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A Review on Contribution of Data mining in e-Governance Framework

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Abstract- Information and communication technology has the aptitude to enhance the method by that governments involve individual in formulating public policy and public policies. Even if a lot of government rules could currently be in digital type (and typically obtainable online), thanks to their complexness and variety, distinguishing those relevant to a selected context may be a non-trivial task. Similarly, with the appearance of variety of electronic on-line forums, social networking sites and blogs, the chance of gathering citizens' petitions and stakeholders' views on government policy and proposals has increased greatly, however the amount and therefore the complexness of analyzing unstructured knowledge makes this tough. On the opposite hand, text mining has come back a protracted manner from straightforward keyword search, and matured into a discipline capable of addressing way more advanced tasks. during this paper we tend to discuss however text-mining techniques will facilitate in retrieval of information knowledge and relationships from matter data sources, thereby helping policy manufacturers in discovering associations between policies and citizens' opinions expressed in electronic public forums and blogs etc. we tend to additionally gift here, an integrated text mining based mostly design for e-governance call support alongside a discussion on the Indian situation.

Keywords: E-Governance, Data mining, Knowledge discovery, Grievance redressal, DSS, ICT, Text mining.

INTRODUCTION

The emergence of Information and Communications Technology (ICT) has provided means for faster and better communication, efficient storage, retrieval and processing of data and exchange and utilization of information to its users, be they individuals, groups, businesses, organizations or governments [1]. What had begun as a faster, more accurate and simpler means of word-processing quickly lent itself to being used as a tool for processing and tabulating data as an aid in decision making. With growing computerization and increasing internet connectivity, this process has presently reached a stage where more and more users are motivated to modifying their ways of doing things in order to leverage the advantages provided by ICT. In other words, this has led to 'business process re-engineering'. So far as governments are concerned, the coming together of computerization and internet connectivity/web-enablement in association with process re-engineering, promises faster and better processing of information leading to speedier and qualitatively better decision making, greater reach and accountability, better utilization of resources and overall good governance. In the case of citizens, it holds the promise of enhanced access to information and government agencies, efficient service delivery and transparency in dealings and interactions with government. With the increasing awareness among citizens about their rights and the resultant increase in expectations from the government to perform and deliver, the whole paradigm of governance has changed. Government, today, is expected to be transparent in its dealings, accountable for its activities and faster in its responses. This has made the use of ICT imperative in any agenda drawn towards achieving good governance. It has also led to the realization that such technologies could be used to achieve a wide range of objectives and lead to faster and more equitable development with a wider reach. In its Fourth Report entitled 'Ethics in Governance' [2], the Commission had clearly stated that the tools of modern technology such as Information and Communications Technology (ICT) should be used to transform the relationship of the government with its constituents, citizens and businesses, and also between its own agencies. While recognizing the potential of ICT in transforming and redefining processes and systems of governance, the Commission had suggested that e-Governance is the logical next step in the use of ICT in systems of governance in order to ensure wider participation and deeper involvement of citizens, institutions, civil society groups and the private sector in the decision making process of governance. Although the term 'e-Governance' has gained currency in recent years, there is no standard definition of this term. Different governments and organizations define this term to suit their own aims and objectives. Sometimes, the term 'e-government' is also used instead of 'e-Governance'. According to the World Bank [3], "E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with

business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions." UNESCO defines e-Governance as [3] "Governance refers to the exercise of political, economic and administrative authority in the management of a country's affairs, including citizens'. The articulation of their interests and exercise of their legal rights and obligations. E-Governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities." This definition visualizes the use of the electronic medium in the exercise of authority in the management of a country's affairs along with articulation of citizens' interests leading to greater transparency and efficiency. The benefits of e-Governance are as follows [4]:

