

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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EMERGENCE AND GROWTH OF BIG DATA IN E-GOVERNANCE OF INDIA

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ABSTRACT

E-Governance has been implementing almost all over the world to make the governance more responsible, reliable and transparent for the citizens' welfare. Although, the successful implementation of e-Governance is the main difference among the developed, developing and under developed countries. But the advancement in the field of science & technology under the edges of ICT has made citizens more tech-saavy as they use maximum online real-time data to express their opinion or views. Their anticipation and participation generates huge data sets that can be textual, pictures, drawings, audio-video messages. These data sets are of high importance for government, as these data sets may need to be reused for future references. However, the enormous size and speed upon which this data is increasing is very difficult to manage through traditional database systems. Thus the term Big Data came into existence whose analytic techniques help to manage and process such structured or unstructured data sets. This paper studies and highlights the various issues in traditional e-Governance database system and throws the light on the growth and emergence of data processing using Big Data in e-Governance of India.

KEYWORDS

big data, e-governance, parallel processing, process re-engineering, unstructured data.

1. INTRODUCTION



e-Governance refers to the process of delivering govt. services and exchange of information electronically.



Through advertisements, workshops, seminars etc, Indian govt. is encouraging interactive medium for bridging the gap between govt. and citizens to make the govt. transparent, responsible and accountable. They have computerized all the portfolios, providing real-time data to the citizens. It is also encouraging PPP (Public Private Partnership) by indulging private sectors in making, updating and maintaining the ICT infrastructure nationwide. They have made various center level and state level agencies, organizations, R & D Centers like NIC, DIS, CIS, CDAC, SWAN etc to deal and manage the e-Governance data. But with the passage of time, the data being produced by them is growing at such a greater speed that the Big Data Analytic techniques are the best solution to store, retrieve and process mixed data sets at a very fast speed.

2. REVIEW OF LITERATURE

The review of literature reveals that Indian e-Governance is evolving constantly. According to the United Nations e-Governance Survey – 2012, e-Governance in India is constantly progressing and stands at No. 2 after China in the list of densely populated countries worldwide. According to the **Gartner's Maturity Model of e-Governance**, India has been passing through its IIIrd stage (vertical integration) with its face towards IV<sup>th</sup> stage (**horizontal integration**) where different departments can access and share common database(interoperability).

The websites detail of different portfolios running under govt. are as follows:

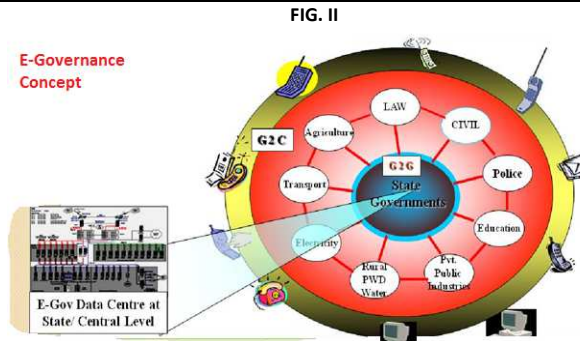
TABLE 1

S.No	Portfolios	Website
1.	PM office	<a href="http://pmindia.gov.in/en/">http://pmindia.gov.in/en/</a>
2.	Ministry of Home Affairs	<a href="http://www.mha.nic.in/">http://www.mha.nic.in/</a>
3.	Ministry of Finance	<a href="http://finmin.nic.in/">http://finmin.nic.in/</a>
4.	Ministry of Cultural Youth and Sports	<a href="http://www.indiaculture.nic.in/">http://www.indiaculture.nic.in/</a>
5.	Ministry of Defense	<a href="http://www.mod.nic.in/">http://www.mod.nic.in/</a>
6.	Ministry of Communication	<a href="http://www.dot.gov.in/">http://www.dot.gov.in/</a>
7.	Ministry of Human Resource Development	<a href="http://mhrd.gov.in/">http://mhrd.gov.in/</a>
8.	Ministry of Foreign Affairs	<a href="http://www.mea.gov.in/">http://www.mea.gov.in/</a>

