A Framework for e-Government Data Mining Applications (eGDMA) for Effective Citizen Services" -An Indian Perspective

Dr. VELAMALA RANGA RAO

Computer Programmer, Soil and Land Use Survey of India

Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

Abstract: **Governments around the world generated large data in multitude of formats and received enormous information from citizens, employees , business and other community in wide variety of formats through various channels such as traditional (Post/Fax) and/or modern (Website/Social media).Simply storing this valuable information does not provide any benefits for decision making in planning and formulation of guide lines for new projects.Therefore the government organizations can use enormous data for discovering hidden patterns, previously unknown relationships, extract meaningful information and trends for decision making.The data mining techniques can help in not only to detect fraud and security threats, but also it can be used for measuring influence facts like citizens' behavior, desire and need, that affect on improving e-government services such as Government to Citizen (G2C), Government to Government (G2G), Government to Employee (G2E) and Government to Business (G2B).**

The objective of this paper is how data mining techniques can help the government organizations in decision making from large data, which is collected from various organizations (National, State and Local level).This paper proposes "A Framework for e-Government Data Mining Applications (eGDMA) – for effective Citizen Services"- An Indian Perspective" for empowering e-government services in decision making. In this framework, the government applications are divided into two, namely; Common and Department's Specific applications. These applications are applied and examined through an exhaustive case study and reported the findings and results. This paper also examined various issues and challenges using Data Mining techniques for decision making within the government organizations.

Keywords: **Data Mining, Decision Making, Decision Support System, E-Government, Knowledge Management**

I.   INTRODUCTION

Government organizations across the world are providing services to their citizens using Information and Communications Technologies (ICT) in an easy, quick and transparent manner to improve public service delivery. e-Government is very resource intensive and normally spread multiple departments and provide information through multi channels such as fax, phone, SMS, social media. The aim of the e-Government is to provide various services to their stakeholders through a single window, to achieve this there is a need to share data across multiple departments. The e-Government refers to the use of Information and Communications Technologies (ICT) to improve the efficiency, effectiveness, transparency and accountability of government (World Bank, 2011). If attributers of good governance are transparency, efficiency, cost effective and accountability, e-Governance is the means to attain these attributers through application of technology (CAG , 2009).The relationship between citizens and government is increasingly mediated by information systems, and e-governance is clearly seen as the way forward for efficient delivery of public services (OGDS, 2010). The changes in government work

processes for e-Government and the features of ICT that enable e-Government services are given in Table [1] and Table [2] respectively.

Table [1] Changes in government work processes for e-Government [Source: UNAPCICT (2012)]	
From	To
Department-level information resource management, with a lot of duplication and redundancy among different departments.	Government-wide information resource management using a common standard and characterized by convergence.
Many government contact points and personal (face-to-face) visits to government offices	A single contact point and online access, making personal visits to government offices unnecessary
Department-oriented procedures	Service-oriented procedures
Paper-based government work processes	Electronic-based document processes

Table [2] The Features of Information and Communication Technologies that enable e-Government services [Source: (NRC, 2002)]	
Distributed-processing Technologies	Allow ICT infrastructure to scale up to support a very large number of users
Approaches to facilitate data interchange	Development of hardware and software techniques to integrate legacy systems into newer systems
Database/transaction capabilities	Development of secure and reliable, large-scale relational database, Enhanced data assurance with greater capabilities to ensure database integrity, Emergence of a standard language for database queries using Structured Query Language (SQL)
Search engines	Applications using indexes of Web content to help general users find relevant content
Date mining	Identify patterns from very large datasets

This paper is organized as follows. In Section 2, literature review on e-Government and its applications provided. In Section 3, an overview of data warehouse, data mining techniques, knowledge management for e-Government given. In Section 4, A framework, namely "*A Framework for e-Government Data Mining Applications (eGDMA) – for effective Citizen Services" - An Indian Perspective*" proposed and discussed its practical usage in various government services like G2C, G2G, G2B and G2E.This framework examined through various Common and Department specific applications used by various State and Central government organizations in India as a Case Study in Section 5. The results and findings of this case study are given in Section 6. In Section 7, discussed on key issues and challenges in implementation of data mining techniques for knowledge discovery in the Indian context and given conclusions in the Section 8.

II.   LITERATURE REVIEW OF E-GOVERNMENT APPLICATIONS

There are different types of e-Government based on using ICT to facilitate relationships between citizens, employees, and business. The types of relationships are a) Government-to-Citizen (G2C) to focus on making information accessible to citizens b) Government-to-Business (G2B) to facilitate government interactions with the private sector to procure goods and services c) Government-to-Government (G2G) to provide services to governments departments through intergovernmental

relations d)Government-to-Employee (G2E) to focus on relationships within government among employees to coordinate internal operations and improve the internal efficiency of business processes (ITU, 2008).The process of information systems development is a formal, step-by-step process (Avison et al., 2004). Feeny and Willcocks (1998) describe nine Information Systems (IS) capabilities, which are necessary to ensure successful adoption and implementation of ICT applications including: leadership, business systems thinking, relationship building, ICT architecture planning , making technology work, informed buying, contract facilitation, contract monitoring and vendor development. The fundamental principal of the database is to present unified representation of organizational data, this can be achieved by schema integration and data integration (Elaasar and Briand , 2004).When a single set of definitions is mandated for all similar applications or services, then these definitions are no longer locally optimal and therefore centralized initiative is needed (Rajesh and Amarjeet , 2011).Providing information to the stake holders (G2C,G2G,G2E,G2B), of the government through a single source of information, optimizing resources of multiple organizations and participatory decision making are some of the functions of the e-Government (Malick and Murthy , 2001).E-governance projects could be a part of some deliverables of the government to its stake holders thus grater care has to be taken entire the project development life cycle (Hatchad and Ndulo, 2004).

