



E-Governance using Big Data

Poonam Salwan and Veerpaul Kaur Maan

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

June 14, 2020

E-Governance using Big Data

Poonam Salwan¹ and Veerpaul Kaur Maan²

1 I.K. Gujral Punjab Technical University, Jalandhar, Punjab, India,
poonam12_sharma@yahoo .com

2 Giani Zail Singh Punjab Technical University, Bathinda, Punjab, India
veerpalkaur1@rediffmail.com

Abstract. The continuous advancements in the field of ICT and the constant efforts from the Central and State governments have been the foremost forces for the successful launch and reinforcement of e-governance in India. With the help of public and private sectors, governments are encouraging organizations for interoperability to store and process data from a central location that further enhances decision-making. This fastest-Growing data is turning into big data. The tools used to study and analyze big data at great speed and accuracy are known as big data analytic. These big datasets can be text/audio/video/picture, etc. As the use of e-governance datasets are increasing, the citizens expect to analyze and process datasets at greater speed and accuracy. This paper shows the relationship between e-governance and big data, its implementation around the globe, initiatives taken by India to establish e-governance, and some challenges in implementing big data with e-governance projects.

Keywords: E-Governance, Big Data, Big Data Analytics, Interoperability.

1 Introduction

E-governance refers to the process of delivering government services electronically. It helps to maintain the essence of real democracy by making the government procedures transparent. It helps to establish the government of the people, for the people and by the people through making the government officers accountable and responsible for their duties. With the help of private sectors [1], [10], the Centre and State governments are conducting seminars, workshops, advertisements to encourage citizens towards e-governance. With all such initiatives, the transactional amount of data has been increasing so fast that the traditional database management system cannot be used to deal with such exponentially growing data. This also affects the decision-making as more than half amounts of data remains unprocessed due to change in its type. In this paper, we shall discuss how to manage this continuously growing data related to e-governance. Section II will discuss big data in e-governance and its features. Section III will discuss the role of big data in e-governance projects across the globe and India's initiatives to adopt big data. Section IV will discuss some challenges that may occur while using big data analytics in e-governance.

2 E-governance and Big Data – An Inside

The main notion of e-governance is to provide a better socio-economic-political environment to the citizens [18]. In 2006, the Indian government had initiated the National e-Governance Plan (NeGP). Initially, it was having 27 Mission Mode Projects (MMPs) of State and Central government and 8 integrated MMPs. Later on, another 4 projects were added in NeGP. All these projects led to the generation of a huge amount of data. This huge amount of data is known as big data [2], [5]. The most popular example of e-governance based big data is Aadhar-UID. The term big data is referred for the datasets whose size and capacity are beyond the capabilities of a traditional database system. These datasets may be structured/semi-structured /unstructured in nature which cannot be dealt with a traditional database system. “The size or amount of data under big data varies from company to company i.e. one company’s big data may not be as big as other company’s big data” [34].

2.1 Characteristics of Big Data

Basically, all the datasets that satisfy the characteristics of 3Vs – Volume, Velocity, and Variety are considered as big data (Fig. 1). The technique used to study and process mixed type datasets at a faster speed is called big data analytics. The big data analytics processes the big data by dividing datasets into equal sizes [3], storing them on different computers known as nodes in a cluster of computers. This way big data analytics makes the processing faster and accurate.

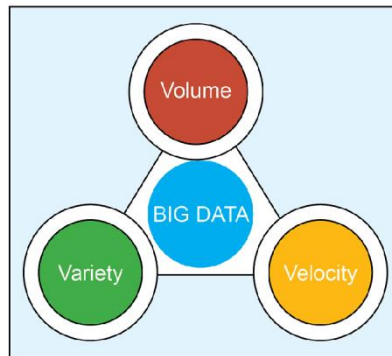


Fig. 1 Characteristics of big data

2.2 Phases of Big Data

The different phases comprising data as big data [3] are as follows (Fig. 2):

- **Big data generation:** This phase refers to different sources generating huge amounts of data at greater speed.

- **Big data acquisition:** This phase refers to collecting data, turning into big data, from different resources, or distributing data among other resources or pre-processing of data.
- **Big data storage:** This phase refers to the management skills to store big data in such a way that it could enhance the accessibility and availability of big data.
- **Big data analytics:** This phase refers to the analysis of structured/unstructured/mixed datasets to forecast future trends or predictions.