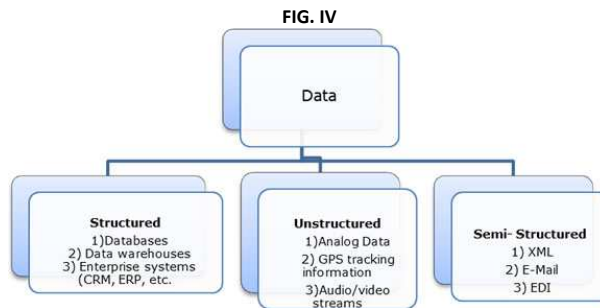
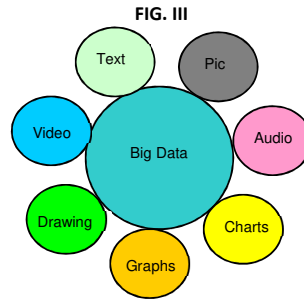
The Indian government has also developed a national portal <http://india.gov.in> that provides various links to deal or access govt. services running nationwide for the citizens' help and welfare. **Let us discuss the initiatives taken by Indian government that are generating huge data sets:**

- ❖ Digital India - a government initiative to integrate all portfolios and to provide all government services under one umbrella
- ❖ Adhar Card – world's largest ID database platform to create digital identity for each Indian
- ❖ Science & Technology - research work carried out in the field of medicine, astrophysics, materials science, earth and atmospheric observations, energy, computational biology, bioinformatics, cognitive science, statistics etc., generate huge data sets of different types.

Moreover, **black box data, social networking websites, stock exchange, sensors, search engines** are the other popular resources for producing huge data sets of mixed type, Fig - II. Thus to deal with such a huge data, Big Data came into existence.



**2.1 WHAT IS BIG DATA:** Big Data means a data that is really very big in size, Fig-III. The data received by govt. departments can be in the form of text, pictures, videos, audio etc.



Thus, the major problem to deal with such data is – type of data, Fig-IV. The data can be one of the following types:

- ❖ **Structured data** i.e well-formed data that can be stored on various types of databases
- ❖ **Semi structured data** i.e XML codes that have tags and attributes specified by users
- ❖ **Unstructured data** i.e audio-video messages, pictures etc.

The traditional database systems are inefficient to store such a heterogeneous data or to retrieve specific data at a great speed from such data sets. To overcome these issues, Big Data Analytic Techniques came into existence.

It uses distributed parallel processing where data is stored on multiple servers, which further encourages parallel processing and fast retrieval of data from the stored data sets.

**2.2 CHARACTERISTICS:** The basic characteristics of Big Data are as follows:

1. **Volume** i.e the huge amount of data is generated every day and expanding rapidly
2. **Variety** i.e the type of data can be audio, video, text, image or mixed
3. **Velocity** i.e the speed at which data is produced or processed
4. **Veracity** i.e the quality or accuracy of data

Big data helps to deal, store, process and retrieve very large and different type of real time data sets. As Indian govt. is also taking steps to make our India as a Digital India, they need to use big data analytics to store, process and retrieve large data sets.

**3. OBJECTIVES**

Basic objectives of this paper are as follows:

1. To study the necessity and use of Big Data in e-Governance
2. To identify the issues in traditional e-Governance system
3. To compare the new system with traditional database system

**4. HYPOTHESIS**

Two basic hypothesis that have been framed to study the above said objectives are as follows:

**HYPOTHESIS - I**

- H<sub>0</sub>: There is no significant growth of E-Governance in India due to ICT.
- H<sub>1</sub>: There is significant growth of E-Governance in India due to ICT.

**HYPOTHESIS - II**

- H<sub>0</sub>: There is no significant need or importance of Big Data concepts towards the successful implementation of E-Governance.
- H<sub>1</sub>: There is significant need or importance of Big Data concepts towards the successful implementation of E-Governance.