 Zuboff (1988) classified that information systems could be used to a) Automate (to replace manual activities) b) Informative (Provide information to management to make decisions and therefore use organization resources effectively and c) Transformative (either by transformation of its current activities or by introduction of new lines of business. Spoeher, et al., (2007) classified the public services into two types, namely Corporate services and Transaction services. a) Corporate services (also known as or back office services): providing administrative services such as human resources, finance, legal, procurement; and asset management etc. b) Transactional services: providing services such as payroll, registration of births, deaths and marriages, taxes. Ibrahim et al., (2011) categorized government applications into three categories: 1) Common Applications used by all government organizations such as human resources , financial systems 2) Applications that are used by many government organizations such as recruitment applications 3) Applications that are used by one government organization such as a core business application. The design and development of different domain specific e-government applications need some special and unique requirements. The complexity in e-government applications pose a challenge to designers and developers, because of the fragmented nature of government administration and communication process (Purao and Desouza, 2011; Abrahams, 2009). The integration of technologies to deliver government services are given in Figure. 1
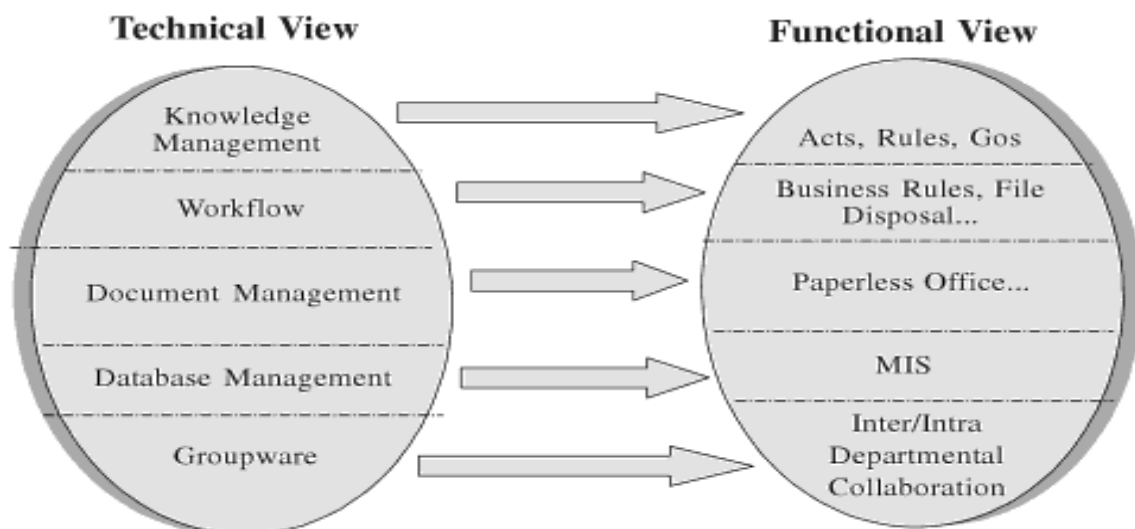

Fig. 1 Integration of technologies to deliver an electronic workplace [Source: (Satyanarayna. J, 2013)]

Subhash (2009) reported that the early government applications were focused on building management information systems for planning and monitoring). The process of information systems development is a formal step by step scientific process that does not coincide with practical experience (Avision et al, 2004).Heeks (2003) mentioned that e-Government system should

be country specific and not an off-the-shelf system from another country. Most of the government applications are not a 'One Size Fits All' solution every application must take into account the variable factors influencing that application. Because every society has different needs and priorities, there is no one model for e-government and no universal standard for e-government readiness (AI-Eryani, 2009). E-Government applications face challenges because of the fragmented nature of government administration and its communication processes (Abrahams, 2009). A top-down approach has been followed by several e-Government applications which have often not worked and the resultant system has not been able to fulfill the needs of the citizens despite the cost of these applications (Agarwal, 2007).

III.   DATA WAREHOUSING AND DATA MINING TECHNIQUES FOR E-GOVERNMENT

It is necessary to understand the concepts, data warehousing, data mining, and knowledge management by the decision makers and/or Government policy makers, for effective public service delivery. In this section, the paper gives an overview of each of these technologies.

3.1) Data warehousing

Over the last three decades, many organizations have generated and stored a large amount of data (Elmasri and Navathe, 2007) to automate the business process for efficient and cost effectiveness (Thomas and Carolyn, 2003). The amount data have exploded due to citizen behaviors, societal transformations. However the organizations are unable to discover valuable information from the hidden data by transforming data into valuable and useful knowledge (Berson et al., 1999). In recent years government organizations are realizing that simply storing information does not provide benefits to deliver public services efficiently. Now these organizations are focusing to use their operational data for decision making. It also allows decision makers to access data, that can be reveled previously unknown, unavailable, new correlations, patterns and trends (Thomas and Carolyn, 2003). To facilitate data analysis, the data warehouse to be created to store the historical data, which is maintained by different operating systems among various departments (example: Health, Education, Transport).The Data warehouse can be defined as 'A subjected-oriented, integrated, non-volatile, time-variant collection of data in support of management's decisions" (Inman, 1993).The goal of data warehousing is to support decision making with data (Elmasri and Navathe, 2007).The data warehousing improves the productivity of government decision-makers by creating and integrated data from multiple incompatible systems that provides a consistent view of the organization and transforming this data into a meaningful information. There are two types of analysis tools, namely Online Analytical Processing (OLAP) and Data mining tools (Thomas and Carolyn, 2003); OLAP uses a multi-dimensional view of aggregate data to provide quick access to information for analysis. This technology can easily answer such as Who, What, What if and Why type questions. There are three main categories of OLAP tools: Multidimensional OLAP (MOLAP), Relational OLAP (ROLAP) and Hybrid OLAP (HOLAP) (Berson and Smith, 1997).

3.2) Data Mining

The Data Mining is concerned with "The process of extracting valid, previously unknown, comprehensible, and actionable information from large databases and using it to make business decisions (Cabena et al., 1997). The data mining is a promising field of information and knowledge discovery (Han et al., 2011). Fayyad et al., (1996) defined six data mining functions are : 1) Classification is finding models that analyze and classify a data item into several predefined classes 2) Regression is mapping a data item to a real-valued prediction variable 3) Clustering is identifying a finite set of categories or clusters to describe the data 4)Dependency Modeling (Association Rule Learning) is finding a model which describes significant dependencies between variables 5) Deviation Detection (Anomaly Detection) is discovering the most significant changes in the data 6) Summarization is finding a compact description for a subset of data. Grossman et al (2001) defined five principles for the operation of data mining are**:** 1) Transparency and notice 2) Accountability, Oversight, and Redress 3) Authority and choice 4) Data Integrity and security 5) Data Appropriateness/Minimization. The evaluation of data mining is given at Table [3].

