BOOK CHAPTER │ E-governance to Smart-Governance

E-governance to Smart-Governance in Developing Countries Creating a digital path for realizing SDGs using Cloud computing, Big Data and Data Mining Technologies

[1]Joseph Danso, [2]Olumide Longe & [3]Frederick Asumang Odame
Academic City University College, Accra, Ghana
Ghana Institute for Management & Public Administration, Accra, Ghana
E-mails: joseph.danso@acity.edu.gh; [2]olumide.longe@acity.edu.gh;
[3]odamefrederick@yahoo.com

ABSTRACT

The emerging technologies of today are contributing to the exponential amount of data all around us. This data characterized by Velocity, Volume, Value, Variety, and Veracity(5V) in literature. This has led to a phenomenon called the Data Revolution as a result of the value that can be gleaned from the data available. The area of government where ICT capabilities are harnessed to enable governments realize its goal of public service delivery is described as e-governance. The e-governance context cannot be left out in this revolution especially in decision making. However, the vast amount of data produced by government in the public sector has not been fully harnessed decision making and planning efforts as the politician's knowledge is mostly preferred. This proposed PhD study seeks to investigate the use of emerging technologies like cloud computing, Big Data, Knowledge Discovery in Databases (KDD) process in Data mining to create a digital path for the realization of the Sustainable Development Goals(SDGs) especially in developing countries. Automating decision support system in the public services via smart technologies and algorithms is envisaged.

Keywords: Cloud Computing, E-governance, Big Data, analytics, SDGs

Introduction

Companies, organizations and firms store lots of data by the help of this powerful tool. All this data is available and kept for retrieval for future analysis that should then assist in decision making. However, dealing with such volumes of data is a big challenge since not all the data is relevant. With the enormous amount of data stored in files, databases, and other repositories, it is increasingly important and necessary, to develop powerful means for analysis and perhaps interpretation of such data and for the extraction of interesting knowledge that could help in decision-making. There are techniques used to mine these data. Such techniques are known as Data Mining. Data Mining, also popularly known as Knowledge Discovery in Databases (KDD), refers to the nontrivial extraction of implicit, previously unknown and potentially useful information from data in databases.

Big data is an integration of digital information of physical world, human society, and cyberspace. The physical world's data are generated through Internet, Internet of Things and other information technology. The human society generates its big data based mapping through human-computer interface, brain-machine interface and mobile internet. Big data is classified into two categories, data from the physical world and data from the human society. Data from the physical world is obtained through sensor, scientific experiments and observations (like biological data, neural data, astronomical data and remote sensing data). Data from the human society is acquired from sources or domains like social networks, internet, healthcare, finance, economics and transportation. Compared to traditional data, the features of big data are characterized by huge Volume, high Velocity, high Variety, low Veracity and high Value (5V).

The amount of data being digitally collected and stored is vast and expanding rapidly. As a result, the science of data management and analysis is also advancing to enable organizations to convert this vast resource into information and knowledge that helps them achieve their objectives.

Computer scientists have invented the term big data to describe this evolving technology. Big data has been successfully used in astronomy (eg, the Sloan Digital Sky Survey of telescopic information), retail sales (eg, Walmart's expansive number of transactions), search engines (eg, Google's customization of individual searches based on previous web data), and politics (eg, a campaign's focus of political advertisements on people most likely to support their candidate based on web searches).

In the case of Ghana every year, the parliament committee on accountability (ie. Public Interest and accountability committee, PIAC) sits to review government agencies utilization of government budget. The basic source of data used is the annual report from the controller and accountant general's department. It is sad to realize that no year passes without detection of gross misappropriation of funds and noncompliance. Considering the quantum of sums wasted through these ills by public officials in the public sector, there is a critical need for automated compliance monitoring and budget utilization tracking across the entire spectrum of government machinery.