**5. RESEARCH METHODOLOGY**

To study these objectives, *Analytical method* has been used where data about e-Governance, role of Big Data and the difference between traditional database processing system and Big Data analytic techniques are analyzed and compared.

**5.1. SOURCE OF DATA:** To study these objectives, secondary data has been collected from various Internet journals, govt. websites and newspapers to check the overall development.

**6. E-GOVERNANCE USING BIG DATA**

**6.1 PROCESS RE-ENGINEERING:** Indian governments are constantly trying to restructure their processes to ensure the socio-economic-political growth of the country. The study reveals that the states like *Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujrat, Rajasthan, Tamilnadu etc.* are among those states that have been successfully running e-Governance projects. Let us have a glance on the reforms incorporated by the Indian govt.:

- Establishing dedicated center level organizations for the research projects and development of e-governance like NIC, NeGA, CSC, CDAC
- Establishing various state level organizations to co-ordinate and develop e-governance in respective states
- Enactment of ICT Act (during 1990s), to develop communication nationwide
- Making IT Act (during yr. 2000) to protect transactions (data) from intentional / unintentional loss or theft
- Passing of RTI Act (during yr. 2005) to encourage the citizens and to make public agencies more accountable and responsible
- Funds and subsidies to various e-governance projects
- Encouraging private sector to participate and invest money in e-governance projects through PPP
- Taking the services from Technical Experts
- Encouraging International trades and treaties with various countries and World bank to help and support e-governance.

All these factors have made various e-Governance Mission Mode Projects (MMPs) successful thus ensuring the socio-economic-political reforms. However, online banking, land reforms, UID card, radio-frequency identification (RFID) readers, wireless sensor network etc are the other few examples ensuring success of e-governance in India. But these changes are generating huge data sets which may be used as and when required. According to a survey, 2.5 quintillions[8] bytes of data is produced in one day and more than 90% of the total data has been produced in the last two years. Thus, the database is expected to be smart enough to store, process such interrelated but mixed data sets to obtain meaningful information. **And the answer to all these requirements is Big Data.**

**6.2 WORKING OF TRADITIONAL DATABASE SYSTEM:** In the early days of computation, RDBMS was the first and foremost choice of every organisation as it was easy to learn and understand as well as powerful enough to store huge amount of data, Fig-5



FIG. V

Oracle, SQL Server, DB2 etc are a few examples of popular RDBMS However, these applications were developed to deal with structured type of data where all the data is stored at central computer and all other share and process the data from that common place. This technique is good only for statistical analysis using structured queries. Review of literature reveals that many e-governance services are designed to deal with structured data sets, processed through statistical measures but could not help in finding out the future aspirations or critical challenges.

**6.3 TYPE OF BIG DATA ANALYTICS:** In order to overcome the shortcomings from the traditional database systems and to fulfill new requirements, new technologies came into existence that are much more efficient in storing, processing and retrieving massive amount of data sets at a great speed, for example: NoSQL, MongoDB, Hadoop etc. Various vendors are available with different products to deal with Big Data like Amazon, IBM, Microsoft etc. But before selecting the appropriate technology requirement of any system, one should understand the type of their big data (structured / unstructured / mixed), size, speed etc. After analyzing the Big Data, we can classify it into two types:

- (i) Operational Big Data
- (ii) Analytical Big Data

(i) Operational Big Data: Operational Big Data as its name is indicating is designed to deal with real-time data that need to support concurrent users at a great speed. These techniques deal with structured data sets. NoSQL, MongoDB technologies are the most appropriate, to deal with the operational big data sets. These technologies have been designed to overcome the shortcomings of relational database management systems in dealing big data. NoSQL uses **Cloud service** that is faster, quicker and inexpensive to store, retrieve and process huge data sets. This is the open source and can be easily downloaded from the Internet. Sometimes, they may provide patterns/trends data followed by their follow users that further helps in decision making.

