Short Communication

Novel IEGM model for effective E-Governance in India

Krishna Kumar Verma*, **Navita Shrivastava and Anil Kumar Patel**
Department of Computer Science, A.P.S. University, Rewa-486003, M.P., India
krishnamscit.verma@gmail.com

Abstract

The national E-governance plan of Indian government seeks to lay and provide the impetus for long term growth of e-governance within the country. Several initiatives has been taken by state and central government for effective implementation of e-governance but integrating these initiatives to enable them in a single view for decision making, is a complex process and needs to be addressed. This is due to lack of uniformity among various applications, which is one of the biggest challenges for model developers today. In this paper authors have proposed a novel model IEGM i.e. "Indian e-governance model", in which above mentioned issues are addressed. The model may help in effective implementation of e-governance in India. The paper also proposed a model for data mining and big data analytic. Challenges and potential opportunities where data analytics techniques can be implemented for effective decision making are also discussed. Authors strongly recommended that the open and homogeneous clean data should be made available to researchers using cloud computing or open platform for future research through a government portal for data analytic and mining purpose.

Keywords: E-Governance, E-Feedback, Data Mining, Big Data, Open Data.

Introduction

Government organization of India is providing all services through Information and Communication Technology (ICT) for the purpose of accessing information and improving services delivery across all over country. In order to produce, "improved citizen service delivery", the developer must know the citizen's feedback, citizen's opinion, suggestion, and citizen pattern of using e-services. On the other hand, E-governance is an initiative to utilize ICT for improving public sector services, which is definitely going to affect the relationship between government and citizens. It can be seen from various definitions: World Bank, United Nations, UNESCO, International/ National author etc. of e-government and e-governance: "E-Governance can be considered as a wider concept than E-Government and it can be treated as superset of E-Government"[1,2].

In United Nations, the Department of Economics and Social Affair (UNDESA) initiated the e-government survey in 2001, So for it has successfully conducted eight surveys in the year 2003, 2004, 2005, 2008, 2010, 2012, 2014 and 2016. In the latest survey, 193 countries have been assessed to find the E-Government Development Index (EGDI). The calculation of EGDI is based on other indexing values which are: Online Services Index (OSI), the Telecommunication Infrastructure Index (TII) and the Human Capital Index (HCI). According to this survey the India has E-Gov Ranked 107 in year 2016, which is 11 point up from the previous 2014 survey. The following

Figure-1 is showing the comparison of OSI and EPI parameter of India for year, from 2003: 2016[3,4].

This Figure-1 shows that at present time, we have a number of online services with the comparison of previous years; both the E-participation Index and Online Service Index has increased from few last years. We can say that we are flooding in e-services data, and the rate of generating data is faster than the rate of analyzing data. So we need to develop efficient techniques to analyze flood of data, daily being generated with exponential rate in digital world. These data are not only huge in size but also dirty, dynamic and heterogeneous in nature.

"Data Mining (DM) and Big Data Analytics" may play pivot role in effective and efficient management of E-governance services. As DM techniques are successfully implemented in several areas like "Banking", "Insurance", "Credit Card", "Weather Forecasting", "Water Resource", "Agriculture", "Customer Relationship Management", "Super Store Sales data analysis", "Stock Market", "Gaming", "Network and Security", "Financial Market", "Telecommunication", "Oil and Gas exploration", Healthcare etc. In addition, new data mining algorithms/ analytic techniques are enabling governments to plan new solutions in every sectors/ departments of country, by providing intelligent analytics and efficient pattern[5,6].

In the era of Digital India (E-Governance) and Open data portal; there is a need to develop uniform and homogeneous data bases repository from stored data bases and should be open for researcher.

This data can be utilized as testing and training data set for generating efficient data mining or data analytic model. This model definitely will produce effective knowledge and pattern, which can be adopted in improved decision making process.