Concerning Human Resource, the work output of most government workers have deteriorated to the extent that for the current government to bring improvements in public services, Government of Ghana has created the monitoring and evaluation ministry. This problem can be addressed in two folds, a total reorientation of workers in public sector or by performance tracking and evaluation which can be done via business process automation in the public sector. In attempt to ensure transparency and enhanced democracy, the parliament of Ghana have passed the right to information bill.

This bill begs to enable information democracy and availability. However, the nature of government machinery makes data distribution and information sharing a huge challenge in developing countries. The problem has led to a long date set for the implementation of the afore mentioned bill. Part of the solution is addressed by the Open Data Initiative or Open Government Data(OGD).

It must be noted data which is a critical tool for forecasting and planning, if not created, stored and preserved well can make the planning efforts non effective. The above mentioned issues and other posse a huge treat to effective governance, inclusive governance, and invariably, the delays the realization of Sustainable Development Goals promoted by the United Nations. My PhD research will focus on development of a scalable effective framework that inculcates performance monitoring and evaluation of public sector; compliance and budget expenditure tracking; and the use of Big Data Analytics and machine learning algorithms in Data Mining to create a path that aid planning, forecasting and abnormalities tracking in governance with cloud computing as the driver. This will serve as an e-governance model with decision support and forecasting capabilities helping governments make smart decisions that will propel the realization of the SDGs faster and effectively.

Possible research areas include:
Economic, Business and ROI Models for Cloud Computing Self-service Cloud Portal, Dashboard, and Analytics, Data Mining Machine Learning, Security, Privacy, and Compliance Management for Public, Private, Hybrid Clouds and e-governance.

Possible questions to address include:
1. How can we rank government business, agencies and workers in terms of performance?
2. Which governance department makes effective use of budget and which departments have crossed threshold in real-time?
3. How can current technologies be deployed to drastically eliminate corruption in public sector?
4. What is the impact of effective and efficient governance system on development in developing countries?
5. How can exiting data enable effective planning and forecasting?
6. What digital models can integrate the SDGs indicators, monitor and report progress on a national scale?
7. What is the ROI for government in efficient OGD impact on development?
8. How can the OGD be an enabler for smart decision making?

Objectives

This proposed study will seek among others to:

1. Design e-governance framework that improve access to public services
2. Design cloud based scalable architecture that enable secured and efficient storage of requisite data for planning and decision making
3. Propose a novel framework that integrates SDG indicators in governance with reporting and prediction functionalities.
4. Design interfaces that enable faster decision making based on OGD based on well tested algorithms and models.
5. Use analytics tools to create budget monitoring, performance evaluation and predict possible deviations in real-time.

Motivation

In a recent interview with the national Development Planning Commission Ghana for the Post of Principal Officer in Charge of Information Technology, I was asked to make a business case for cloud computing; and also whether I think analytics will benefit government and will strongly recommend its consideration by the Commission. Reflecting my responses to these questions I am convinced a PhD study to explore the issues further and an opportunity to advise as expert on the topic and contributing to its debate whiles training the manpower needed to provide the solution to government will be of great importance.

I am also encouraged by the various recent government of Ghana IT initiatives which seek to create a strong foundation for the study such as digital addressing project, paperless port, e-passport application, land administration portals, mobile money interoperability project, and such. The indicate government's recognition of the role of emerging technologies in accelerated development of the nation. Though these are laudable e-government solutions there is still the need to integrating current technologies such as cloud computing and Big data to providing efficiency, transparency, and improved performance. The whole-of-government approach to ensure inclusiveness and integrating the SDGs are best to be done through this PhD proposition.

Background and State Of The Art

Chandrasekaran in his Essential Guide to Cloud computing [1] provides valuable basic to advanced compendium for researchers in a comprehensive range of cloud computing topics. This great work provides grounds for understanding several key aspects of cloud computing technologies, models cloud services currently available, applications that are better suited for cloud and more. The great contribution from this book help in examining the issues and challenges and developing and deploying applications in the cloud.

