Governance in the Digital Era: An Assessment of the Effectiveness of Big Data on Emergency Management in Lagos State, Nigeria

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Abstract: The frequency and intensity of natural disasters have increased significantly in recent decades, and this trend is expected to continue. Facing these possible and unexpected disasters, emergency management has become a serious governance challenge in the digital era across the world. The objective of the paper is to assess the effectiveness of big data on emergency management in Lagos state, Nigeria. The paper argues that the adequacy of a modern government could largelybe measured by her immediate response to theemergency situation and the prevention of its occurrence in the society. It observes that the absence of well-articulated, organized institutional structure to co-ordinate response activities during emergency situations in most developing countries like Nigeria. It notes that Lagos State government has, however, developed a preparedness plan which is currently assisting all stakeholders, to anticipate/ implement recovery measures speedily to reduce the effects of emergency on the citizens. This paper provides an account of how recent big data project initiatives have been successful in managing emergencies in Lagos. Based on the positive effects of the Lagos model, the paper suggests that the federal and other state governments in Nigeria should follow the footsteps of Lagos State government by developing similar emergency management preparedness plans. This will enhance their ability to develop and speedily implement effective response and recovery measures. The paper highlights the challenges facing management of emergency through big data in Lagos State and proffer remedial actions for effective management of emergency in the digital era. The paperconcludes that big data will fundamentally change and improve emergency response if properly embraced.

Keywords: Big Data, Digital Era, Disaster, Emergency Management, Governance

Introduction

Globally, disasters have continued to cause severe catastrophic consequences in the loss of human lives as well as economic losses (James, Shaba, Zubair, Teslim, Yusuf &Nufu, 2013). As observe by Huang &Cervone (2016) and Smith & Matthews (2015) the impacts of disaster events can disrupt the progress and developmental efforts of nations, often pushing them many years back. The global incidence of disaster has appeared to be on a steady rise. Available records indicate that within the period of 1990-2000, the world lost US$235 billion and 425,000 lives to disasters (CRED, 2002 in Niekerk 2005). Between 1994 and 2003 the world witnessed a total of 3,561 major disasters, ranging from ecological and industrial cataclysms to health epidemics (Ndace 2008). The regional breakdown of this figure shows that Asia recorded the highest incidence of 1,309 events (36.75%), followed by Africa with 814 (22.9%) and America with 637 (17.9%) events (Ndace 2008). In 2004, the report of the International Red Cross and Red Crescent Societies revealed that sundry major disasters affected 146 million people world-wide with 250,000 deaths; while in 2005, more than 360 disasters were reported worldwide with around 92,000 people killed and 160 million affected. In this regard, India has the highest casualties on the country-specific data, followed by China and then United States of America (USA) (Ndace, 2008). Altogether, disasters affected 211million people per year in the past decade of 20000s (Munich Re, 2003 in Niekerk 2005).

In the era of digital governance,public sector activities and relationships are increasingly mediated and shaped bythe technologies of information and communication (George, 2014).In the 21st century, data has been one of the most discussed subjects in the world of information technology. It has witnessed a drastic growth in recent years, and its

popularity is increasing by leaps and bounds.There is no doubt that the world is in the age of the big data revolution, which holds the potential to mitigate the effects of disaster events by enabling access to critical real time information (Nurul, 2017).The era of big data is opening up new possibilities for emergency management. Due to its ability to visualize, analyze and predict emergencies, big data is changing the humanitarian operations and emergency management dramatically (Shahriar& Samuel, 2017)**.** Data revolution has let the application of big data expanded to every aspect of our digital society. While data is a catalyst for innovation, data governance is a catalyst for quality, and value is derived from well governed quality data (Cohn, 2016).

With the advances of information communication technologies, it is critical to improve the efficiency and accuracy of emergency management systems through modern data processing techniques(Dontas&Doukas, 2016). The efficient data collection, archiving and analytics is essential for effective emergency management. Big data can play a major role in all phases of emergency management. The potential and utility of big data paradigm is growing for emergency management as the number and access to different datasets is expanding rapidly.
The paper notes that in the digital era, ability to respond to anemergency is at an infant stage. There is great optimism that big data tools can be leveraged to process large amounts of crisis-related data to provide an insight into the fast-changing situation and help drive an effective disaster response. Therefore the use of big data in times of emergency is gaining momentum and is the focus of much existing research.
Various works have highlighted that Big Data provide enormous opportunities for designing and delivering more efficient and effective public services (Bollier, 2010; Boyd & Crawford, 2012; Manovich, 2011 etc.). it is important to note that most of these studies focused on big data and emergency management in developed societies or on big data and emergency management separately. This paper however, examine the effectiveness of big data in emergency management in Lagos state, Nigeria.