According to negp.gov.in[7], in India, 1374 different e-services are linked (for information as integrated platform) with this government website. After analysis of this web data, we produce some result related to number of e-services in India, which is shown in Figure-2. This figure presents number of e-services identified by different state and linked with this website for information. The identified services in this webpage are belonging to specific mission mode project (MMP's) of state government and also could be categorized in three different ways as: Service for Citizen (S4C), Service for Business (S4B) and Service for Government (S4G). The Haryana state is providing maximum number (216) of e-services by covering 23 different MMP's, which is given in Table-1.

The remainder of this paper is organized as follows; we begin by describing some related works in the field of E-Government framework, data mining, open data etc. In next section we will present a model for effective e-governance and architecture for data mining. Finally we present a conclusion of our work.
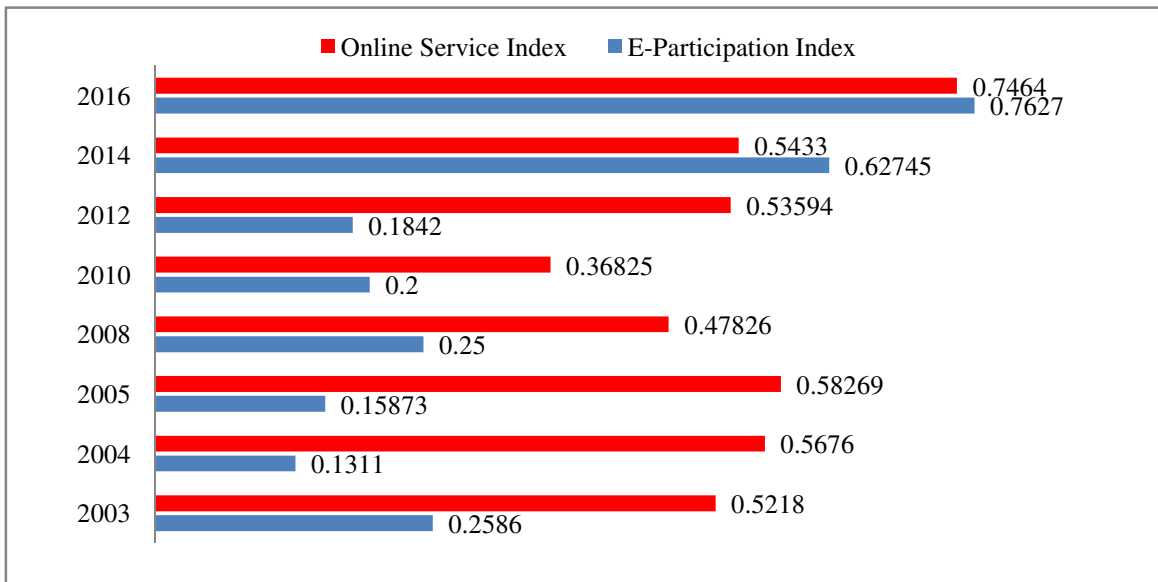