The Cloud benefits over e-government [2] include but not limited to:
1. Data Scaling
2. Auditing and logging
3. Performance and Scalability
4. Reporting and Intelligence
5. Policy management

The existing government is very much server centric [1] cost effective in nature and finds itself unable to address all categories of users starting from rural urban to metropolitan citizens. This success of e-government lies in wiping out of this discrimination by providing accessibility of different web services of e-governance irrespective of geographical and language barriers.

The iterative nature of new technologies impacting the operations of government which can change the way in which technology is used and by whom, highlights the interdependency between government and technology.

A good question to ask is, how can emerging technologies like cloud computing and big data be used to accelerate the value that this interdependency relationship creates for developing countries like Ghana? Such value can be demonstrated by these trends [3] contributing to the transformation of government.

Such value includes:
  i. Real time expectations of citizen engagement and responsiveness;
  ii. The demand for "just-right" business intelligence for managing policy and operations;
  iii. The potential to draw and share resources and capabilities from many government, private and nongovernmental sectors [3].

This world bank report also predicted cloud computing as one of the range of emerging technologies expected to influence e-government in 2010[3]. Recent literature confirms such efforts in research, implementation and discussions as can be found in [4]. Bill Williams in the economics of cloud computing [5] discusses the Human-economic impact of cloud computing. He further suggests a check list for Decision makers considering cloud computing. Such efforts make strong case for cloud computing as an enabler of governance.

Regarding the major issues of quality management, Architecture, cost sustainability finance; cloud computing is proposed as aid for any attempt to use cloud in e-governance [6]. [7] in vision to implementation discussed detailed work on studies of Social and Economic impact of e-governance. This can be considered as perfect continuation of the work by [2]. Necessary additions including guidelines for designing a country wide strategy for e-government, potential benefits and impacts of e-government in developing countries were also discussed.

While e-government is an enabler for all SDGs its influence is evident remarkably on preemptive delivery of services particularly on health and education. E-governance enables better delivery of public services to citizens and contribute to their empowerment(G2G), improves interactions with business(G2B), and enhances performance of employees (G2E) [7]. E-governance can also enable participatory decision making [8].

Along with integrated services, e-governance may increasingly support policy integration and encourages the efforts of various government institutions to work more closely together as stated in 2016 edition of the UN e-governance survey [9].

It can provide government with increased insights to help revisit existing decision making workflow – a critical condition for realizing the SDGs [9]. Growth however is slow, although there are examples of positive incorporation of policies within the social area for examples, integrating policies and services across the economic, social and environmental areas remains difficult [9].

Determination to encourage whole-of-government services distribution and policies have to be supplemented with effort to ensure that executive coordinating apparatuses and financial culpability system support collaboration amongst public organizations. In [10], we notice majority of the effort in Big Data are mostly focused on other industries such as e-commerce as done by [11] manufacturing and supply Chain.

[10] in his comprehensive survey of the literature on Big Data reports some major works of Big Data in the public sector. Notably among them are: Big data in European public administration [12], Field of security informatics and public safety [13].   Public administration accountability and efficiency [14], Monitoring the interaction between citizens and Public Administration [15] in [10].

Big data application in e-government with data from smartphone [16]. The underlining message from his study shows that there is a strong bias against studies on Big data in the public service. Furthermore, all these great studies above do not consider the Whole–of-Government approach that this investigation seeks to adopt.

[10] bemoans the minimal state or lack of research in the area of Big Data in public services. This some researchers maintain that Healthcare and Public administration rarely segment population to customize action because they ignore the potential of big data in improving the public welfare. But also, are less interested in supporting human decision with automated algorithms preferring the guide of politician's knowledge [10].

Such less interest make it even worthwhile to embark on this study, to demonstrate the value that lie in automated algorithms, whiles the data that the politicians create remains a valuable mine to be explored. Looking at the promise this study holds for promoting accountability, data backed decision and its impact on the realizing the SDGs [17][18][19], there is an enormous amount of work to be done in creating an effective tested digital path which will serve as aid to smart decisions for governments but more so developing countries that seek a better and faster ways of achieving the SDGs.