Table [3] : The Evolution of Data Mining [Source (Seyyed, 2004)]

Stage	Business question	Enabling technologies	Product providers	Characteristics
Data Collection (1960s)	"What was my average total revenue over the last five years?"	Computers, tapes, disks	IBM, CDC	Retrospective, static data delivery
Data Access (1980s)	"What were unit sales in New England last March?"	Relational databases (RDBMS), Structured Query Language (SQL), ODBC	Oracle, Sybase, Informix, IBM, Microsoft	Retrospective, dynamic data delivery at record level
Data Navigation (1990s)	"What were unit sales in New England last March? Drill down to Boston"	On-line analytic processing (OLAP), multidimensional databases, data warehouses	Pilot, IRI, Arbor, Redbrick, Evolutionary Technologies	Retrospective, dynamic data delivery at multiple levels
Data Mining (2000)	"What's likely to happen in Boston unit sales next month? Why?"	Advanced algorithms, multiprocessor computers, massive databases	Lockheed, IBM, SGI, numerous startups (nascent industry)	Prospective, proactive information delivery

The data mining applications were initially used in the government organizations to detect fraud, but they have used for measuring, improving program performance and recover millions of dollars in fraudulent Medicare payments (George, 2000). There have been reports of successful data mining applications are used in various government applications such as the healthcare (Milley, 2000), the employee's performance prediction (Hamidah et. al, 2010), prediction of the unemployment rate to make decisions and design policies (Wei Xu et al, 2013) and to identify anomalies in tax patterns (ITDMS, 2011).

3.3) Knowledge Management:

Knowledge management (KM) refers to how organizations create, retain and share knowledge (Argote, 1999; Huber 1991). KM in an organization involves: a) Identification and Development of knowledge assets b) capturing and preservation of the knowledge c)Using and sharing of the knowledge (SARC,2008).The data mining as a part of the Knowledge Discovery in Databases (KDD), it has six phases: Data selection, data cleansing, enrichment, data transformation, data mining and the reporting & display of the discovered information (Adriaans and Zantinge, 1996).The data mining can be useful for KM in two ways: (i) to share common knowledge of business intelligence among data miners and (ii) to use data mining as a tool to extend human knowledge. Thus, data mining tools could help organizations to discover the hidden knowledge in the enormous amount of data (Wang et al, 2008). The KM strategies in e-Government will demonstrate how governments can benefit from adopting strategies in e-government (Zhou Ping , 2008).

3.3.1) Knowledge Management in e-Government:

A successful e-Governance requires Knowledge Management (KM). The objectives for KM initiatives in the public sector include (Riege and Lindsay, 2006): 1) Maximize efficiencies across all public services by connecting silos of information across different levels of government and across borders 2) Develop new or consolidate systems to integrate and accessible knowledge base 3) Improve accountability and mitigating and 4) Deliver better and more cost effective services. HuiYuen Yum (2007) reported that, KM is central to information sharing and access between government agencies and between the government and the citizens. The governments of developing nations can use KM as a key driver towards increasing productively in public sector productivity and building trust in government by focusing on a few key policies and designating the appropriate department to driving these policies into effective implementations. According to a HuiYuen Yum a survey conducted in 2007 (India is one of the country), reported that all the respondents are aware of KM and have KM programs in

place, are setting the program, or examining the need for such programs. Sixty seven percent of the participants of the survey indicated that the goal of KM programs is to either share knowledge or to provide access to knowledge and expertise. This survey also reported that lack of time and lack of awareness and understanding are the top two reasons for resisting KM initiatives. Inadequate or no knowledge management practices within the Government generally lead to loss of opportunity as a result of lost institutional memory, knowledge gaps and non-availability of appropriate inputs for decision making (SARC, 2008).

IV.   PROPOSED FRAMEWORK FOR E-GOVERNMENT DATA MINING APPLICATIONS (eGDMA)

In this section, this paper describes the proposed framework, namely " A framework for e-Government Data mining applications (eGDMA)" in terms of Common and Department-specific applications discussed briefly in the Section 4.1.

4.1) e-Government's Common and Department-specific Applications:

In this framework, the government applications are classified in two, namely; Common applications and Department's specific applications: *a) Common Applications*: The most common applications are considered to address the common requirements of the departments. The applications such as Grievance Management System (G2C, G2B, G2E), Citizen's Demographic information (G2C,G2G), Employees personal management system such as Personal Pay, Leave, Loan, pension, service book (G2E), Budget, Accounts Management System (G2G), Procurement of goods and services (G2G, G2B) etc., are considered to get uniformity, reduce redundancy, time &cost. *b) Department's Specific Applications*: These applications are specific to a particular department such as Education, Health, Transport, Revenue, Police, Law etc. Therefore, we cannot mix department's specific applications with common application for uniformity among government application to get unified digital government, for an instance applications related to Food and supplied department is given in Figure 2
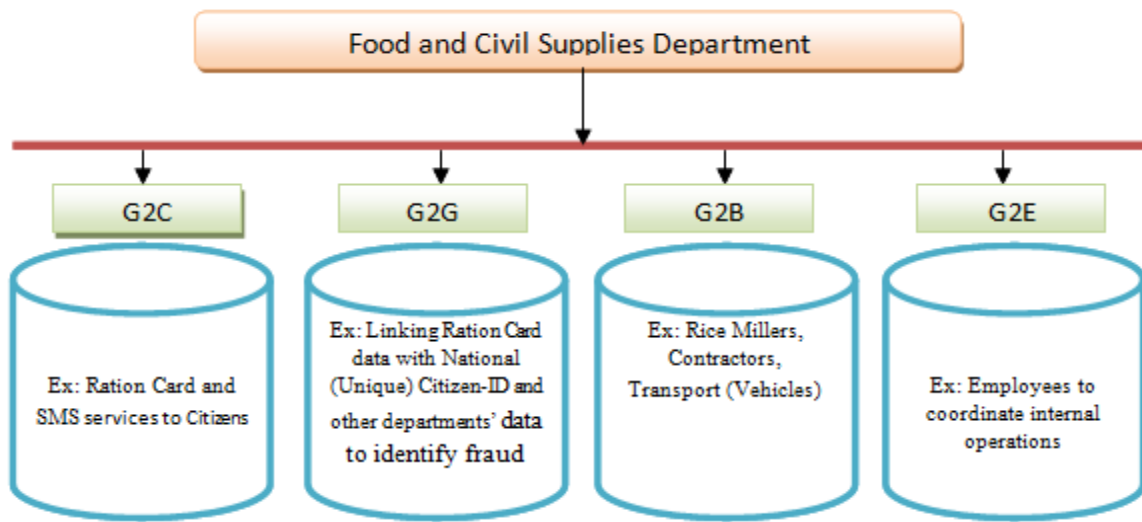
Fig 2: Some e-Government applications of Food and Civil Supplies Department