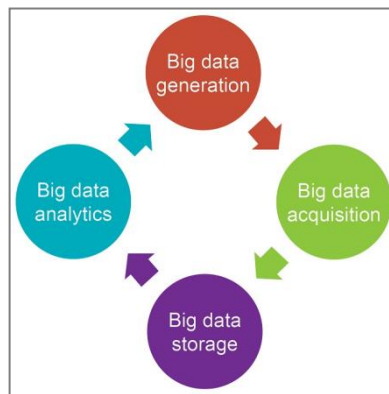


Fig. 2 Phases of big data

2.3 Features of Big Data

The important features of big data are as follows:

- It is capable to manage a dynamic type of data i.e. it can manage the structured, semi-structured, and unstructured type of data easily.
- It can easily manage a great volume of datasets produced at a great velocity.
- It is scalable in nature i.e. its setup can be modified as and when required.
- It has very vast analytic techniques meant for different types of data that help to study different patterns or trends from processed/unprocessed data.
- It helps to take important decisions basis the current trend's analysis.

3 Adoption of Big Data in E-governance Project

Earlier, when the digital form of data was not available - the veteran leaders of the government were expected to use their wisdom and past experiences to make decisions [4]. In the present era, big data analytics helps in decision-making using digitized datasets. Almost 90% of datasets generated through different resources are of an unstructured type. Big data analytic techniques give us a facility to explore the unknown or hidden facts through the dissemination and processing of data under

different phases. Figure 3 shows how different types of datasets are collected, refined, synthesized to get the required data from the datasets [11].

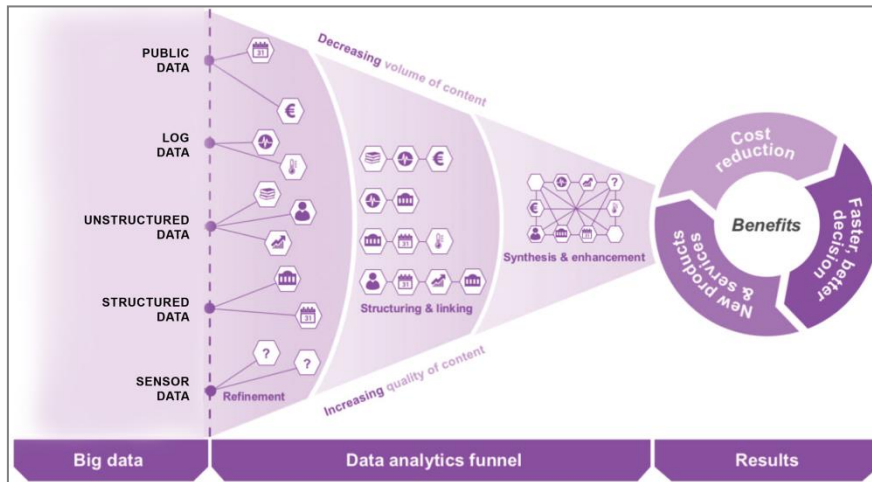


Fig. 3 Overview of different phases of Big Data processing

The private sector has started using big data analytics to maximize their profit by studying market trends, consumer behaviour, expectations, etc. The government departments are using it for the growth and development of their citizens. The governments are also making laws and implementing policies to ensure security and privacy, at all the phases of big data processing, for the validity of the information. Many countries of the world like the US, UK, Japan, etc. have already started projects using big data analytic techniques to make future predictions [6].

3.1 E-governance and Big data Across the Globe

Here is the analysis of various countries running e-governance projects based on big data analytics [6], [8].

- The Australian government has been using big data analytics to provide better services to their citizens. The Australian Customs and Border Protection Service (ACBPS) is using big data analytics to ensure the security of their borders.
- The UK government had allotted £189 million for big data research and major emphasis was given to the agriculture industry.
- The government of France has allocated €11.5 million on the proposal related to 7 big data processing projects.
- The Norway government has been using big data analytics for the health care of its citizens.
- The Indian government has invested Rs. 5,630 crores on the UID project to provide a unique ID to its citizens.

The United Nations Dept. of Economic and Social Affairs (U.N DESA) conducts E-Governance Development Survey [12], [13], [14] every two years (biannually). This survey helps to find out the e-readiness of different countries and calculates E-Government Development Index (EGDI) using human development related parameters. The detail of these parameters is as follows:

1. Online Service Index (OSI): It checks whether the countries are following the minimum level of Web Content Accessibility Guidelines or not.
2. Telecommunication Infrastructure Index (TII): It checks communication-Related aspects of the nation like total users of computer per 100 people; total connections of telephone connections per 100 people; total connections of Internet per 100 people; total users of mobile per 100 people and total users of broadband per 100 people.
3. Human Capital Index (HCI): This parameter checks the literacy rate, enrolment, and level of education at the primary and secondary level, skill development.