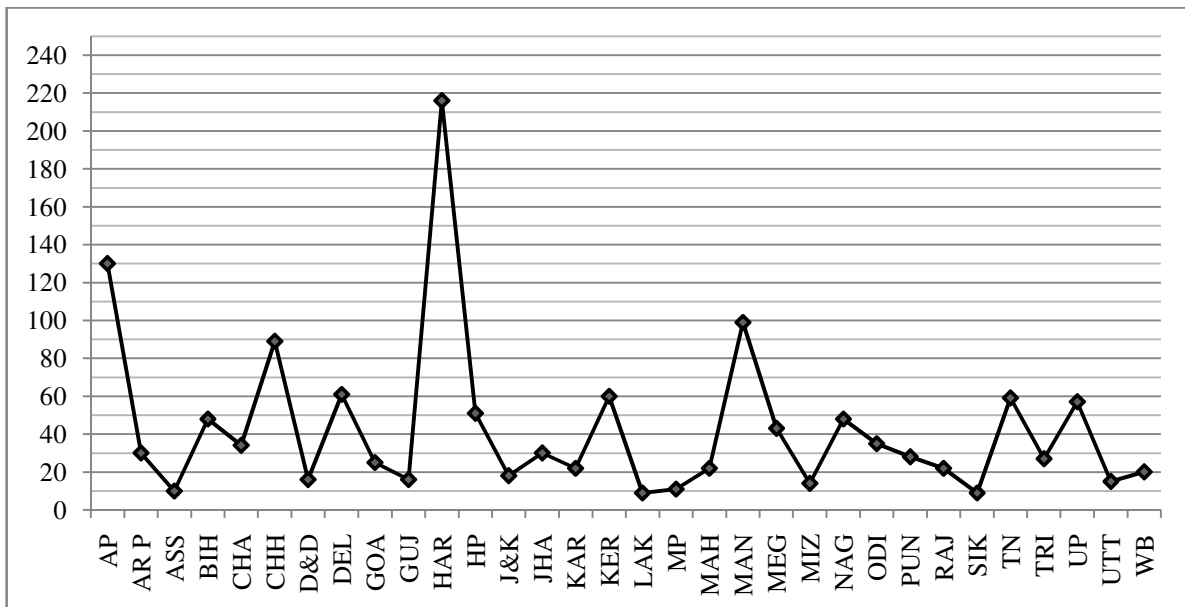**Figure-1:** UN E-Government Survey (OSI and EPI) of India[3,4].

Figure-2: Number of E-Services[7].

Table-1: Haryana State MMP and It's Category[7].

No.	MMP	Category	No	MMP	Category
1	Agriculture	Citizen	12	e-Procurement	Business
2	CCTNS	Citizen	12	e-Procurement	Government
2	CCTNS	Government	13	Health	Citizen
3	Central Excise	Business	14	Municipalities	Citizen
4	Commercial Taxes	Citizen	15	NLRMP	Citizen
5	e-Biz	Citizen	16	NSDG	Government
6	e-Courts	Citizen	17	Passport	Citizen
6	e-Courts	Government	18	PDS	Citizen
7	e-District	Citizen	19	Pensions	Citizen
8	Education	Citizen	20	Posts	Citizen
9	Employment Exchange	Citizen	21	Road Transport	Citizen
10	e-Office	Citizen	22	State Project	Citizen
11	e-Panchayat	Citizen	23	Treasuries	Citizen

Related work

This section, include three different aspects of literatures that have been carried out till date in the area of e-governance: Frameworks, Data Mining and Open Data by different authors:

Al-Hassan M. et al. proposed a conceptual framework called "*Pe-Gov Service Framework*" which can be used for delivering personalized e-government services to citizens. This framework has a number of different features including being citizen centric; comprehensive user profiles creation; personalization of adoption techniques; using domain ontology; and using user community concept in generating intellectual recommendations. They used two current e-Gov systems which are selected for comparing between proposed and current e-Gov system[8].

"A framework for e-Government Data Mining Applications (eGDMA) for Effective Citizen Services" is proposed by RAO, V.R.; this framework can be used for empowering e-government services in decision making. It divides government applications into two categories namely: common and department's specific applications. The common applications are G2G, G2B, G2E and G2C that considered for getting uniformity, reduce redundancy, time and cost; and department applications are specific department such as Health, Education, Police, Law, Transport, Revenue, etc. This proposed framework is divided into four layers named Users, Channels, Applications, Business layer. In business layer, the concept of data warehouse, data mining and modeling is used for decision making, which will be utilized for improving the performance of public services[9].

Kacem A. et al. proposed a new conceptual *CP-Gov framework*

that investigates users and community's profiles based on social media. The CP-Gov framework was designed with the aim of offering personalized e-government services to citizens. From the government side, it may improve decision making process on the basis of better citizen needs and expectations[10].