4.2) A Framework of e-Government Data Mining Applications (eGDMA):

The proposed framework for e-Government Data Mining Applications (eGDMA) given in Figure 4, has four layers, namely *1) Users*: Citizens, Employees, Business, Government departments *2) Channels*; multi-channel services such as traditional, for example postal (regular mail), phone, face to face and Modern channels like Mobile (SMS), Kiosk, Citizen Service Centers (CSCs), website, call center *3) Applications:* Common and Department-specific applications and 4) *Business layer* have Data warehouse, Data mining, modeling and reporting for decision making to improve the performance in public services.
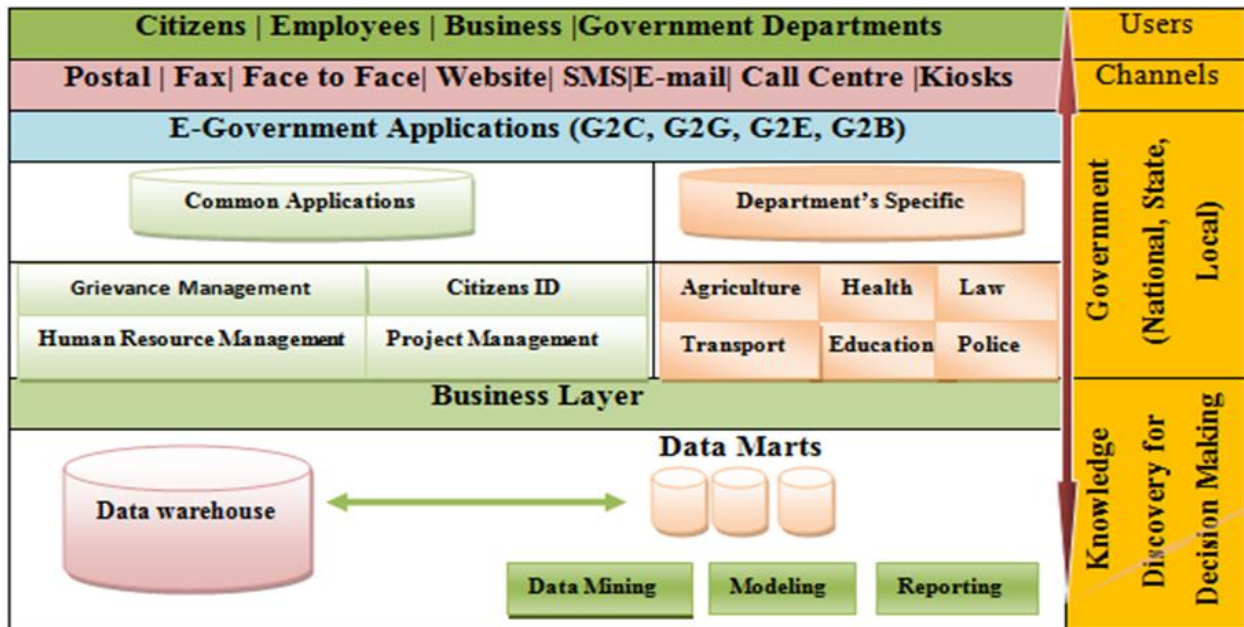
Fig. 3:   A framework for E-Government Data Mining Applications (eGDMA)

4.2.1) Usage of eGDMA in Decision Making:

The government can probably be answered the questions using the proposed framework (eGDMA) for effective decision making in e-government services. Some examples of G2C, G2G, G2B and G2E are:

(a)   Government-to-Citizen (G2C) applications:

Who are our citizens? What services are to be promoted through which channel? (Traditional Channel like Phone, Fax, Face to Face, and/or Modern channels like Website, SMS, Kiosk, CSC   or mixed channels?).Which Channel is more preferred by whom? And Why? What is the behavior of those citizens? What is their age? And Area? (Rural or Urbal). What is the reason for not using any services or channels by the citizens?.What types of citizen services have the biggest impact on government revenue? Which citizens are not paying House/Income/Commercial/Sales taxes or misusing schemes/services? Will the citizen default on a loan/Utility bills, or they pay back in time? Which citizens are responding to the new services/schemes? What is the behavior of those citizens? In which area government services are not reaching to citizens? Why? Is citizens are availing services such as certificates like birth, death, marriage certificates through Citizen Services Centers (CSCs), Kiosks**?**

(b)   Government to Government (G2G) applications:

i. *Agriculture:* Integrated agriculture data can be used to track the quantity and quality of crop information by taking the attributes like land capability, soil health, quality/type/timing/usage of seeds/ pesticides/ fertilizers, weather issues such as no rain//heavy rainfall (cyclone), flood, drought, irrigation facilities. Where farmers can sell their product with best prices without middle man? How and through which channel the agriculture related information can send quickly to the farmers? While giving compensation to framers when crops are affected by the flood/drought/natural calamity, the government can generate the questions like: Is these crops are insured? How Banks can withdraw these loans? How much compensation to be given to the farmers? , based on these questions the government can provide compensation to the right farmer at right time (through banks lined with citizen-ID) to reduce misuse/fraud.

