Digital Forensic Readiness in Megacities

1 author:

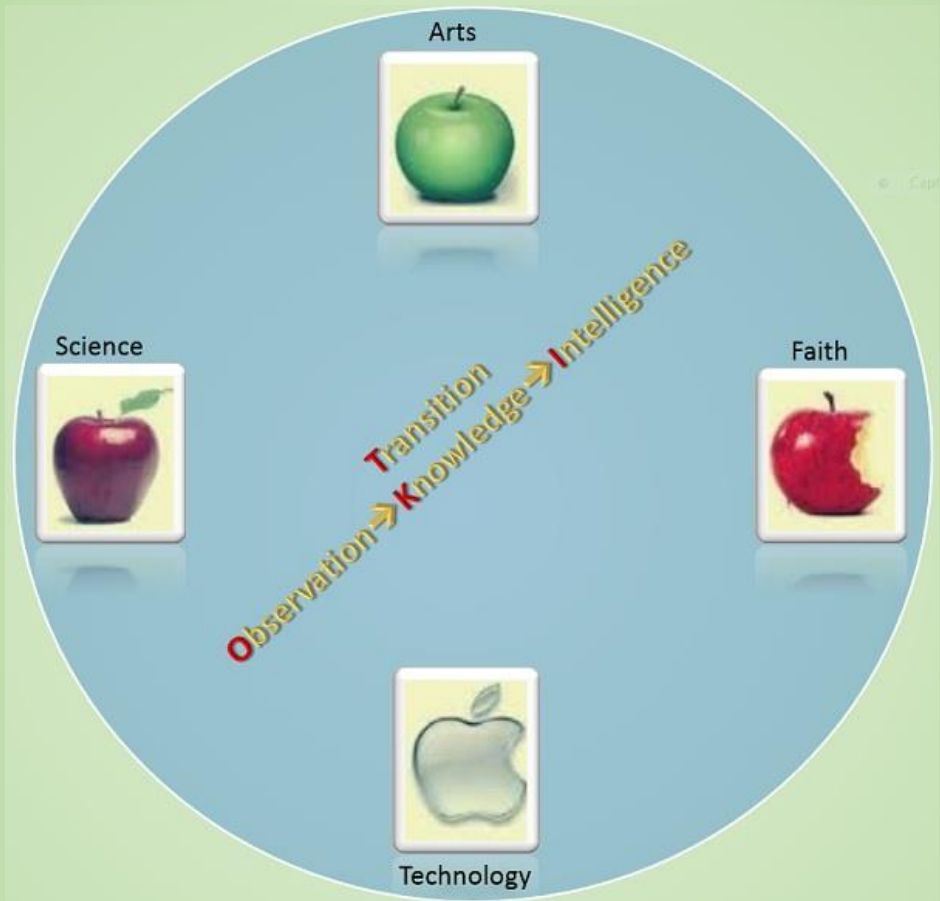Alaba Bolaji Ojediran
Lagos State University
4 PUBLICATIONS   **0** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Digital Forensic Readiness in Megacities View project

TRANSITION FROM
OBSERVATION TO KNOWLEDGE TO INTELLIGENCE
University of Lagos – Nigeria 2014

Editors – Prof. Amos DAVID & Prof. Charles UWADIA

Digital Forensic Readiness in Megacities

OYELADE Jelili Olanrewaju, OJEDIRAN Alaba Bolaji,
ISEWON Itunu

OYELADE Jelili Olanrewaju

Computer and Information Sciences Department
Covenant University, Nigeria.

OJEDIRAN Alaba Bolaji

School of Science and Technology
National Open University, Nigeria.

ISEWON Itunu

Computer and Information Sciences Department
Covenant University, Nigeria.