After calculating the above parameters, EGDI further finds out the composite index based on the weighted average of these parameters. The possible values of this index lie between zero (minimum) to 1 (maximum).

$$EGDI = (1/3 * OSI) + (1/3 * TII) + (1/3 * HCI)$$

The EGDI index report 2018 (Table 1) shows Denmark at the top rank with 0.9150 index value. India, through its constant efforts, has made it possible to achieve 96th global rank in the EGDI report with 0.5669 index value [12], [17].

Table 1: E-Governance Development Index (EGDI) 2018 survey report

Rank	Countries	EGDI 2018	OSI 2018	TII 2018	HCI 2018
1	Denmark	0.9150	1.0000	0.7978	0.9472
2	Australia	0.9053	0.9722	0.7436	1.0000
3	Republic of Korea	0.9010	0.9792	0.8496	0.8743
4	UK	0.8999	0.9792	0.8004	0.9200
5	Sweden	0.8882	0.9444	0.7835	0.9366
11	USA	0.8769	0.9861	0.7564	0.8883
65	China	0.6811	0.8611	0.4735	0.7088
94	Sri Lanka	0.5751	0.6667	0.3136	0.7451
96	India	0.5669	0.9514	0.2009	0.5484
117	Nepal	0.4748	0.6875	0.2413	0.4957

Source: UN e-government survey 2018

Now the obvious question that comes to the mind is – Is the ranks scored by different countries is the result of continuous efforts [16] or the result of efforts invested in two years only? The answer to this question can be understood with the help of Table 2. It

shows the consolidated status of different countries on the basis of EGDI Biannual reports of 2014, 2016, and 2018.

Table 2 Biannual comparison of EGDI

Rank	Country	EGDI 2014	EGDI 2016	EGDI 2018
1	Denmark	0.8162	0.8510	0.9150
2	Australia	0.9103	0.9143	
3	Korea	0.9462	0.8915	0.9010
4	UK	0.8695	0.9193	0.8999
5	Sweden	0.8225	0.8704	0.8882
6	USA	0.8748	0.8420	0.8769
7	China	0.5450	0.6071	0.6811
8	Sri Lanka	0.5418	0.5445	0.5751
9	India	0.3834	0.4637	0.5669
10	Nepal	0.2344	0.3458	0.4748

Source: UN e-government survey 2014, 2016 and 2018

The pictorial representation (Fig. 4) further helps to understand the difference in parameters, the growth rate of e-governance, and the e-readiness of various countries at different time intervals. It indicates that e-governance is a long-term project seeking continuous efforts, time, money, and management for its successful implementation.

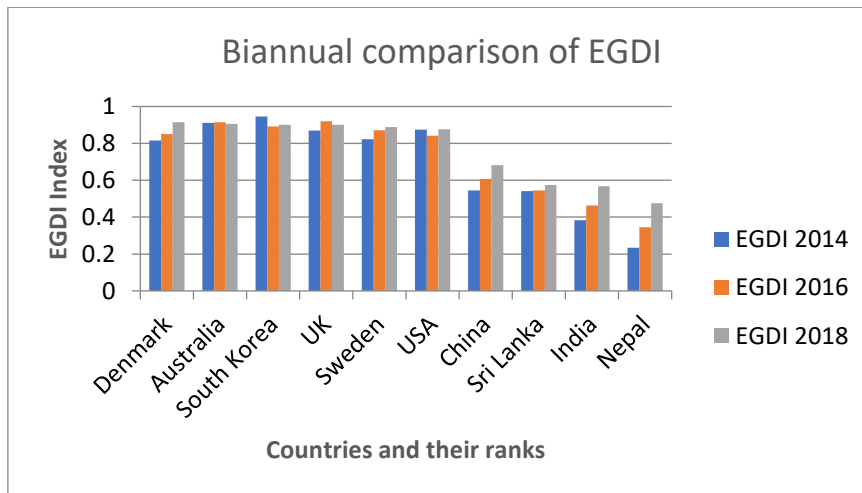


Fig. 4 Biannual Comparison of EGDI survey 2014 - 2018

3.2 E-governance and Big data in India

The Indian governments have initiated many e-governance based projects at the Centre level, State level, or with the integration of both for the citizen's welfare [7]. The most prestigious project was UID (Aadhar Card) where the government has invested Rs. 5,630 crores, to uniquely identify citizens. This project is using big data analytic techniques as it is dealing with huge amounts of mixed datasets that need to be processed in real-time at great speed. In order to make India — Digital India, the governments are trying to make the citizens aware and enable to use all the government services. As far as the digitization of public departments is taking place, the problem of maintaining a huge amount of data using traditional databases was also becoming heartbreaking. Thus, now the role and support from big data analytics have not been only supporting e-governance but also to provide various techniques to easily store or process a huge amount of datasets at a great speed and accuracy. That is how big data has been proving its worth in e-governance projects.