ii. *Disaster management :*Factors like the age of the building (Building Department), electrical issues (Electricity Department), illegal/quality of construction\ lack of earth residence (Building construction/ Sanctioning Authority / Revenue Department), Loan details (Banks), Identity of the citizens (ID proof) and departments like police, fire, ambulance, hospitals & communication channel (Wired and/or Wireless) capabilities of the departments can be correlated to take decisions to save citizens in a timely manner in case of disaster.The government organizations can make management decisions to identify effective treatments and patients receive better healthcare services.

iii. *Track Departments' (G2G) Efficiency*: Which departments' schemes and /or services are effective (or not effectively) delivered to citizens? Why some departments are not delivering their services properly? What are the reasons for success or failure of a particular department? And how to improve those services? To answer to these questions, the data of the departments such as Infrastructure, Human resources and Quality of their services may be lined to identify the pattern and improve services.

iv. *Education*: The Students' performance can be linked with factors like the students' medium of teaching, students' habits, behavior, parents' qualifications, number of hours studied, the type of teaching facilities. Why some schools/students are not doing well? What type of students requires government schemes and how long? Which students are availing scholarships? Is scholarships are reaching timely to the right students at the right time, without middle man?

v. *Fraud Detection:* Which citizens are availing Blow Poverty Level (BPL) government schemes, Is these citizens have other facilities such as land (Plot/Flat) or vehicles. This integrated information can be used to identify fraud or misuse of government schemes.

vi. *Health:* Data mining applications can be used to identify and track chronic disease and high-risk patients. Which Primary Health Centers (PHCs) can connect which Citizen Services Centrs (CSCs)? What type of ICT infrastructure, health staff is required to provide telemedicine services to save citizen lives particularly in rural areas?

(c) Government to Employee (G2E) applications: How many and how employees are frequently leaving the organization? What is their average age and length of service? What is their behavior? How public services affecting in these cases? Which employees are frequently on leave? What is their health status? The employee performance can be linked with employees' educational qualification age, experience, salary, health, leave, Annual Confidence Reports (ACRs), promotion, demotion, stagnation etc.

(d) Government to Business (G2B) applications: Which companies are participating tenders? Why very few companies were participating in tenders? Why some tenders failed after award? Why the awarded company is not able to provide services efficiently as per the tender? How frequent a particular company is participating tenders? What is the rate of success in awarding tenders to a particular company? Which tenders are successes (or failure)? Why some department's tenders are failed frequently? Is the staff is capable in preparation of tenders? Are they trained in e-procurement?

V. A CASE STUDY ON COMMON AND DEPARTMENT'S SPECIFIC APPLICATIONS OF E-GOVERNMENT

In this section, this paper examined some Common and Department's specific applications used by various States and Central government departments in India.

5.1) State Governments Initiatives:

This Section provides some e-Government initiatives in terms of Common and Department's specific applications provided by various State Governments of India.

Table [4]: Some E-Governance Initiatives of State Governments		
Sr. No	**State/ UT**	E-Governance Services (G2C, G2G, G2B, G2G)
1	Andhra Pradesh	*a) Common applications* :eSava (www.esevaonline.com) is a 'One-stop-shop'' providing multiple services, E-Procurement , Integrated Financial Information System , Human Resources Management System, eGazette, eOrders, Secretariat Knowledge Information Management, , online access to knowledge base such as like Acts, GOs, rules, judgments, policies etc. b) *Department's specific Applications*: Fully Automated Services of Transport Depar**tmen**t, Issue of driving licenses, Issue of licenses, Registration of vehicles, Computer-aided Administration of Registration Department etc.
2	Assam	*a) Common applications:* File Monitoring System, grievance management system, Tenders, Personnel Information Management System, b) *Department's specific Applications*: *E-PANJEEYAN* for document registration and *Dharitee*: Web based Land Records Management System, ublic Distribution System (PDS)
3	Bihar	a) Common applications: Jankari: Phone (155311) based Right To Information (RTI) support system, Redressal of the grievance of the people through a website, gazette, Tenders b) Department's specific Applications: VICTORY: VAT Information Computerization to Optimize Revenue Yields, e-KHAJANA: Treasury Accounting and Management System, SCORE: System for Computerized Registration, RACE: Revenue Administration through Computerized Energy
4	Chhattisgarh	*a) Common applications*:-. CHhattisgah Online information system for Citizen Empowerment (CHOiCE), Jandarshan: public grievance management system, e-Karmachari or Employee Database b) *Department's specific Applications*: -e-Kosh: Online Computerization of Treasuries, *'BHUINYA'*: Land Records information is made accessible to public, e-Challan.
5	Chandigarh.	*a) Common applications e-Sampark*: A Multi Service Single Window operation, to bring together the basic citizens' services of all departments under one roof and give them a 'single window-experience. These services are also available through SMS.
6	Delhi	*a) Common applications:* Jeevan, a one stop shop for citizen series centric services, e-Procurement, File Monitoring System, E-Purty for Store Management, E-Courties for Court Management System, PAO-2000 for Automation of accounting functions, e-SLA for electronic service-level agreements, Website through Content Management, Citizen Relationship & Grievance Management System, Centralized Acts and Rules, forms, Gazette notifications etc., Centralized Right to Information Act (RTI) b) *Department's specific Applications*: available at http://it.delhigovt.nic.in/doit/success/success.asp.
7	Goa	*a) Common applications*: E-gazette, orders and circulars, rules, acts, schemes, citizen charter, Notices, Tender, E-Forms b) *Department's specific Applications***:** Dharani Project, SMS based services and other services available at http://www.goa.gov.in/departments/departmenthome.html.
8	Gujarat	*a) Common applications*: e-Gram Project, E-Procurement, State Wide Attention on Public Grievances by Application of Technology (SWAGAT) a communication between the citizens and the Chief Minister, Jan Seva Kendra to provide various citizen services. Integrated Workflow and Document Management System etc. b) *Department's specific Applications*: Land Records (e-Dhara), VAT Information System (VATIS), HMIS for hospital management etc..