Different quality aspects of e-government are explored by W. Chutimaskul et al. in this research process quality; information quality and service quality have been pointed out by authors, which can be embedded into e-Government for quality management. Based on these quality aspects a model for e-government success has been proposed. To test the quality of e-government, a survey has conducted via online questing system. The datasets from 340 experienced citizens were collected and analyzed. The above three quality aspects should be considered by the government agencies while developing e-Government. In addition, it was also discussed that, for sustainable e-government development; it must contain four main components which are: stakeholder, development methodology, ICT and environment. In this paper, the concept of DeLone McLean model was also used in information system success[11].

Open data mining is one of the new concepts that can be used in effective development and improving the e-government. A framework for open data mining has been presented, which deals with the large amounts of data stored in open data portals. This framework is divided into four important tasks: i. data collection, ii. data processing, iii. pattern discovery and iv. pattern analysis. Authors have observed that for analysis of open data, there are two most important techniques which are "association rules and classification". Also these techniques have been utilized and applied on earthquakes dataset for

effective pattern discovery[12]. Authors Dos Santos Brito et al. also discussed concept of open data portal and service delivery model for Taiwan and Brazillian government[13].

Sangeetha G. has suggested an e-governance framework for mining knowledge from "Massive Grievance Redressal Data". This proposed system is mainly based on the feedback analysis over the textual data and define the feedback in two categories as positive or negative[14]. Some other researchers have also described the use of data mining in different field of e-governance; Chen P. has proposed a more mature association analysis model which can be utilized in information security. They have given an information security risk assessment for a large-scale e-government[15]. Suh J. H. et al. apply text and data mining techniques on the petitions filed by e-People and proposed a framework for forecasting the trends of petitions[16]. Text and data mining can be used in service quality enhancement; Tilahun, T. et al. designed a text mining model for service quality enhancement. This model is applied on citizen's opinions database for classifying and categorizing the opinions in well known manner[17].

Proposed model

The study of Models/Frameworks developed so for reveals that existing models lacks efficient and effective integrated environment. For example Feedback and Suggestion facility is available in all most e-services in government portal but the centralized feedback/suggestion and their integration for analysis is still not up to the mark. In present paper we have introduced a novel "*Indian E-Governance Model (IEGM)*" model (Figure-3), which incorporate this integrated feedback module. Our model also introduced a software agent for integration and homogeneous data converter (SAI and HDC) which will help in the development of uniform and homogeneous data e-repository from stored data base.

This model has three different well known sections: top section introduces data store, services (existed) and services (identified), middle section introduce Internet Highway (I-Way) and bottom section is Indian citizen. The Internet highway (I-Way) is a global-way that is being used by all over the world so there is need to setup a strong security server, here we have presented a security server as an intermediate connection between top and middle section so that citizen can upload his/her data in present and access in future for further use.

Data store and e-service section, presents "e-services of National e-governance plan", these services are also divided into three categories of mission mode project (MMP)[18] these are central mission mode project (CMM'P) (includes Income tax, Passport, MCA21, Insurance, National Citizen Data Base etc.), state mission mode project (SMM'P) (includes Land Records, Road Transport, e-Health, e-Education etc.) and integrated mission mode project (IMM'P) (includes e-sansad, Agriculture 2, rural development etc). New mission mode project are also

presented in this model, these are the projects that are in initial stage in Indian e-governance context. All data and information related these e-services are being stored in state data center as well as central data center[19]. The Indian citizen can store his/her demographic, cognitive, psychographic[20] and service oriented attributes, using internet highway and able to retrieve these data in recent future using same e-services.

Though, Feedback and Suggestion facility is available in all most e-services in government portal but the centralized feedback/ suggestion and their integration for analysis of feedback and suggestion is still not up to the mark and work has to be done in this context. In this model, we have proposed integration of feedback and suggestion facility, under a single umbrella where the feedback from any e-services of the user will come to the government through a single portal. Suggestion and Feedback given by the citizen or customer will be analyzed in a single portal. For analysis visualization techniques are also used which will help in decision making of the top level executives. The proposed model will help in improving and monitoring the e-services of India more effectively.