Methodology

The project will seek to combine concepts from Data mining, cloud computing and Big Data. Some of the Big data tools to be explored include Hadoop and SPARK framework. A novel framework that integrates these three technologies will be developed. The project will take advantage of the Open Data Initiatives of nations which is promoted by the United nations.

Though available data from developed countries could be used to test the models developed, existing data from developing countries will be targeted. Though government of Ghana is party to this open data initiative development of the data sources is in the early stages. Data mining KDD process, and tools like Hadoop and spark from Big data will be explored for this study. The approach seeks to move the current discussion of Governance from its current stage to SMART Governance (a concept which is less discussed in literature) in attempt to create a digital path for the realization of the SDGs.

Expected Outcomes Of Study

By the end of this study, I would have developed the necessary expertise and a leading authority on the role of Big data, cloud computing technologies on e-governance. This will help me contribute to global discussions on the subject, and I will be well positioned to advice stakeholder in the promotion of emerging technologies for development. The outcomes of the study will promote public dialog and advocacy in developing countries especially for governmental bodies, non-governmental bodies for the implementation of effective global information society and smart decision born out of public service automation.

9

The study will also create a strategic fit or alignment between emerging technologies and SDGs, which will influence national ICT strategies for collecting and analyzing data for decision making and development.

References

[1] K. Chandrasekara, Essentials of Cloud Computing, New York: Taylor & Francis, 2015.

[2] A. Rastoji, "Framework to Overcome Existing Problems in E-government," 2010.

[3] World Bank, "e-Governement Primier," World Bank, Washinton, DC., 2009.

[4] C. M. Ambira, H. N. Kemoni and P. Ngulube, "A framework for electronic records management in support of e-government in Kenya," Records Management Journal, 2019.

[5] W. Bill, The Economics of Cloud Computing, Indianapolis: Cicsco Press, 2012.

[6] M. Pokharel and J. S. Park, "Cloud Computing," in ICEGOV 2009, Proceedings of the 3rd International Conference on Theory and Practice of Electronic Governance, Bolgota, 2009.

[7] S. Bhatnagar, "E-Government: From Vision to Implementation - A Practical Guide With," SAGE, 2004.

[8] A. Chakrabarty, "Technology and Governance: Enabling Participatory Democracy," 2015.

[9] UN, "United Nations E-Government Survey 2016," 2016.

[10] G. D'Arconso, "Big Data: Unleashing their economic value. A literature review," Politecnico di Torino, 2018.

[11] J. Damen, "Uncovering e-Commerce Firm Performance: the effect of big data and the customer orientation A quantitative study on firms in the e-Commerce context," Radboud University, Nijmegen, 2016.

[12] C. J. Manyika, "Big data: The next frontier for innovation, competition and producivity," 2011.

[13] D. S. Chen D. Q., "How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management," Journal of Management Information Systems, pp. 4-39, 2015.

[14] S. Lavertu, "We All Need Help: "Big Data" and the Mismeasure of Public Administration," Public Administration Review, 2015.

[15] M. D. Guillamon and M. R. A., "Factors influencing social media use in local governments: The case of Italy and Spain," Government Information Quarterly, p. 460-471.

[16] M. Anshari and A. S. , "E-Government with Big Data Enabled through Smartphone for Public Services: Possibilities and Challenges," International Journal of Public Administration, pp. 1143-1158.

[17] UN, "E-government for Sustainable Development," UN, New York.

[18] M. Anshari and M. N. Almunawar, "E-Government Initiatives through Cloud Computing: Empowering citizens," E-Government Innovation Centre, Brunei.

[19] E. K. Ali , A. S. Mazen and E. E. Hassanein, "A proposed hybrid model for adopting cloud computing in e-government," Department of Information Systems, Faculty of Computers and Information, Cairo, 2018.