Abstract. As megacities emerge in splendor, so also do threats to security and sustainability of these cities. Earlier research found out that the leading threat amongst several security and safety threats in megacities are organized crimes. Since technology is involved in all facets of megacities, including the threats therein, this paper seeks to stimulate scientific curiosity in *finding out effective and sustainable ways of harnessing technology in readiness, to protect these cities from threats rather than reactively responding to them*. Using Lagos State, an emerging mega city as a case study, we seek how to systematically execute this concern which should be built from the scratch into megacities systems.A Megacity Digital Forensic Readiness Model (MEDFORM) is proposed in this paper.

Keywords: megacities, digital forensic readiness, organized crime, security

1. Introduction

A megacity is usually defined as a region consisting of a densely populated urban core and its less-populated surrounding territories, sharing industry, infrastructure, and housing (http://en.wikipedia.org/wiki/Metropolitan_area) with a total population in excess of ten million people.

As at 2013, there were 24 megacities globally, according to the Population Reference Bureau (Megacity, 2014) . The five largest of these are the metropolitan areas of Tokyo in Japan, Delhi in India, Mexico City in Mexico, New York in United States of America and Shanghai in China: each of these has a population in excess of 20 million inhabitants. In 2006, the population of Lagos State in Nigeria was 17.5 million, (based on the parallel count conducted by the state during the National Census) with a growth rate of 3.2%. The state today has a population of over 21 Million (Population, 2014) .

The United Nations (UN) estimates that at its present growth rate, Lagos State will be third largest mega city in the world by 2015 after Tokyo in Japan and Bombay in India. The development of megacities is driven by technological application in its systems. These come with their attendant challenges, and of interest to us in resolving these challenges, is how to effectively and functionally collect, preserve and utilize digital evidences (data) to enhance the planning and management of Megacities. A Megacity Digital Forensic Readiness Model (MEDFORM) is proposed in this work.

This paper progress thus: Megacities Challenges are described in section two; Digital Forensic Readiness being a must, follows in section three. Section four highlighted-where do we go from here? There in the model is proposed, while section five concludes the paper.

2. Megacities and Mega Challenges

Megacities may be congested and complex, but they are also among the planet's most exciting places to live. They have proven effective in

stimulating creativity, innovation and economic development; factors that often lead to improved quality of life (Ericsson, 2013).

However, in recent years, the debate on sustainability and the necessity for development without harming the environment and endangering future generations has been re-emphasized (Blackburn, 2007; Cernea, 1994; Nejati et al., 2010; Robinson et al., 2006) . Although there is no unique definition for sustainable development, the most widely accepted definition is the one by World Commission on Environment and Development (1987) whereby sustainable development is defined as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Ardakani, 2006)

Despite the key roles that cities play in the development of the society, ignoring the negative aspects that might be caused as a result of modernizing and developing cities can be harmful in the long run. Thus, planning and managing strategies for a sustainable and balanced city is vital (Assadian & Nejati, 2011) .

This is where ICT can play an important role. By mining the vast amount of data produced by the array of connected things within any megacity, ICT is instrumental in the efficient day-to-day management of the city. More importantly, ICT provides the mechanisms to support balanced views when implementing solutions that affect several interconnected challenges and opportunities (Ericsson, 2013) .

Digital Forensic Readiness (DFR) is the ability of an organization to maximize its potential to use digital evidence while minimizing the cost of an investigation. When this capability is built into a model, it ensures that not just a technical model has been established but also an administrative and legally-sound model put in place, which keeps too many hands off the evidence and alleviates any chain of custody concerns while ensuring minimal disruption to the business in the event

of an incident. These benefits are necessary factors in decision-support of megacities.

Lagos state has made great strides in the area of data gathering for decision support in developing and sustaining her megacity status, with the commencement of the Lagos State Residents Registration Initiative, deployment of fiber optics through the metropolis to drive the e-goverance platform of the state, digitalization of operation of its parastatals, establishment of a world class forensic lab as well as Operating and sustaining Lagos State security command.

However, more needs to be done, especially in the area of ensuring that the systems being put in place for the megacity are digital-forensic ready. Thereby dynamic events in the city can be tracked, integrated as a holistic model with which we can anticipate future events and carry out appropriate actions. The "systems " here, refers to both digital processes and its corresponding human interactions.