Some attributes which should be included in proposed integrated e-feedback system are: i. FID (feedback ID), ii. UID, iii. Selection State, iv. Selection of Service category (Central / State / Other), v. Selection of Service Name, vi. Rural / Urban / Other, vii. Feedback Box, viii. Suggestion Box etc.

With the perspective of data mining application in e-governance, we have suggestion/ opinion database, feedback database, server web logs in text format. These three databases are totally unstructured and large in size. For opinion and feedback; we need to perform text operation, tokenization, and synthesis analysis for converting unstructured data into structured data. After that we need to apply text and data mining techniques for producing knowledge patterns. In server logs, we also need to convert unstructured data into structured data and then need to apply web mining techniques for producing knowledge patterns[21]. This above process can't be done directly by end users of India. There is also a concept of Indian Open Data Gov[22] which contains number of databases in CSV, XLS, XML etc. format which can be used directly by researchers and citizens.

With the use of this open data, we can also integrate more than one data and apply DM techniques, which will definitely produce some hidden pattern/ knowledge. In Figure-4 we have also proposed data mining architecture for improving e-governance. This architecture has major three stage procedures: i. Data Pre-Process, ii. Data Mining and Big Data Analytics, iii. Knowledge Management, iv. Decision Making for E-Governance. For improving the e-services of E-Governance, it is very necessary to analyze the feedback of these services. On the other hand web log analysis can also be used in finding the potential knowledge / pattern of e-services users.
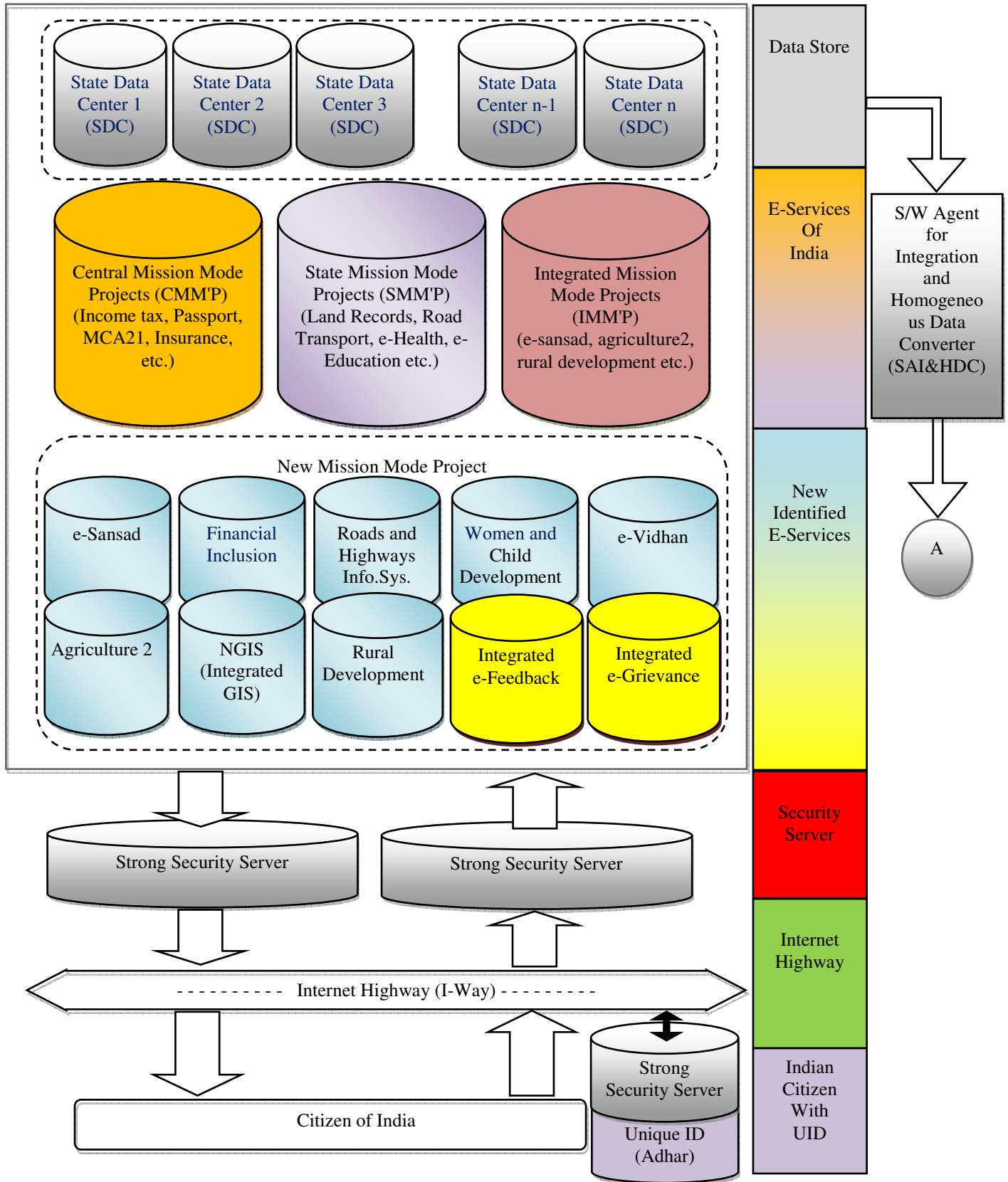
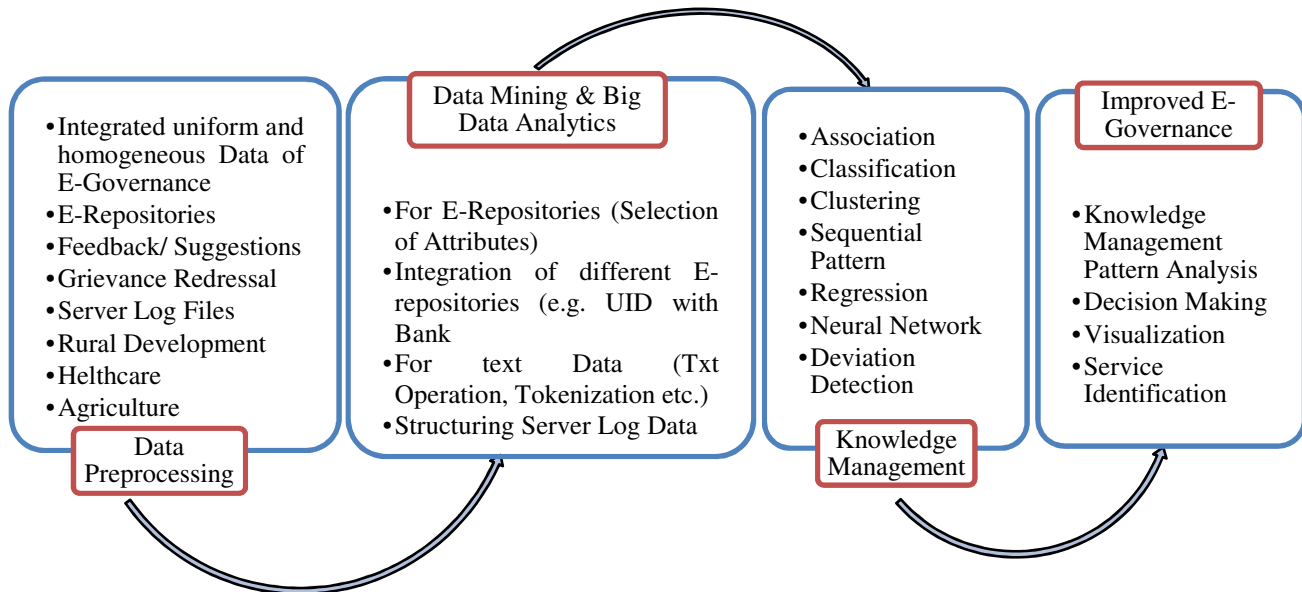**Figure-3:** Indian E-Governance Model (IEGM).