- Better access to information and quality services for citizens: ICT would make available timely and reliable information on various aspects of governance. In the initial phase, information would be made available with respect to simple aspects of governance such as forms, laws, rules, procedures etc later extending to detailed information including reports (including performance reports), public database, decision making processes etc. As regards services, there would be an immediate impact in terms of savings in time, effort and money, resulting from online and one-point accessibility of public services backed up by automation of back end processes. The ultimate objective of e-Governance is to reach out to citizens by adopting a life-cycle approach i.e. providing public services to citizens which would be required right from birth to death.
- Simplicity, efficiency and accountability in the government: Application of ICT to governance combined with detailed business process reengineering would lead to simplification of complicated processes, weeding out of redundant processes, simplification in structures and changes in statutes and regulations. The end result would be simplification of the functioning of government, enhanced decision making abilities and increased efficiency across government – all contributing to an overall environment of a more accountable government machinery. This, in turn, would result in enhanced productivity and efficiency in all sectors.
- Expanded reach of governance: Rapid growth of communications technology and its adoption in governance would help in bringing government machinery to the doorsteps of the citizens. Expansion of telephone network, rapid strides in mobile telephony, spread of internet and strengthening of other communications infrastructure would facilitate delivery of a large number of services provided by the government. This enhancement of the reach of government – both spatial and demographic – would also enable better participation of citizens in the process of governance.

DATA MINING IN E-GOVERNANCE

The transformation from conventional government services to E-government services heralds a new era in public services. E-government services can replace the government's traditional services with services of better quantity, quality and reach, and increase citizen satisfaction, using Information and Communication Technology (ICT). E-governance aims to make the interactions between government and citizens (G2C), government and business enterprise (G2B) and intergovernmental department dealing (G2G) friendly, convenient transparent and less expensive [5]. A growing amount of informative text regarding government decisions, directives, rules and regulations are now distributed on the web using a variety of portals, so that citizens can browse and peruse them. This assumes, however, that the information seekers are capable of entangling the massive volume and complexity of the legally worded documents [6]. Government regulations are voluminous, heavily cross-referenced and often ambiguous. Government information is in unstructured / semi-structured form, the sources are multiple (government regulations comes from national, state and local governments) and the formats are different – creating serious impediment to their searching, understanding and use by common citizens. In the G2G arena, the government departments are in an even greater need of a system that is able to provide information retrieval, data exchange, metadata homogeneity, and proper information dissemination across the administrative channels of national, regional / state, and local governments [7]. The increasing demand for and complexity of government regulations on various aspects of economic social and political life, calls for advanced knowledge-based framework for information gathering, flow and distribution. Also, regulations are frequently updated by government apartments to reflect environmental changes and changes in policies. Tools that can detect ambiguity, inconsistency and contradiction are needed because the regulations, amended provisions, legal precedence and interpretive guidelines together create a massive volume of semi-structured documents with potentially similar content but possible differences in format, terminology and context. Information infrastructures that can consolidate, compare and contrast different regulatory documents will greatly enhance and aid the understanding of existing regulations and promulgation of new ones. Government regulations should ideally be retrievable and understandable with ease by legal practitioners, policy makers as well as general public /citizens. Despite many attempts, it is recognized that e-government services are yet to render the desired pro-citizen services and are mostly targeted towards internal efficiency [8]. Kwon et al [9], have proposed a system that helps rule makers understand and respond to the public comments, before finalizing proposed regulations. These public comments are opinion-oriented arguments about the regulations. The facility of identification and classification of main subject of the claims / opinions provided by the tool helps rule-writers preview and summarize the comments [9]. The proposed solution identifies conclusive sentences showing

the author's attitude towards the main topic and classifies them to polar classes [9]. The researchers have applied a supervised machine learning method to identify claims using sophisticated lexical and structural features and to classify them by the attitude to the topic: in support of, opposed to, and proposing a new idea.