Objective of the paper

The main objective of this paper is to asses to effectiveness of big data in emergency management in the digital era, with particular reference to Lagos state.

Methodology

The method of the paper is exploratory and descriptive analytical. Relying on systematic exegesis of secondary data. It utilizes descriptive statistic like bar chart, etc. to explain the data gathered. Descriptive statistics therefore enables us to present the data in a more meaningful way, which allows simpler interpretation of the data. The paper applies itself to discursive and deductive reasoning, whereby salient issues are schematically considered under selected themes and sub-themes. This methodological approach typifies qualitative mode of inquiry of which the paper typically exemplifies.

Conceptual and Theoretical Review

In this section, the paper explain the major concepts in the paper like, Big data and emergency management. It also uses theories to analyse the paper.

Big Data

The advent of digital and networked technologies has caused an explosion in the amount and variety of data available on each individual, as well as the velocity with which such data become available. These large collections of data, referred to as big data (Bryant & Raja. 2014).Big data is a term that describes the large volume of data that now inundates the world (Wall 2014). Big data refers to datasets whose size are beyond the ability of typical database software tools to capture, store, manage and analyze (McKinsey, 2012). Big data can be defined as the collection of data sets which are large and complex and beyond the capacity of the conventional processing system (Deng & Di, 2013).

Gartner (2013) sees big data as "…high-volume, high velocity and/or high variety information assets that demand cost-effective innovative forms of information processing for enhanced insight, decision making and process optimization". From the definition by Gatner, it shows that big data can often be described in terms of the 'three Vs' where volume relates to massive datasets, velocity relates to real-time data and variety relates to different sources of data.The digital and connected nature of modern day life has resulted in vast amounts of data being generated by people and organisations alike. This phenomena of an unprecedented growth of information and our ability to collect, process, protect, and exploit it has been described with the catchall term of big data.

Emergency Management

The word emergency emanated from the Latin word “emerge" or "merger," meaning to rise out or move up, dive, or plunge. It is an unexpected and sudden event that must be dealt with urgently.Emergency management is an important area of governance which aids in the protection of the citizens from consequences of any form of disasters, damages, threats, and acts of terrorism. This is an act of militating against possible threats as well as its study and prediction for preparedness purposes. This preventive measure, however, eulogizes mitigation against risks; preparedness for any form of threats; quick responsive to any form of social problems; and methods of recovery after disasters (Lamidi& Benson, 2014)

Emergency Management is a continuous process by which all individuals, groups, and communities manage hazards to avoid or ameliorate the impact of disasters resulting from the hazards (Benson & Edward, 2000). Emergency management implies:

> *The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capabilities of the societies and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to prevent or limit (mitigation and preparedness) adverse effects of hazards (NEMA 2012:243).*

The United Nations International Strategy for Disaster Risk Reduction (2004) defines emergency management as the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters

Theoretical Background

The paper is anchored on Diffusion of Innovations Theory andTechnological, Organizational Environmental Theory (TOE).

Diffusion of Innovations Theory:

Diffusion theory has been studied in a variety of contexts and from many perspectives. The theory was developed by Rogers in 1995 to serve as a theoretical guideline for studying factors shaping the adoption and utilisation of big data in developing countries. Rogers synthesized research from over 508 diffusion studies and came out with the ‘diffusion of innovation’ theory for the adoption of innovations among individuals and organization. The theory explicates “the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 1995).

The Rogers model provides a reasonably comprehensive view of innovation diffusion (Brancheau&Wetherbe 1990). Since the publication of Rogers’s widely referenced work, the diffusion model’s focus on the individual adoption process and emphasis on communication behavior have been extended to technology and information adoption (Bajwa, Lewis, Pervan, Lai, Munkvold, Schwabe,. 2008; Chatman 1986). The theory states that innovations in technology and greater affordability of digital devices worldwide have ushered in an age of Big Data. The Diffusion of Innovations Theory is useful in providing an account of how technological innovations such as Big Data move from the stage of invention to widespread use or not.