Figure-4: Data Mining Architecture for Improving E-Governance (DMAI E-Gov).

Open data[22] is a new movement in the field of e-government. Government of different country has launched the legal framework and portal for open data, for covering the concept of transparency, accountability, and knowledge sharing. In the continuation of this government of India has also launched "Open Government Initiative", during October 2012, in compliance with the National Data Sharing and Accessibility Policy (NDSAP) of India. This initiative has four modules: i. Data Management System (DMS), ii. Content Management System (CMS), iii. Visitor Relationship Management (VRM) and iv. Communities.

For the purpose of valuable research output Authors recommended that the open and homogeneous data should be open and made available for researcher.

Conclusion

Lack of uniformity among various applications developed by different states, integrating them to enable for a single view and using data mining / analytic techniques for decision making is a complex process and needs to be addressed. In this paper authors have proposed a novel model IEGM i.e. "*Indian e-governance model"* which addresses the above challenges and may help in effective implementation of e-governance in India. Application of data mining/analytic techniques in e-governance and open data enables us to discover efficient patterns and improve the decision making in e-Governance. The paper also proposes data mining/analytic architecture for improved E-Governance. The paper also discusses challenges and potential opportunities, where data mining and analytics can be implemented to discover knowledge for better decision making. Authors also strongly recommended that the open and

homogeneous data should be open and made available for researcher.

Main features of proposed model are: i. Inclusion of integrated e-feedback consisting of suggestion box. ii. Inclusion of integrated e-Grievance Redressal system. iii. Development of uniform and homogeneous data base repository from stored data base, using software agent for integration and homogeneous data converter (SAI and HDC), iv. Uploading homogeneous data as open data so that researcher can utilize this for generating data mining / analytic model. v. Proposed Data Mining architecture for improved decision making.

References

1. Palvia S.C.J. and Sharma S.S. (2007). E-government and e-governance: definitions/domain framework and status around the world. *International Conference on E-governance*, 1-12.

2. Verma K.K. and Shrivastava N. (2015). Exploring Role and Associated Challenges of Data Mining Technique and it's Implementation in E-Governance. *IJARCET*, 4(8), 3473-3478.

3. UNPAN (2016). UN e-Government Survey 2016. E-Government in Support of Sustainable Development. New York: UNPAN. Retrieved August 02, 2016, ISBN: 978-92-1-058156-1. from http://workspace.unpan.org/ sites/ Internet/ Documents/UNPAN96407.pdf

4. Verma K.K., Shrivastava N., Patel A.K. and Pandey A. (2017). Status of E-Governance and E-Services in India. *2nd International Conference for Convergence in*

Technology (I2CT), IEEE, Siddhant College of Engineering, Pune , India, 1-5, ISBN: 978-1-5090-4307-1.

5. Joshi H.D., Gondaliya T.P. and Joshi H.J. (2015). New Big Things in Era of Digital Data:'Big Data'and Big Data Challenges with its Solution Using Different Tools. 10th International CABLIBER 2015, HP University and IIAS, Shimla, Himachal Pradesh, India, March 12-14, 496-507. ISBN: 978-93-81232-05-7.