It is widely acknowledged that democracy requires well-informed citizens. Information creates trust and is the mechanism for ensuring that politicians serve the electorate. Democracy if effective when there is smooth flow of information between citizens and government [10]. E-Governance in its present form has furthered this concept to a certain extent. However, the character of e-governance is mainly one-way flow of information – from the government to the citizens, and authentic citizen participation is absent. With the integration of citizens' participation in the entire process of governance with the help of Information and Communication Technology e-governance evolves into E-democracy and Citizen Participation in policy making can secure democracy, as it generates a continuous flow of information between citizens and the government, helping them in the decision-making process and the citizens can assume a more active role in society, exercising their opinion power with ease and agility [11]. In the usual form of democracy, the general election is the most important citizen participation process. It is significant because it formulates the country's transfer of power from one civilian government to another. Since, elections are intermittent, it is important to have a system in place that has the capability to track public opinion on a more or less continuous basis, and encourage involvement and participation from the electorate on matters of public importance. It is quite possible for citizens' to have different opinions on government proposals. Government can use the online discussion forums and encourage citizens' to discuss on public projects. Once the discussions phase is opened and finished its output are needs to be analyzed so that the underlying trends and preferences of citizens can be incorporated into the decision-making process of the pertinent administrative department [12]. Capturing citizens' opinions through electronic participation / discussion media can be more reliable than traditional methods based on opinions polls and help avoid false opinion declaration. This also drastically changes the methods of surveying citizens' opinion trends as well as the accuracy of the evaluation of their opinions. It reduces the cost, increases reach, and provides almost real time information. Potentially, arguments that led to significant opinion shifts can be detected. However, the volume and the complexity of analyzing unstructured data make this far from straight forward. Text mining can process unstructured data leading to greater understanding of the text in the context of others on the same topic. This is especially important when dealing with expressed public opinion, where the arguments for and against particular positions are important to identify and gauge, but is immensely difficult to extract due their storage in natural language format. These systems though somewhat futuristic and still in the process of being researched, demonstrate that the concept of participation of citizens' in democratic processes through electronic media is an achievable one. It is also evident from the way these systems work, that text mining capability is the cornerstone of the move towards democracy systems. Figure-1 depicts a 'Participation System' for gathering, analysis and addressing citizens' concerns regarding existing / proposed government policies / laws. In the figure, the central repository of documents (mostly in unstructured form) has been labeled 'Proposed Govt policies/Govt policies. The citizens are encouraged to record their reactions through the 'public forums / feedback'. Government can also collect data corpus from Social networks. Print/Digital Media contains data in the form of 'Public dialogue and stakeholders opinions. Each of these three corpuses contains huge amount of unstructured/semi structured Data. Knowledge/ insights extracted from these databases can be used in forming new regulation/policies, understanding citizens' opinions and answering their concerns. The main users of the system are Public Administrative officers (PA Officers), Moderators and Decision makers. It helps in the formulation of new policies, budget analysis, understanding the stakeholders' opinion on national level projects and regulations with the help of text mining tools. Government agencies can better understand social behaviour and demands, through analyzing citizens' behaviour patterns, information extracted from this can be used to provide citizen centric solution and maintain a closer relationship between government and citizens and enhance the citizens' satisfaction on govt services.