This then leads us to the main issues of this paper, which is, how to effectively and functionally collect, preserve and utilize digital evidences (data) to enhance the planning and management of Megacities challenges. That is, how can we ensure that the systems in an emerging megacity, are digital-forensic ready to tackle its challenges?

An detailed survey carried out by a research project conducted in 2010 by GlobeScan and MRC McLean, in which Lagos was included. The research looked at the challenges facing megacities in city management and five critical infrastructure sectors: Transportation, Electricity, Water and Waste Water, Healthcare, and Safety and Security.

The conclusions are based on a survey of 522 stakeholders spread across 25 cities. Stakeholders were divided into four groups: Elected political leaders, Employees of the municipality (employees) , Private

sector infrastructure providers, construction company managers and financiers (privates) , people who are in roles that influence infrastructure decision makers such as thought leaders, academics, NGOs, and media (influencers) .

Of the divers' threats to the existence of mega cities, the research found the leading ones to be: "crime itself (put first by 24%), corruption or incompetent law enforcement (15%) , poor planning/city management (10%) , terrorism (9%) , and natural disasters (9%) . In other words, the causes of crime, terrorism and natural disasters are criminals, terrorists, and natural disasters, or incompetence in fighting them"(Siemens, 2010) . Consequently, if we can't eliminate criminals, terrorist and natural disasters from occurring, we should be able to competently fight them.

3. Digital Forensic Readiness, A Must

The Digital Forensic Research Workshop (DFRWS) of 2001, defined digital forensic as the use of scientifically derived and proven methods toward the preservation, collection, validation, identification, analysis, interpretation, documentation and presentation of digital evidence derived from digital sources for the purpose of facilitating or furthering the reconstruction of events found to be criminal, or helping to anticipate unauthorized actions shown to be disruptive to planned operations (Palmer, 2001) . Crime is a disruption to planned operations, and it is undesirable in megacities administration.

While dictionary definitions of 'forensics' typically specify legal processes, it is also used (to some extents metaphorically) to allude to the notion of exhaustive investigation and argument (Jeremy, 2012) .

Apart from the use of digital evidence for legal cases, corporate organisations are also faced with the need to preserve evidence of actions/records for Disaster Recovery or Business Contingency Plan, so as to make their organisation proofed against unanticipated and

anticipated catastrophic incidence, and even more serious, incidence whose occurrence threatens the continued existence of the organisation.

This paper decides to beam more light on crime, which is the highest threat to the existence of mega cities. Digital Technology, ICT &Computers has become an important part of our lives and as such will play a pivotal role in building and managing megacities. As digital data are consistently growing in size and complexity, and the amount of stored digital records is doubling at an estimated rate of every 18 to 24 months, the majority of crimes committed today has digital component.

The figure 1, 2 and 3 below, gives a graphic conclusion of the research carried out by GlobeScan and MRC McLean Hazel and sponsored by Siemens AG, with regards to crime in megacities. The summary is that, organized crime has been identified as the most serious safety and security problem in megacities.

Figure 1: The Most Serious Safety And Security Problems Of Megacities (Siemens, 2010) .

The Federal Bureau of Investigation(FBI) defines organized crime as any group having some manner of a formalized structure and whose primary objective is to obtain money through illegal activities. Such groups maintain their position through the use of actual or threatened violence, corrupt public officials, graft, or extortion, and generally have a significant impact on the people in their locales, region, or the country as a whole (Organized Crime, 2014) .

Figure 2: Predicted Approaches of Safety and Security Experts in Megacities
(Siemens, 2010) .