The diffusion theory provide an effective mechanism for policy leaders in developing countries like Nigeria to maximize adoption of Big Data innovations, and at the same time can also be useful in informing policy implementers on how to increase adoption rates (Elyjoy, 2015). Thus, the diffusion approach helps to understand how individuals behave as they consider the adoption of an innovation. Moreover, it is a useful theory to know the diffusion process in online communities

Technological, Organizational Environmental Theory (TOE).

The theory was proposed by DiPietro in 1990 to analyze adoption of technological innovations by firms and organizations (Melville & Ramirez, 2008). The technological-organizational-environment theory posits that the ability of an organization to successfully implement technological innovations is influenced by the technological context, the organizational context, and the environmental context (Melville & Ramirez, 2008). TOE framework has also been used as the only theoretical framework to investigate new technologies. “The TOE framework as originally presented, and later adapted in IT adoption studies, provides a useful analytical framework that can be used for studying the adoption and assimilation of different types of IT innovation.” (Oliveira & Martins, 2011).

There are several reasonable motivations which make TOE framework feasible in analyzing big data in emergency management (Feuerlicht, 2010).TOE framework explains the adoption of technology through three elements: technological, organizational, and environmental contexts. Therefore, TOE framework compared to other adoption and diffusion theories is a much more relevant analytical tool to classify all determinants of big data adoption in technological, organizational, and environmental contexts. Also, The TOE framework is a useful analytical tool for explaining the adoption of innovation by firms and organizations (DePietro, Wiarda&Fleischer, 1990).

The Nature of Managing Emergency

Although natural disasters cannot be avoided, studies have shown that adequate disaster management plan can reduce its impacts on lives and properties (James, Shaba, Zubair, Teslim, Yusuf &Nufu, 2013).During an emergency, evacuation and rescue operation to ensure public safety is a priority. The United States emergency management identified four different phases: mitigation, preparedness, response, and recovery (Altay & Green 2006; Green & McGinnis 2002; Waugh 2000). Emergency management is about managing risks to communities and the environment. It is the core business of emergency services which everyone has a part to play. Emergency management is about mitigation, preparedness, response and recovery. The emergency management cycle is graphically shown below:

Figure 2: Emergency Management Cycle

The emergency management cycle above shows that emergencies happen at all the times, and the way the phases blend into each other and overlap rather being discrete categories.

Mitigation: This is undertaken in advance. Sometimes this is referred to as prevention. Mitigation activities should be happening all the time.

Preparedness: This involves making arrangements, creating and testing plans, training, educating and sharing information to prepare the people should an emergency eventuate.

Response: This is the intervention and assistance during or immediately after an emergency. The focus at this stage is on saving lives and protection of properties.

Recovery: This involves the process of supporting emergency affected people in the process of reconstruction of physical infrastructure and restoration of the economic, physical and economic well-being of the affected people (Poyarkov, 2005).

Foundational Principles of Big Data

Scholars like Oguntimilehin&Ademola (2014), Sagl, Delmelle&Delmelle, (2014), Mark (2013) etc. have used either three or four "V's" words (volume, velocity, variety and value) in describe Big Data. However, Mathes (2016) observes that these four V's only explain the proportional dimensions and challenges specific to big data but fail to fully describe the whole concept of Big Data. He therefore added three V's by proposing 7 V's, which he believes are the aspirational qualities of all data and provide a more complete picture to describe the attributed of big data and what is necessary to maintain the integrity of the data as well as be able to leverage data as a value generating asset (Mathes, 2016). This is graphically illustrated below:

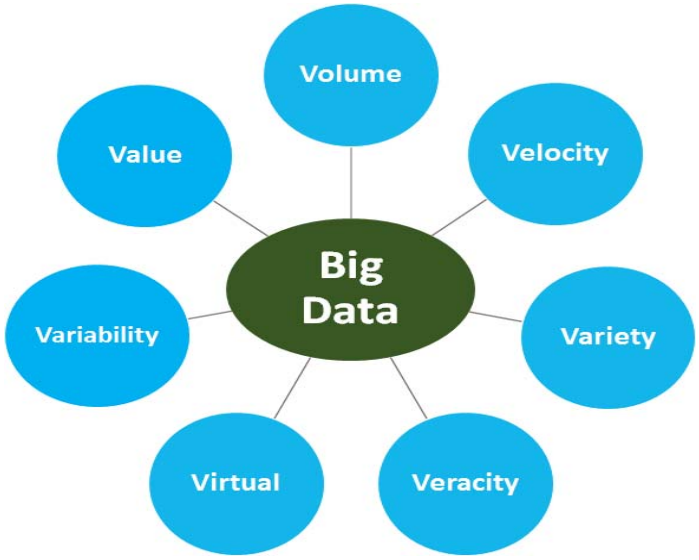


Fig. 1: Seven V's of Big Data

- Volume (data at rest): Volume is the scale of data. It is the most important feature of big data is generally large. Enterprises are awash with data, easily amassing terabytes and petabytes of information, and even zettabytes in the future. The accumulation of record involves progress and time. The amount of data is so big that we can cannot fully analysis and utilization them (Sagl, Delmelle&Delmelle, 2014)
- Velocity (data in motion): Often time-sensitive, streaming data must be analyzed with millisecond response times to bolster real-time decisions. The application of big data usually request collect, analysis, react to the data rapidly and accurately. The rate at which data is being received and has to be acted upon is becoming much more real-time. Velocity is the rate of change that the data experiences. The velocity of data is described as data at rest, data in use, and data in motion (Mathes, 2016). The major concern is the consistency and completeness of fast pace streams of data and getting the desired result matching. Velocity also includes time and latency characteristics is the data being analysed, processed, stored, managed, update at a fast rate or with a lag time between the event (Nurul, 2017).
- Variety (data in many formats): Data today comes in all types of formats (Oguntimilehin&Ademola, 2014; Mark, 2013). Variety is various forms that data can take. It is common to think of data variety as structured data, unstructured data, andsemi-structureddata. The data format could be in the forms such as documents, emails, social media text messages, audio, video, graphics, images, graphs, and the output from all types of machine- generated data from various sensors, devices, machine logs, cell phone GPS signals, DNA analysis devices, and more (Nurul, 2017).
- Value (cost effectiveness): Organizations are looking to gain insights from big data in a cost-effective manner. We need to consider what commercial value any new sources and forms of data can add to the business or scientific research.
- Veracity: is correctness or accuracy of the data along with the context of the data that leads totrust. Three aspects of veracity are data lineage, traceability,and integrity. It describes the quality of data. Is the data noiseless or conflict free? Accuracy and completeness is concerned (Sharma &Mangat, 2015)
- Virtual: Virtualization is extending the applications and their respective data sources to an abstraction layer so the data from disparate systems appears as a unified table. There are five patterns of data virtualization use. Data federation, data warehouse extension, enterprise data sharing, real-time enterprise data, and cloud data integration (Mathes, 2016).
- Variability: Variability refers to data whose meaning is constantly changing. Words do not have static definitions, and their meaning can vary wildly in context. Individual words without context can be very misleading.

Big Data application in Emergency Management: Opportunities and Challenges

Big data enable public authorities to detect early signs of emerging phenomena, measure behavioral or economic impact, and pick the 'sentiment' of communities. By means of advanced statistical and computational techniques, public sector analysts may unveil patterns and anomalies within these large socio-economic datasets that may not be ordinarily evident on the basis of 'conventional' information channels.

Emergency management demands a near real-time information dissemination so that the emergency services can be provided to the right people at the right time. Recent advances in information and communication technologies enable collection of real-time information from various sources. Emergency management also requires safe evacuation of people from the danger zone; thus, an emergency management system must also collect, process, analyze, and disseminate relevant, accurate, and timely information (Currion, de-Silva & Van-de-Walle, 2007).

Big data in emergency response is becoming more prominent and important. The role of big data in emergency management has been evolving (Grolinger, Mezghani, Capretz&Exposito, 2016).

Opportunities

Big Data analysis now drives nearly every aspect of our modern society, including mobile services, retail manufacturing, financial services, life sciences and physical sciences (Chris, 2013).Big data application is in emergency management is comparatively new.Many opportunities and challenges exist in the appropriate use of big data in the emergency case. According to Roy (2016), five ways to leverage big data include:

- Big Data can unlock significant value by making information transparent.
- As organizations create and store more transactional data in digital form
- Big Data allows ever-narrower segmentation of customers and therefore much more precisely tailored products or services.
- Sophisticated analytics can substantially improve decision-making, minimize risks, and unearth valuable insights that would otherwise remain hidden.
- Big Data can be used to develop the next generation of products and services.