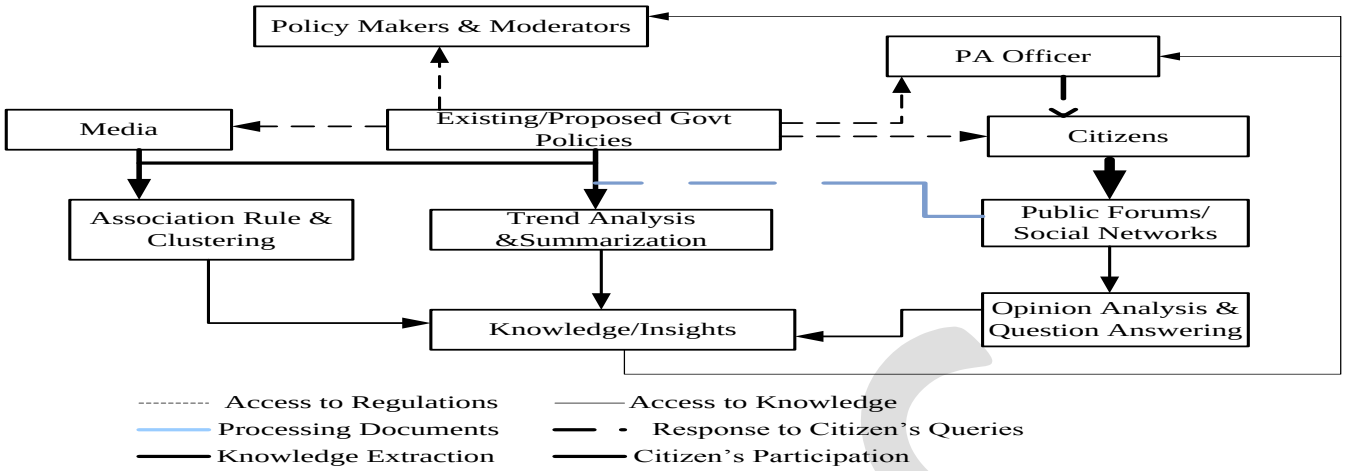

Figure. 1: Citizens' and Stakeholders' participation system

E-GOVERNANCE IN INDIA

India is a land of diversity. This diversity spans across culture, language, geography and the economic condition of the people. There are significant numbers of people who are below the minimal socio-economic benchmarks. This section of the Indian society is not only deprived of basic necessities but also lack skills and elementary education. Their social development is far worse i.e. health, education, sanitation and availability of drinking water. The quality of life of these people is far below satisfactory levels thereby making the task of improving their standard of living and sustain the same is daunting. Government of India recognizes that e-governance, in the context of developing countries, provides an excellent opportunity for improving the quality of life of these sections of society and moreover it could actually provide them more equitable access to economic opportunities. India's experience in e-governance initiatives has demonstrated significant success in improving accessibility, cutting down costs, reducing corruption and increased access to un-served groups [13]. The study points out that the development of infrastructure is very important in countries such as India, which have a high proportion of global population and could benefit from E-Government if literacy can be improved. E-governance is reforming the way government manages and shares information with external and internal clients. Specifically, it harnesses information and communications technologies (such as Wide Area Networks, the Internet, and mobile computing) to transform relations with citizens, businesses and amongst various arms of government. Chakravarthy [14] has discussed the need of Citizen Centric e-Governance in India and discussed about the need to create a culture of maintaining, processing and retrieving the information through an electronic system and use that information for decision making. The Government of India, in various forums, has indicated its commitment to provide efficient and transparent government to all strata of society. E-Governance is now mainly seen as a key element of the country's governance and administrative reform agenda. The Government of India aspires to provide governance that is easily understood by and accountable to the citizens, open to democratic involvement and scrutiny (an open and transparent government) and Citizen-centric governance that will cover all of its services and respect everyone as individuals by providing personalized services.

ROAD MAP FOR DATA MINING

E-Government can advance the agenda on Governance and fiscal reform, transparency, anticorruption, empowerment and poverty reduction .E-Governance in India has steadily evolved from computerization of Government Departments to initiatives that encapsulate the finer points of Governance, such as citizen centricity, service orientation and transparency. Paramjeet Walia [13] has discussed about the initiative applications of Information and Communication Technologies (ICTs) in support of e-government initiatives in India, National portal of India is initiated as a Mission Mode Project under the National e-governance Plan (NeGP) [15] and other planning initiatives undertaken by the Government of India (GOI) have discussed about the importance of feedback pertaining to utility of the projects, which are part of NeGP and need of a systems to assess the usefulness and impact of e-governance initiatives in India. The plan envisages creation of right environments to implement Government to Government (G2G), Government to Business (G2B), Government to Employee (G2E), and Government to Citizen. Among national portals in the Southern Asia region, India has the highest ranking portal with the highest online services score. It has the most e-services and tools for citizen engagement in the region but not included one among the top 20 countries in e-participation (United Nations E-Government Survey 2010) [16], there is not much literature available on this. Indian government should take the initiative to encourage citizens to send their feedback, complaints, and suggestions through e-portal and discuss various issues on government services in virtual discussion forums. Gupta,

has discussed about the problems with existing systems and implemented an Indian Police Information System and that can be used to extract useful information from the vast crime database maintained by National Crime Record Bureau (NCRB) and find crime hot spots using crime data mining techniques such as clustering etc. Gupta [17] has noted many E-Government projects which are running in India (Rural and urban level projects, National level, state level, district level projects and so on) all these projects are taking about G2C and few of them are G2G and we can find very few efforts towards C2G (e-democracy). Yadav [18] has discussed about the need of making policy based on computerization to overcome environmental changes and need of series of efforts to achieve this. Need of establishing complete connectivity between various ministries and departments so that transfer of files and papers could be done through Internet thereby choosing efficacious speed as an alternative to manual labour. Authors in [19] and [20] have discussed the major challenges and bottlenecks for successful E-Governance Implementation in India. It has been shown that lack of local language interface is a major detrimental effect for wider proliferation of E-Governance applications in India. For successful deployment of E-Governance applications in multilingual domain, various standardization aspects related to input mechanisms, storage and retrieval, and output and display mechanism need to be addressed in a national perspective. It is also necessary that open-standards to be in place and adopted for seamless access and interchange information and Moreover, various research aspects for futuristic tools such as Cross-Lingual Information Retrieval between Indian Languages and W3C compliant Indian Language Web-Browsers need to be initiated in an urgent basis.