9	Haryana	*a) Common applications*: E-DISHA is an electronic interface between the government and citizens, Court Cases, Centralized File Movement and Tracking Information System, e-Employees. Net for G2E services, Grievance Management b) *Department's specific Applications:* Haryana Land Records System, Online Treasuries Information System, E-Finance. Net for Finance, E-Food. Net for Food and Supplies Dept., E-Health.Net for Health Department.
10	Himachal Pradesh	*a)Common applications:* e-Samadhan: Online Public Grievance Solution, Sugam : Integrated Community Information Centre .eGazette, ePensioner: a portal for pensioners Helpline, pension status, Pension Case Status Online, Personnel Information System b) *Department's specific Applications*: HimBhoomi for Land Records Computerisation etc.
11	Jammu and Kashmir	*a)Common applications***:** Community Information Centres for citizen services, Secretariat Knowledge Information Management System, Integrated workflow Automation System *General Provident Fund (GPF),* Family Pension of the Employees. (Source: http://jkit.nic.in/skiims.htm) for Department's specific Applications b) Core application: Registration of vehicles and issue of driving licenses (http://jaktrans.nic.in/)
12	Jharkhand	*a)Common applications:* Common Services Centres (CSC) for providing services to citizens, Tenders, Online status of General Provident Fund Account , SMS Alert from Jharkhand Treasury to employees *b) Department's specific Applications* :VAT Information Computerization to automating the entire tax administration, VASUDHA: Land Records Information
13	Karnataka	*a) Common applications*:- Bangalore One focuses on the common man ,e-procurement, Human Resource Management System ,Call centre services,,'e-archive' to search documents,e-MAN' web based software for store management *b)Department's specific Applications*: Bhoomi: land records management systems, Sarathi & Vahan' provides total automation of Regional Transport Office. 'Aasthi Terige' is software for calculation and collection of property tax, Ahara' provides Public Distribution System,Online delivery of Record of Rights , Tenancy and Crops to farmers. KHAJANE: The Comprehensive Online Treasury Computerization, etc. **'**RAITA MITRA' portal for farmers for better cultivation.
14	Kerala	*a) Common applications:* - Akshaya: to provide Citizen services, FRIENDS: Fast, Reliable, Instant, Efficient Network for Disbursement of Services to provide one-stop for citizens. Service and Payroll Administrative Repository for G2E services *b) Department's specific Applications*: Land Records Information System, Public distribution system (PDS) SMARTMOVE a package that automates all the citizen-centric procedures of the motor vehicles. SMS services for providing health related information, Online Motor vehicle services
15	Madhya Pradesh	*a) Common applications::* MP Online information for citizen empowerment, Samadhan for one day governance, Basic services/Amenities Management Programmee, E-tender, Public services Delivery Guarantee Act, Jan Sunwani for Dialogue with people, Public grievance Redressal, Orders and Acts, Tele Samadhan**:** Status check of grievances Through 155343 to know about government schemes, Citizen charter *b) Core applications*: Gyandoot: Various services provided such as Daily agricultural commodity rates, BhuAbhilekh: Online land records, e-PDMS: Public Monitoring System, Transport Services
16	Maharashtra	*a) Common applications*: a) SETU: Integrated Citizen Facilitation Centres,b) The citizen service portal (www.Mahaonline.gov.in) will be integrated at the back-end

		with DigiGOV,, it provides a Dashboard to the senior management for decision making c) SARITA :application for Registration of documents d) Rojgar Wahini:A web portal http://ese.mah.nic.in :Provides services like vocational self-employment guidance to the job seekers.
17	Manipur	*a) Common applications:* Computerization of Personnel Information Systems (CPIS) for employees, Notification, Gazette, Orders, Online employment Exchange for job seekers. b) *Department's specific Applications:* Transport, Health services
18	Odisha	*a)Common applications*: E-Shishu, Common service centres (CSCs) in panchayats, Human Resources Management Information System (HRMIS), RTI Central Monitoring Mechanism b) *Department's specific Applications:*Land Records, Integrated Odisha Treasury Management System etc. e-Shishu': Its two components: Child Tracking system (CTS) and Intervention monitoring & Information system (IMIS), It is the first of its kind in the country, ORIS: Orissa Registration Information System
19	Punjab	*a) Common applications*: SUWIDHA: To provide services to the citizens. b) *Department's specific Applications:* Public Distribution System with GPS to detect fraud, Land Records Management System, Saarthi and Vahan: Services related Traposrt dept.
20	Punducherry	*a) Common Applications:* Gazettes on the web: It is a one-stop-source for all government publications such as Acts, Rules, Orders and other Govt. notifications
21	Rajasthan	*a) Common applications*: e-Mitra: The aim is to bring services under one single umbrella and give citizens of the state a multi-service, single-window anywhere-anytime, acts, policies, citizen charter b) *Department's specific Applications*: SARTHI: Stamps and Registration Automation, Transport services, HEALING: health information system, Online Answering Information System for Legislative Assembly
22	Tamil Nadu	*a) Common applications:* Grievance Redressal e-Tender, Acts, Rules, Orders, Gazette Notifications, orders, contact directory, Forms, schemes, services, policies, announcements, one line public Grievance Redressal Mechanism, Right to Information Act, Citizen Charter, Processing Status for Pension, Employment Online for job seekers, tenders *b) Department's specific Applications*: Transport, Land records
23	Uttar Pradesh	*a) Common Applications*: Lokvani: Its objective is to provide a single window, Tenders, Rules, E-mail Directory, Right to information, publications, project Monitoring System, Pensioners Information System *b) Department's specific Applications:* BhuLekh for, land records to digital form, Koshvani for Financial Management, Sugar Cane Information System (SIS).
24	Uttarakhand	*a) Common applications*: General Provident Fund Information for employee *b) Department's specific Applications: Dev-Bhoomi* for computerization of Land Recordss. Kisan Soochna Kutirs (KSKs) , Village Information Centres (VICs), Automation of Transport Department, Market ,weather information
25	West Bengal	*a) Common applications*: Tenders, Publications, Forms, Notices, Recruitment Information, Right to Information, Computerization of Salary Accounts (COSA, News Corner, feedback facility, Projects information *b) Department's specific Applications*: available at www.westbengal.gov.in.