Pu&Kitsuregawa, (2013) explains three aspects where big data can enhance emergency response. These three aspects are identifying the critical area, real time situation analysis, and identification of most efficient response from past experiences. With the increasing number of smartphones, social media platforms, mobile application, and a large volume with the various format of data can be gathered during emergency.Big data can contribute to early detection of emergencies through the integration of various data format from different sources. Both the remote sensing data and data from social media can play a major role to emergency prediction and impact analysis.

Big Data can help in all four phases of emergency management: prevention, preparedness, response, and recovery. Big data help policy makers and first responders to come with quick and concrete decision on the number of people affected, type and nature of the damage and where to allocate the resource. The big data archive can be helpful for model development and validation to ensure more efficient emergency management (Rahman, Di &Esraz-Ul-Zannat, 2017).

Big Data analysis, however, can contribute to emergency forecasting using satellite and atmospheric data combined with statistical analysis. Big data has proven its usefulness for forecasting and warning system for this meteorological and climate hazard (Pu&Kitsuregawa, 2013). Therefore, big data playing a vital role to enhance the disaster preparedness worldwide.

Challenges

It is to be noted that there are a lot of challenges facing the Big Data and in order to make optimal use of this modern discovery, users must be quite aware of these challenges so as to providing a measurable adjustment or solutions to them as quick as possible (Oguntimilehin&Ademola, 2014).

The language barrier is often hindering the emergency management process. Crowdsourcing and data mining approaches also suffer from language and cultural difference. Many emergency management specifications are contextual basis; thus, this information and contents might need to be translated (Rahman, Di &Esraz-Ul-Zannat, 2017). Data privacy could be another challenge to deal with. Many social media data are considered as private. Apart from this privacy concern, access to some parts of social media data related to an emergency might be helpful.

Despite the challenges discussed above, big data proves its usefulness in emergency management. More data will gather, more new analytical tools and techniques will be developed to get appropriate information from these data to

enhance disaster management. The organizations involved with disaster management will strengthen their capacity to utilize this growing opportunity.Despite these risks, big data is a growing wealth of critical information and its use is rapidly rising in popularity.

An Overview of Emergency Management in Nigeria

Over the years, occurrence of emergencies remains one of major threats to lives and properties in various parts of Nigeria.According to the World Bank's Statistical Capacity Indicator, Nigeria recorded a 67.8 per cent in terms of statistical capacity (World Bank, 2016). This score is higher than the sub-Saharan Africa average and other international development association (IDA) eligible countries. Despite the relatively high statistical capacity, data collection and processing in Nigeria over the past decades (post-independence in the 1960) has experienced enormous challenges in terms of its use in achieving developmental objectives.

Nigeria is prone to different types of hazards, both natural and man-made. Natural hazards that are prevalent in Nigeria include,but are not limited to, flooding and droughts (Etuonovbe 2011; Ibem 2011, Oladipo1993;).As observe by Babatunde (2011), flooding is therefore a perennial problem in Nigeria that consistently causes deaths and displacement of communities. For example, in 2010, about 1,555 people were killed and 258,000 more were displaced by flooding. While man-made hazards peculiar to Nigeria include,but are not limited to, terrorism, pipeline explosions, road and air transportation accidents, internal crises, and structural fires (Ibem, 2011, Ogundiya&Amzat 2008).

Emergency management in Nigeria, is in its infancy. Althoughorganized responses to disasters date back to the early 1900s when the Fire Brigade was in charge of putting out fires, protecting properties, and helping communities respond to disasters, a comprehensive approach to emergency management only began in 1999. However, since then, Nigeria's emergency management system has undergone tremendous changes.

The search for a public disaster management system was necessitated by the need to safeguard Nigeria from the devastating impacts of natural and man-made disasters. This search predated Nigeria's Independence. Over the years, two patterns or traditions of emergency management have obtained in Nigeria. These have been represented as the "vulture concept" and the "eagle concept" (Ndace, 2008). The vulture concept is reactive in essence while the eagle concept is pro-active. The former is likened to what is often referred to as "command-and-control" approach, while the letter could be referred to as "fire-brigade" approach (Tietenberg, 2006, Ndace, 2008).