(ii) Analytical Big Data: This technique is basically designed to deals with unstructured data sets at a great speed and accuracy. Unlike traditional RDBMS, these systems support Massive Parallel Processing (MPP) where the data sets are stored on various commodity hardware along with Map Reduce algorithm to process unstructured data sets at a great speed and accuracy for example, Hadoop.

Let us compare and contrast the Operational and Analytical Big Data:

TABLE 2

Measuring Factors	Operational	Analytical
Latency	1 ms – 100 ms	1 min – 100 min
Concurrency	1000- 100,000	1 – 10
Access Patterns	Both Read and Write	Only Read
Data	Structured	Both Structured, Unstructured
Queries	Selective	Unselective
Data Scope	Operational	Retrospective
End User	Customer	Data Scientist
Technology	NoSQL, MongoDB	Hadoop(MPP + Map Reduce)

There can be a situation where a company needs both operational and analytical techniques together to deal with its data sets. The technocrats have provided the solution to this problem by integrating the MongoDB and Hadoop through an API. This technique provides the quality speed, storage and processing power of MongoDB and analytical, decision making skills of Hadoop.

FIG. VI



Thus, we can conclude that Operational and Analytic techniques complements to one another.

**6.4 DIFFERENCE BETWEEN TRADITIONAL DATABASE SYSTEM AND NEW SYSTEM:** Let us understand the difference between traditional database system and new Big Data system.

TABLE 3

TRADITIONAL DATABASE SYSTEM	BIG DATA SYSTEM
It refers to the collection of structured data sets having predefined data types and values.	It refers to the collection of structured data sets, unstructured or semi-structured data sets.
It stores terabytes of data.	It stores enormous data sets.
Here data value is text-oriented.	Here data value can be an audio, sound, video file, text or pictures etc
Simple statistical operations are performed very easily under some known conditions.	It is mainly useful to get unknown data from the given data sets or to explore new market trends etc.
It works on establishing relationship between two or more tables, generate queries to find the required results.	It works on heterogeneous types of data that is very difficult to correlate.
It works on operational type of data.	It works on analytical type of data.
It is simple and easy to understand.	It needs expert person to interpret the results produced from heterogeneous data.

**7. FINDINGS**

E-governance has been implementing nationwide in India. Due to the ICT development, many electronic services like e-governance, e-commerce, e-reservation, e-registration, Digital Lockers, online banking, online education, virtual labs, social networking website have been used almost all over in India. Traditional database systems had been designed to store and process structured well-formed data sets. But data can be in the form of text, pictures, audios or videos or a mixed data. As the requirements have been changed, Big Data Analytics has become the foremost solution to store and retrieve huge data sets.

**8. RECOMMENDATIONS & SUGGESTIONS**

Thus, we find that Big Data helps to do massive parallel processing (MPP) on the unrelated data sets to get overviews about the current trends which further effects the decision makings. Along with this, the Big Data Analytic technique are the open source, can be easily downloaded and used. It also provides cloud storage. Thus this technique is well-suited to fulfill the future-aspirants of e-governance in India.

**9. CONCLUSION**

On the basis of the study, it has been found that E-Governance is growing significantly due to the revolution of ICT. But the traditional relational database systems are not well-suited to store, retrieve and process huge data sets of e-governance projects. On the other hand, Big Data uses commodity hardware to store the chunks of data and provide parallel processing to get the results from un-related data sets at a faster speed. However, the selection of big data technique (operational type or analytical type) depends upon the current projects' requirements. Thus, Big Data is the need of hour for our future digital India.

**10. LIMITATIONS**

Let us understand the basic threats or limitations found out while analyzing the growth of e-governance and Big Data:

- ❖ Expensive and high quality hardware required
- ❖ Require technical expertise for hands-on
- ❖ Security threat as data is stored on some private clouds
- ❖ More prone to data theft

**11. SCOPE OF FUTURE RESEARCH**

We will try to find out the scope of various Big Data Analytic techniques, their scope, usage and impact on the efficient and effective implementation of e-governance in India.

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