Source: (http://www.india.gov.in),

(http://indiagovernance.gov.in/),(http://www.indg.in/) and respective State/Central Government Websites]

5.2) Central e-Government initiatives:

Some Central government initiatives are briefly described in this section.The National e-Governance Plan was established in the year 2006 and its objective is "Make all Government services accessible to the common man in his locality, through common service delivery outlets, and ensure efficiency, transparency, and reliability of such services at affordable costs to realize the basic needs of the common man". NeGP comprises 31 mission mode projects (MMPs), which are further classified as state, central or integrated projects. Each state government can also define five MMPs specific to its individual needs (Source:www.negp.gov.in). The National Data Sharing and Accessibility Policy 2012 (NDSAP) is to facilitate access to Government of India owned shareable data and information in both human readable and machine readable forms through a network all over the country in a proactive and periodically updatable manner, within the framework of various related policies, Acts and Rules of the Government (Source: http://pib.nic.in/newsite/erelease.aspx?relid=80197).The National Knowledge Network (NKN) has been envisioned as a state-of-the-art multi-gigabit pan-India network to connect universities and colleges in India (Source:www.nkn.in).The National Informatics Centre (NIC) is providing integrated e-government services such as Internet data centre (http://idc.nic.in), e-mail services (http://mail.nic.in) , web services (http://webservices.nic.in), financial(http://acid.nic.in), public grievances (http://pgportal.gov.in/).The National portal of India (www.india.gov.in) developed as a single-window access to information and services for citizens and other stake holders , with the specific objective of reaching the 'un-reached' rural communities of India, especially women and the poor (,UN 2012).

5.2.1) Some Data mining initiatives for Decision Making

Many scientific organizations in India have been employed data mining technology to deliver powerful research and analysis tools for bio-informatics, remote sensing, medical imaging, information retrieval, atmospheric, and astronomical research (SARC, 2008). Some Data Mining initiatives for decision making are:-

 a) *Integrated Taxpayer Data Management System (ITDMS):* The Income Tax Department implemented a data mining that generates the 360 degree profile of an entity by compiling information from all data sources to track tax payments, for instance, the software assisted the department to track a person who managed to get a fake identity and three panes to evade Rs. 100 crores in taxes. (ITDMS, 2011)

b) *Multi Purpose Household Survey***:** The Andhra Pradesh state developed a data warehouse to organize the Multipurpose Household Survey (MPHS) data and the land records data into meaningful information for the decision makers in agricultural yield and cropping pattern analysis. The data warehouse has enough potential to access the impact of various welfare schemes across the population of the state. The planners can design schemes focused on specific target groups and achieve high impact. The decision-makers can carry out analysis of the population profile across the state in areas of economy, education, family units, shelter, etc. (Souce:http://pune.cdac.in/html/dwh/dwhegov.aspx)

c) *Unique Identification Authority of India (UIDAI):* Existing identity databases in India is fraught with problems of fraud and duplicate/ghost beneficiaries. To prevent this Unique Identification Authority of India (UIDAI) has been created by the Government of India, with the mandate of providing a Unique Identity (Aadhaar) to all Indian residents. It would significantly reduce identity frauds. It should be used to link various records, databases related to residents to enable offering of various services in an integrated manner. Citizen Data Repositories at the Central and State levels should be used to augment the other based authentication mechanisms and significantly enhance citizen service experience, especially by not repeatedly asking for the information already available to the government. (Source: www.uid.gov.in)

d) The corporate affairs ministry is setting up a new intelligence unit that will delve into 'data mining' from all possible sources to detect financial frauds, by the companies and their promoters at the earliest possible stage (TOI, 2012)

e) The number of credit card holders who have become victims of cyber frauds has risen exponentially. Electronic payment systems have become vulnerable to new types of misuse. The Reserve Bank of India ((RBI) asked banks to put in place security and risk measures. According to the RBI, the number of credit card frauds rises to 1590 during October -December

quarter of 2012-13 (HT, 2013). With programs such as the National Rural Employment Guarantee Act (NREGA), Central Plan Scheme Monitoring System (CPSMS) and the National Rural Livelihoods Mission (NRLM), the government of India is literally grappling with pet bytes of data tied to these programs, and extracting value from these massive data sets is far from straightforward. However, a variety of emerging tools are proving to be very effective at mining big data intelligently, and have great promise for the government of India (Rahul , 2012)

VI. RESULTS AND FINDINGS

Some e-Governance initiatives of States and Central Government departments are examined with respect to e-government applications as a Case Study given in section 5.1 and 5.2. The observations and findings of the results of the case study are:The case study shows that many State governments have made significant efforts in providing services to their stakeholders using ICT to achieve good governance. However it was observed that these applications were developed according to respective State government convenience and functional domain and there is no uniformity among these applications. Lake of uniformity among various applications is a key challenge to the government in decision making. It was found that, the purpose of the application is same, but its architecture, design, formats, names, vendor specific etc., used by different State governments in different ways. Integrating these applications to enable them in a single view for decision making is a complex process not only to government organizations but also to the designers. Such similar type of applications are:

1) Common applications: a) Accounts Information system: Computerization of Salary Accounts (COSA) , PAO-2000, some departments are still using spreadsheets or they developed their own software for accounting applications b) e-Employees.Net and Human Resource Management System

*2) Department's specific applications***:** a) Land records: Applications such as Bhu-Abhilekh , Bhulekh , Bhoomi, CARD, Dharani and E-Dhara used for Computerization of Land Records b) Health Information System:Health.Net, HEALING and HMIS applications are used for computerization of health related information. Health Department c) KAVERI, SARTHI etc., used for automation of stamps and registration.

Different departments have different level of e-preparedness. These projects are implemented in different timings, for instance Computer-aided Administration of Registration Department (CARD) implemented in the year 1998, it needs to be integrated with National Land Records Modernization Programme (NLRMP) with NeGP (2006).e-procurement was introduced in the year 2004 by Gujarat government , which needs to be integrated with mission mode project of e-Procurement under NeGP. Many issues and challenges may arise while integration with applications of various States like semantically interoperable, as these have collected in different formats, architecture, languages at different points of time. Inconsistency in database may lead to difficult in integration of data for generation of reports in decision making for planning and providing services to stakeholders of the government. Lack of consistency in the various terminologies and methodologies employed by different State government for instance, data is collected and stored in various formats Word, spreadsheets, PDF ', paper based (may be some information still not computerized). Therefore these applications are not operable at national level in decision making unless common standards are implemented for developing unified applications across India. The common standards are very much required to facilitate interoperability and enable shared services among government departments, as same application/solution implemented by multiple departments.