E-governance projects at Centre level: Table 3 shows the detailed list of Mission Mode Projects initiated in India [15].

Table 3 Mission Mode Projects (MMPs)

Sr. No	Central MMPs	State MMPs	Integrated MMPs
1.	Banking	Agriculture	CSC
2.	Central Excise & Customs	Commercial Taxes	e-Biz
3.	Income Tax (IT)	e-District	e-Courts
4.	Insurance	Employment Exchange	e-Procurement
5.	MAC 21	Land Records (NLRMP)	EDI for eTrade
6.	Passport	Municipalities	National e-governance Service Delivery Gateway
7.	Immigration, Visa And Foreigners Registration & Tracking	e-Panchayats	India Portal
8.	Pension	Police	
9.	e-Office	Road Transport	
10.	Posts	Treasuries Computerization	
11.	UID	PDS	
12.		Education	
13.		Health	

Source: <https://meity.gov.in/content/mission-mode-projects>

Some of the MMPs initiated and implemented at the Centre level are:

- Digitization of government offices: The Department of Administrative Reforms and Public Grievances (DAR&PG) and National Information Centre (NIC) worked together for the computerization and its successful implementation in all the government departments [19] to make the system more transparent.
- Issuance of Unique Identification (UID): The idea of this project was first triggered and discussed in 2006 [20]. This project stores all the related information like Name, Address, retina scan, finger impressions, etc.
- Income Tax (IT): This project enables the citizens to file income tax [21] on anytime and anywhere basis. This project encourages issuing PAN cards to citizens that are further linked with the citizen's account. Citizens can also track the status of their returns or refund online.
- Central Excise & Customs: This project facilitates the trade and industry by simplifying the custom and excise processes [22], filing of returns, reconciliation, e-registration for excise and service tax; etc.
- Insurance: This project provides speedy processing of claims, online insurance of policies on the web, etc. through interoperability [23].

E-governance projects at the state level: Some of the mission mode projects initiated and implemented at the state level are as follows:

- Agriculture: The main objective of this MMP is to inform the farmers [24] about seeds, type of soil and matching crops, fertilizers, pesticides, government schemes, weather forecasts, etc.
- Commercial taxes: The main objectives taken care by this project are e-filing of returns [25], refunds, e-payment of taxes, online dealer ledger, etc.
- Education: Education is the common concern of both the Centre and State governments [26]. Thus, the Ministry of Human Resource Development (MHRD) established a centralized structure that will be implemented by state governments.
- E-municipalities: Digitization of the state-level municipalities is another very important initiative taken by the Central government [27] under the e-governance plan.
- Digitization of land records: The main objective of this project is to digitize the existing land records to avoid the chances of human mistakes [28].
- Employment Exchange: This project helps employers and employees to match their requirements and find the best fit using online resources [29].

Integrated E-governance projects: Other than the projects mentioned above, there are many projects seeking Centre and the State government's coordination for the welfare of the citizens. For example land records, education, entertainment, etc. Some of the integrated projects and their objectives are as follows.

- Road Transport: This project created a unified scheme (states and union territories) to computerize their transport offices for efficient and quick management of driving licenses and certificates [30].
- E-Procurement: This project helps to make the procurement processes simple, transparent, and result-oriented [31] using the Internet.

- EDI for eTrade: The Electronic Data Interchange (EDI) for online trade provides deliveries of services (24 * 7) electronically, increased transparency, reduced time, cost, etc. [32].
- E-Biz: This project provides services in Government-to-Business (G2B) [33] by sharing updated online information, easy to access the website, etc.

4 Challenges of using Big Data Analytic Techniques

Big data analytic techniques have proved their worth in e-governance based projects. Still there seems some challenges or gaps to overcome for the successful use of big data in e-governance [9][18].

- Threat to privacy: Big data analytic techniques need to process personal details of the citizens like UIDs, bank details, health details, sale or purchase information, etc. for analysis. If this personal information is not used appropriately, then it may lead to its safety threat.
- Ethical Vs Unethical: As the end-Users (citizens) are neither aware nor informed that their personal details have been shared for future analysis, this act inclines towards the unethical use of power for accessing sensitive information.
- Security of data: The e-governance project's datasets, placed on the distant servers may lead to intentional or unintentional threats to sensitive datasets.
- Lack of skilled resources: There is a deficiency of skilled resources to maximize the utilization of big data analytics by finding out hidden patterns or detail.
- Reliability of information: The reliability of these reports mainly depends on the capabilities and intentions of the enabled resource generating that report.