There are many challenges facing Nigeria's bourgeoning emergency management systems, including but not limited to, inadequate funding, differences in emergency management structures at the state level, inadequate disaster education, lack of collaboration among different levels of government, and corruption. First, NEMA is inadequately funded.

Due to weak administrative and institutional system of government in Nigeria, production of administrative data remains poor and that have impacted poorly on its quality and that of the official statistics as well. Most administrative data are not properly stored and still remain in hard files rather than electronic files and they are also mostly not regularly updated

Big Data and Emergency Management in Lagos State

The importance of emergency response systems in Lagos state as a mega city cannot be emphasized due to many manmade and natural disasters that occurred in the recent years. In this digital era, emergency response and management through big data play a major role to reduce the loss of human life and economic cost and disruptions.

Emergency Call Summary Report: 2013 - 2015

Call Analysis	Year 2013	Year 2014	Year 2015
Total Incoming Calls	25,554,550.00	31,312,715.00	28,700,846.00
Total Calls Answered	19,677,003.00	23,014,986.00	21,996,917.00
% of Calls Answered	77.00	73.50	76.64
Total Distress Calls Escalated	46,207.00	44,374.00	46,916.00
Total Non-Distress Calls (Enquiries, Complaints, Accolades, and Information)	19,630,796.00	22,970,612.00	21,950,001.00

Source: Source: Lagos Bureau of Statistic (2016) Digest of Statistics

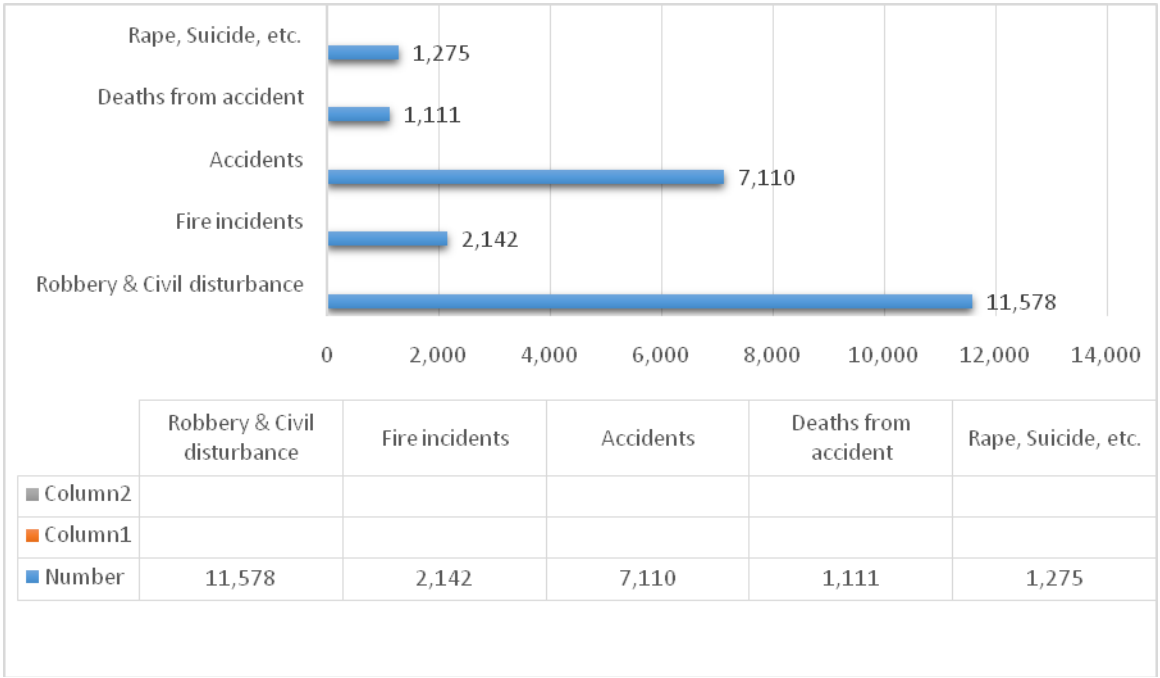
Emergency Call Category For The Year, 2013-2015			
Call Category	**Year**		
	2013	**2014**	**2015**
Robbery	7956	10563	6675
Civic Disturbance (Fight & Riot)	10006	8495	9512
Collapsed Building	142	84	122
Fire/Electricity	5481	4748	6244
Flood	177	148	111
Accident	6197	4463	6227
Explosion/Bomb Threat	14	33	17
Medical (Illness/Injury)	3062	2717	4694
Abandoned Baby (vulnerable Child)	268	243	179
Kidnap/Missing Person	237	259	284
Dead body	2505	1940	2473
Traffic Congestion	3068	2604	3520
Rape (Sexual Offences)	93	93	153
Suspicious Activities	3807	3667	2567
Complaints	3194	4317	7346