6. Linders D. and Wang C.M. (2013). Proactive e-governance: flipping the service delivery model in Taiwan. *Proceedings of the 7ᵗʰ International Conference on Theory and Practice of Electronic Governance*, ACM, New York, NY, USA, pp. 154-157. http://dx.doi.org/10.1145/2591888.2591913

7. The National e-Governance Plan (NeGP), https://www.negp.gov.in. 16 September 2016.

8. Al-hassan M., Lu H. and Lu J. (2009). A framework for delivering personalized e-government services from a citizen-centric approach. In *Proceedings of the 11th International Conference on Information Integration and Web-based Applications and Services*, ACM, New York, NY, USA, 436-440. http://dx.doi.org/10.1145/1806338.1806419

9. RAO V.R. (2014). A Framework for e-Government Data Mining Applications (eGDMA) for Effective Citizen Services-An Indian Perspective. *International Journal of Computer Science and Information Technology Research*, 2(4), 209-225.

10. Kacem A., Belkaroui R., Jemal D., Ghorbel H., Faiz R. and Abid I.H. (2016). Towards Improving e-Government Services Using Social Media-Based Citizen's Profile Investigation. *Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance*, ACM, New York, NY, USA, 187-190. http://dx.doi.org/10.1145/2910019.2910029

11. Chutimaskul W., Funilkul S. and Chongsuphajaisiddhi V. (2008). The quality framework of e-government development. In *Proceedings of the 2nd international conference on Theory and practice of electronic governance*, ACM, New York, NY, USA, 105-109. http://dx.doi.org/10.1145/1509096.1509117

12. Milić P., Veljković N. and Stoimenov L. (2012). Framework for open data mining in e-government. *Proceedings of the Fifth Balkan Conference in Informatics*, ACM, New York, NY, USA, 255-258. http://dx.doi.org/10.1145/2371316.2371369

13. Dos Santos Brito K., da Silva Costa M.A., Garcia V.C. and de Lemos Meira S.R. (2014). Brazilian government open data: implementation, challenges, and potential opportunities. In *Proceedings of the 15th Annual International Conference on Digital Government Research*, ACM, New York, NY, USA, 11-16. http://dx.doi.org/10.1145/2612733.2612770

14. Sangeetha G. and Rao L.M. (2016). Modelling of E-Governance Framework for Mining Knowledge from Massive Grievance Redressal Data. *International Journal of Electrical and Computer Engineering (IJECE)*, 6(1), 367-374.

15. Chen P. (2012). Data Mining Applications in E-Government Information Security. *Procedia Engineering*, 29, 235-240. https://doi.org/ 10.1016/ j.proeng.2011.12.700

16. Suh J.H., Park C.H. and Jeon S.H. (2010). Applying text and data mining techniques to forecasting the trend of petitions filed to e-People. *Expert Systems with Applications*, 37(10), 7255-7268. https://doi.org/ 10.1016/j.eswa.2010.04.002

17. Tilahun T. and Sharma D.P. (2015). Design and Development of E-Governance Model for Service Quality Enhancement. *Journal of Data Analysis and Information Processing*, 3(03), 55-62. http://dx.doi.org/ 10.4236/ jdaip.2015.33007

18. Digital India (2017). EKranti- Electronic Delivery of Services. http://digitalindia.gov.in/content/ekranti-electronic-delivery-services. 11 August 2017.

19. Presentation (2014). Digital India–A programme to transform India into digital empowered society and knowledge economy. *Department of Electronics and Information Technology, Government of India*, http://pib.nic.in/newsite/erelease.aspx?relid=108926. 20 August 2014.

20. Mostafa M.M. and El-Masry A.A. (2013). Citizens as consumers: Profiling e-government services' users in Egypt via data mining techniques. *International Journal of Information Management*, 33(4), 627-641. https://doi.org/10.1016/j.ijinfomgt.2013.03.007

21. Al Saghier H. (2016). Kingdom of Saudi Arabia: A Web Usage Mining Based Approach. *Asian Journal of Information Technology*, 15(1), 13-17. 10.3923/ ajit.2016.13.17

22. Government of India (2012). About Open Government Data (OGD) Platform India. https://data.gov.in/about-us. 19 September 2016.