholders can leverage eSDP model for effective service delivery with minimum of Cost, Time and Resources.

(eSDP- e-Governance Service Delivery Platform)

References

[1] Dr. Sanjay Kumar Dwivedi, Ajay Kumar "E-Governance In India – Problems and Acceptability", Bharti Journal of Theoretical and Applied Information Technology.

[2] National Informatics Centre, "Service Delivery Platform (SDP)", Version 3.5, July 2010.

[3] eBook," Software Development Life Cycle(SDLC)",Chapter-4.

[4] "Agile Project Management with Scrum" - by Ken Schwaber.

[5] Moriana Group, Report on Service Delivery Platforms and Telecom Web Services - An Industry Wide Perspective, 2004.

[6] Andy Johnston, Jan Gabrielsson, Charilaos Christopoulos, Martien Huysmans and Ulf Olsson," Evolution of service delivery platforms", Ericsson Review No. 1, 2007.

[7] "Business Activity Monitoring (BAM)" ©2006 webMethods, Inc

[8] Communication from the Commission, 2003, "The role of eGovernment for Europe's future", COM(2003).

[9] "Face Image Data Standard For e-Governance Applications in India", eGov.BIDS:01, Version: 1.0 November, 2010.

[10] "Fingerprint Image and Minutiae Data Standard for e-Governance Applications in India", eGov.BIDS:02, Version: 1.0 November, 2010.

[11] "Iris Image Data Standard for e-Governance Applications in India" , eGov.BIDS:03, Version: 1.0 November, 2010.