VII. KEY ISSUES AND CHALLENGES

The purpose of this section is to understand the various key issues towards developing eGDMA.E-Government requires the government leaders and managers to address three issues: First, how do you take the technologies of the Internet and integrate them with existing information systems and existing organizational and institutional processes? , Second, how do you build e-Government applications to meet the needs, capabilities and values of the end user? Third, how do you overcome the reality of the organizational, economic, political, technological, legal, and the local environment that through the complex factors influence and define the context of the e-Government service? (ITU, 2008).The common challenges for the government

include (Ndou, 2004): 1) Role of leaders and strategy definition 2) Change management 3) Development of human capital and lifelong learning 4) Provision of ICT infrastructure 5) Partnership and collaboration 6) Policies and legislation.There are many challenges and issues such as clean data, infrastructure, interoperability, human resources, funding, legal, policy, security that must be addressed while moving data towards Data warehousing for decision making, for example same information collected through various formats (text, data, word, excel, e-mail, fax), by various departments cannot be tackled easily. Some departments still lack automation of processes at all levels. Below the national level where technology practices are either not in place or have not been fully cemented and the collection itself is of the first degree. (OGES , 2010). The data generated, and maintained independently by the department may be lead to a poor or independent decision making and isolated planning, but for the government need centralized data for decision making .In India , majority computerization exists in majority of the government departments, but cannot interface with each other and significantly impact interoperability when integrated (TCS , 2008). The reason for the slow evolution of e-governance in India includes lack of IT literacy and awareness, especially amongst the rural masses, underutilization of existing ICT infrastructure (Preethi, 2009).In the absence of countrywide policies on data standardization and data sharing, security provisions have not been adequately handled in designing systems (Subhash, 2009). The survey on open government data found that Data collected from projects IndiaGoverns and Akshara is not semantically interoperable (OGDS , 2010).Comptroller and Auditor General of India (CAG , 2009) reported that "At present, various State Governments are choosing their own ways of selectively computerizing their processes and provide E-governance. Many of these programs are vendor-driven and not scalable. It is critical to develop and enforce citizen/business entitlement standards uniformly over all states and central ministries and functions, spanning from taxes, certificates, properties of land, etc. These standards should not be hardware-centric and vendor dependent, but should enable easy participation by any State. To enforce standards and to keep the governance uniformly responsive and transparent, it is recommended that State Governments use templates created by the Central Government to offer localized data and services in Indian languages (CAG, 2009). When it comes to large-scale application the practical problem to be faced is agreement at policy-making, administrative and technical level (Kotsiopoulos and Rentzepopoulos, 2009).The governments, both at the central and State levels, have witnessed the intervention of KM initiatives albeit in a sporadic manner. These efforts have been initiated either because of the interest of some Government officials or due to a push from technology. There have been no instances of KM initiatives undertaken as a matter of policy (SARC, 2008). The government services are well known for creating large volumes of data. Many organizations already struggle to manage their existing data. Big data is a relative term describing a situation where the volume, velocity and variety of data exceed an organization's storage or compute capacity for accurate and timely decision making (SAS, 2013).Big data offers a chance for policy-making and implementation to be more citizen-focused, taking account of citizens' needs, preferences and experience of public services. But it is also technologically challenging for government, and presents new moral and ethical dilemmas to policy makers (Helen Margetts, 2013).The big data is useless without proper tolls to analyze it faster.

Box1: Decision making Issues with Land administration system

The evolution of the land administration system in India has been a complex process and historical chronicles. Though many States have completed, but some of the states need further guidance and support for its effective and timely implementation. The available digital land records data is mostly in ISCII 8.0 for providing local language interface. In order to bring out the desired uniformity in terms of storage, display and presentation, the fonts and storage formats for various datasets have to be standardized, without which it will not be possible converging & understand data in multiple languages(RCOCLR , 2005).Each State has chosen to design its application without learning from the available best practices. According to 11th report on Second Administrative Reforms Commission (2008), no State in India has reached an evolved stage in land records computerization which integrates the functionality of the three related agencies 1) Revenue department where land records are maintained 2) Survey department where maps of land parcels are maintained 3) Registration department where deeds of sale/purchase of land are registered and maintained. There is a great deal of difference in the performance of the "best" and the "worst" State in case of these computerized applications. The Union Government has accorded priority to this scheme to institutionalize the mechanism for regular mutation/updating of Record of Rights (ROR) and strengthen, the delivery system (RCOCLR, 2005).Two schemes namely Computerisation of Land Records (CLR) and Strengthening of Revenue

Administration & Updation of Land Records (SRA & ULR) (pre-NeGP)) have been merged into a new scheme called the National Land Records Modernization Programme (NLRMP) for providing integrated land related information and services to citizens (SARC , 2008). National E-Governance Action Plan (2006) suggested that this scheme should be completed on mission mode.

VIII. CONCLUSIONS

This paper mainly discussed on common & department's specific applications of the government organizations and how data mining techniques can help the planners and decision makers in making use of big data for decision making. The Data mining can be utilized by the government to determine the patterns or relationships from large data warehouse, but how to develop it successfully is vital to the government decision and policy makers. Even if, these organizations are storing big data for decades, but as and when they required necessary information at right time, they are unable to get due to numerous reasons. The technology is available, but the government should confident in solving their challenges and issues related common standards in store and share the information among various stakeholders in decision making. This framework would help, not only in improving the internal efficiency but also tremendous increases in decision making. The proposed framework for may be helpful to the policy makers and planners for extracting the hidden information from various e-Government databases to improve decision making by framing guidelines for new projects for providing better services to the stake holders.

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Author's profile:

Dr. Velamala Ranga Rao obtained his Ph.D in Statistics (1994) from Andhra University and M.Tech in Information Technology (2011) from Karnataka State Open University, Mysore, India. Currently he is working as a Computer Programmer at Soil and Land Use Survey of India, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, Delhi. His research papers have appeared in International Journals, Book reviews and National/International Conference Proceedings. He is having more than 20 years of experience in the field of Information Technology in the Government Sector. His primary research interests focus on ICT applications in e-Government.