5 Conclusion

E-governance has been transforming the whole world. Now paper files have been turned into computerized files, stored and maintained at the repositories placed at far of places. Big data analytic techniques have been adding sophistication in the e-governance by providing detailed insights of hidden patterns or datasets. Big data analytic techniques have also been overwhelming the traditional DBMS problems like storing, sharing, and processing huge volumes, high velocity of datasets at greater speed. Big data analytics also have some issues or risks related to safety, security, accessing of datasets. Technocrats are continuously working to provide safeguards against all the odds being faced using big data analytic techniques. The Indian government is also working to make India – a digital India. Various e-governance projects have been implemented at the Centre and the State-levels for the welfare of the citizens. The most popular project i.e. UID has been using big data analytic techniques to store and process huge amounts of data. Thus, the integration of e-governance and big data should be encouraged to make Indian cities – smart cities and India – Digital India. This will also help the Indian government in decision-making, better planning, and management of resources for the welfare of citizens.

6 References

1. WSP: International Management Consulting: Report on Public-Private Partnerships in India.
2. Preet N., Neeraj S., Dr Manish: Role of Big Data Analytics in Analyzing e-Governance Projects: GIAN JYOTI E-JOURNAL(2016), Vol. 6, Issue 2, pg. 53—63.
3. Min Chen, Shiwen Mao, Yunhao Liu: Big Data: A Survey: Springer: Mobile Netw Appl (2014); page 171—209.
4. Seif Abou Zaid: Case Study: Impact of Leadership on Governance in Public Administration: Academia.edu.
5. Big data: Wikipedia: https://en.wikipedia.org/wiki/Big_data.
6. Rajagopalan M.R, Solaimurugan V.: Big Data Framework for National E-Governance Plan: 11th International Conference on ICT and Knowledge Engineering (2013): IEEE.
7. P.K. Mohanty: Using e-Tools for Good Governance & Administrative Reforms: Academia.edu.
8. V. Sridhar: E-paper - Big Data's big governance impact: May 2017.
9. Sameer Sachdeva: White paper on E-Governance Strategy in India: Dec 2002.
10. Infrastructure in India: The Economist (Magazine): Dec 2012.
11. Big Data & Analysis: FOSTECH & COMPANY.
12. E-governance Development Index survey report from UN DESA, 2018: <https://drive.google.com/file/d/1FZT5zDfTa-ejvPh9c1Zu1w51DoMOefw1/view>.
13. E-governance Development Index survey report from UN DESA, 2016: https://drive.google.com/file/d/1C-wGuGkLEIY4pwM-cO7Nv2xjM2_IvJbl/view.
14. E-governance Development Index survey report from UN DESA, 2014: <https://drive.google.com/file/d/1BrSZ7zfsPGLd6t6AiHyynsZLhCEFZjmY/view>.
15. Mission Mode Projects(MMPs) of India: Ministry of Electronics & Information Technology, Government of India.
16. Chap 8-Egovernance in India: Initiatives, Opportunities and Prospects to Bridge the Digital Divide.
17. E-governance and Digital India Empowering Indian Citizens Through Technology: September 2015.
18. Benchmarking E-government: A Global Perspective: United Nations Division for Public Economics and Public Administration.
19. National Portal of India: www.india.gov.in.
20. UID: <http://www.censusindia.gov.in/>.
21. Income Tax Department: www.incometaxindia.gov.in.
22. Central Excise & Custom: <http://www.cbec.gov.in/>.
23. Insurance: <http://financialservices.gov.in/>.
24. Agriculture: <http://agricoop.nic.in/>.
25. Commercial Taxes: <https://dor.gov.in/>.
26. Ministry of Human Resource Development: www.mhrd.gov.in, www.edudel.nic.in.
27. E-municipalities: http://tte.delhigovt.nic.in/wps/wcm/connect/doiit_udd/Urban+Development/Home.
28. Digitization of land records: <http://noidaauthorityonline.com/land-record.html>.
29. Employment exchange: www.labour.nic.in/.
30. Road Transport: <http://morth.nic.in/> and <http://meity.gov.in/>.
31. E-procurement, <https://commerce.gov.in/>.
32. Electronic Data Interchange (EDI) for Trade (eTrade): <https://commerce.gov.in/>.
33. E-Biz Homepage: <http://dipp.nic.in/>.
34. Poonam S., Veerpaul Karu Mann: <https://www.ijrte.org/wp-content/uploads/papers/v8i6/F7820038620.pdf>: IJRTE (2019), Vol. 8, Issue 6, Pg. 1609 —1615.