Source: Lagos Bureau of Statistic (2016) Digest of Statistics

Lagos State Emergency Cases in 2017

Nature of Emergency	**Number**
Robbery and civil disturbances	11,578
Fire incidents	2,142
Accidents	7,110
Deaths from accident	1,111
Rape, suicide and social welfare cases	1,275.
Total	**27,016**

Source: Lagos State Emergency Management Agency (2017)



The illustration above shows that Lagos state recorded 27,016 in 2017. According to AdesinaTiamiyu, the General Manager of the Lagos State Emergency Agency (LASEMA), the number of emergency cases recorded in 2017 was reduced, compared to that of the previous year due to massive publicity and the utilization of call centres, toll free lines, and other ICT devices which prompted quick response by emergency workers in Lagos state.

In Nigeria, big data is still in the early stages of application, more so in the public sector. When compared with other states in Nigeria. The rapid growth of population in Lagos, increasing urbanization and industrialization as led to increase in the rate of emergencies. This led to the establishment of Lagos State Emergency Management Agency. Undoubtedly, if there are agencies at all that keep Lagos moving in spite of its obvious challenges, resulting from ever increasing population, rising spate of crime and emergency incidences, the Lagos State Emergency Management Agency, LASEMA and the Lagos State Fire Service Fire Service would readily come to mind.

The nature of emergency management in Lagos state can be regarded as the best in Nigeria. The state introduced the "Safety Arena", where all the departments and agencies responsible for safety and emergency management under one roof.Today, Lagos State, Nigeria is a major hub for the headquarters of national and global organizations. However, there has been little knowledge of the big data adoption in the management of emergencies despite the benefits its offer; such as, optimization in operations, reduction in costs, and improvement in efficiency. The Lagos state has given significant attention to emergency response through big data technologies. ICT equipment is installed in emergency vehicles to make emergency personnel work easier, and safer. Example of such ICT equipment are computers, video cameras, two-way radios, and manually operated light and siren controllers. This is possible through "Emergency Vehicle Pre-emption (EVP)". EVP system is designed to give emergency response vehicles the ability to control the traffic light. This enables emergency vehicles to change the red light to green light when they are approaching where there is a signalized intersection while providing a red light to conflicting approaches.

Concluding Remarks

The big data era is upon us and the established trend is that the volume of data will continue to grow at an astonishing rate.This paper contributes to the existing knowledge on big data and emergency response management, a field of study that is still largely underexplored, especially in the context of Nigeria. A systematic review of the existing, pertinent literature has been examined in this paper. The future of big data analytics in emergency management looks promising. Big data technology can help to improve the decision-making ability when facing the emergency. The government, enterprises and individuals should continue to support the research of big data technology. Encourage the application of emergency management of large data help to improve the cities' service level. Though the utilization of big data in emergency management in Nigeria is still at infant stage. However, the application of big data in emergency rescue still have a lot of room to improve.

It is important to note that the emergency service system through big data in Nigeria and Lagos in particular are not so improved impressive when compared to developed societies. Therefore there is need for a structured, collaborative and strategic approach to information sharing and formulation of emergency management capacities, regarding preparedness, mitigation, early warning, relief, rehabilitation and recovery actions at the provincial and district level, is essential in providing a reliable communication system during an emergency.

Transportation is another area of concentration; it is known that rescue service vehicles have a big role to play when responding to an emergency situation. Police, firefighter and ambulance, cannot do their work effectively without well-equipped emergency vehicles. It is clear that Lagos state has these vehicles in place but is it up to standard? No because those vehicles are not well equipped.

To adequately address emergency situations in Nigeria, modern intelligence gathering devices must be acquired and deployed by emergency workers. Surveillance system that can monitor most sensitive equipment and public places must be put in place. Real time communication systems through big data technology that will enable information sharing must be installed. Proper application of big data can solve fundamental socio-economic challenges facing Nigeria. Big data is one of the readily available tools that the Nigerian government can adopt to bring about rapid changes in the socio-economic status of the country.

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