- Multilingual Text Mining (MLTM):- Various authors [19][20] has discussed about the need for highly multilingual text mining applications (10, 20 or more languages), but the available systems cover only few number of languages and also noted that machine learning solutions are particularly promising to achieve high multilingualism. Multilingual text processing is useful because the information content found in different languages is complementary, both regarding facts and opinions. Authors in [21] have proposed a text mining method to extract associations between multilingual texts and use them in multilingual information retrieval. Documents written in different languages were first clustered and organized into hierarchies using the growing hierarchical self-organizing map model. They have also noted that in the domain of multilingual text mining, little attention has to be paid for building multilingual document hierarchies and deriving associations from such hierarchies. Rowena Chau et al [22] have discussed about the multilingual text mining approach to cross-lingual text retrieval (CLTR), and their multilingual text mining approach for automatically discovering the multilingual linguistic knowledge contributes to cross-lingual text retrieval by providing a more affordable alternative to the costly manually constructed linguistic resources. By exploiting a parallel corpus covering multiple languages, the automatic construction of language-independent concept space capturing all conceptual relationships among multilingual terms is accomplished.
- Multilingual and Cross Lingual Projects in India:-India is a multi-lingual with 22 official languages and multi-script country. The Indian languages belong to four language families namely Indo-European, Dravidian, Austro- Asiatic (Austric) and Sino-Tibetan. Majority of India's population are using Indo-European and Dravidian languages. The former are spoken mainly in northern and central regions and the latter in southern India. Some ethnic groups in Assam and other parts of eastern India speak Austric languages. People in the northern Himalayan region and near the Burmese border speak Sino-Tibetan languages. As the amount of textual data on the Internet increases, there are also an increasing number of people who want to retrieve information in their native language. Many citizens also have multilingual capabilities that allow them to understand more than one language. This is one of the main reasons behind developing cross-language information retrieval systems. It is therefore essential that tools for information processing in local languages are developed in India. Development of technologies in multilingual computing areas involves intensive indigenous R&D efforts due to variety of Indian languages. The focused areas of the Technology Development for Indian Languages Programme in India may be divided into following domains [23]:
  - Translation Systems
  - Cross Lingual Information Access and Retrieval
  - Linguistic Resources
  - Human Machine Interface systems
  - Language processing and Web tools
  - Localization and content creation

The Data Mining techniques are extensively used by private organizations and research communities to uncover hidden trends and knowledge from historical data. The survey suggest that data warehouse and data mining concepts are adopted in many government sectors like healthcare, agriculture, education, social security fund, pollution control, electronic voting, rainfall prediction, customer complain, road traffic violation, crime control, crime forecasting, tax department et. The Table 1 provides summary of the literature review

Table 1. Summary of literature review on data mining implementation on e-governance data

Authors	Research Area	Country	Practical Implementation?	Remarks
Matjaž Gams et al. [24]	demography, fertility	Multinational	YES	Analysis performed using Decision Trees
Neera Singh et al. [25]	Healthcare	India	Yes	Knowledge discovered using Association rules, Clustering, Decision Trees
Kishori Lal Bansal et al. [26]	E-governance	India	No	Conceptual discussion about use of data warehouse and data mining in e-governance
G. Koteswara Rao et al. [27]	DSS	India	No	Conceptual discussion about Text Mining
Bidgoli [28]	Customer complain System	Iran	Yes	Knowledge discovery using Association Rules
Sushil Kumar et al. [29]	E-voting	India	No	Conceptual discussion
Adeyemo [30]	Air Pollution	Nigeria	Yes	Knowledge discovery using Clustering and decision trees
Hana. [31]	Road Traffic	China	Yes	Knowledge discovery using Association Rules
Malathi. A et al. [32]	Crime Detection	India	Yes	Enhance Data Mining algorithm for Crime Detection
R Sujatha et al. [33]	Crime Detection	India	Yes	Crime Detection using Classification
Anjum Mujawar [34]	Tax	India	Yes	Better decision making in Tax department using Fuzzy Data Mining
Hanmant N. Renushe et al. [35]	Crime Forcasting	India	Yes	Crime forecasting and prevention using data mining

CONCLUSION

In this paper we have discussed need of text mining based DSS for government agencies, various text mining applications developed in e-government, architecture for system development process and proposed an integrated framework that can be used by government

organizations' to develop text mining based DSS. We have also studied e-government objectives and the need for citizen centric systems for India and provided a road map for an Indian TMbDSS project. India can start with bilingual text mining project at national level and extend the same as multi lingual text mining initiative and then replicate the system to states at a later stage

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