The emphasis of security efforts in megacities has shifted towards preventing problems over protection from them. In New York it's called "risk-based policing". In Europe and Australasia, it is dubbed "intelligence-led policing". Data Mining and Event Modeling using integrated database, Crime mapping and Closed Circuit Television (CCTV) integration, are very useful technological tools in predicting and mitigating crime.
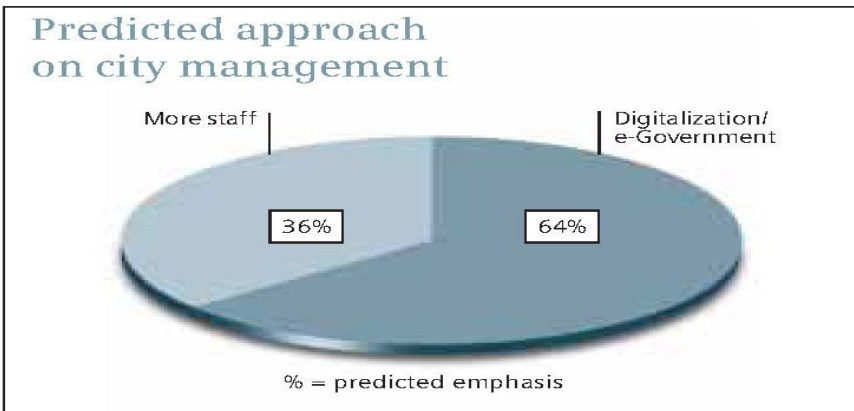

Figure 3: Predicted Approach of on City Management in Megacities (Siemens, 2010)

As megacities management seeks to digitize their operations, they must also ensure that the data acquired from different facets are integrated and are appropriately utilized in effective decision making. A typical example of this need and use of data for effective megacity

management is transportation and traffic congestion, accident management, crime mapping, health, housing and education.

4.   Where Do We Go From Here?

As the paradigm shifts from protection of problems to prevention of problems, we hereby present a model that seeks to solve these problems proactively. However, we have in this paper, highlighted the application of the model to build and manage the security aspect of Lagos;a mega city, with 'organized crime' which is the most prevalent of crimes in megacities, being used to test the model.
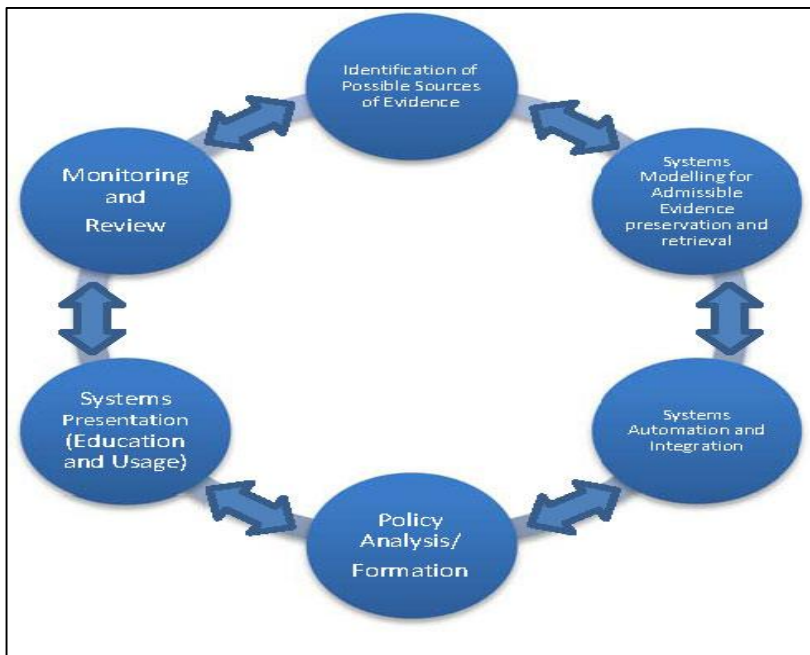

Figure 4: Megacity Digital Forensic Readiness Model (MEDFORM)

A representation of the model in figure 4 below, which has six (6) phases, could be implemented, starting with the phase of "Identification of Possible Sources of Evidence".Wherein, we must objectively enumerate the possible sources of digital and non-digital evidences that will be needed to model the security system of a megacity. In terms of security, almost all facets of the megacity are

concerned. This phase answers the question; What are the current and prospective sources of data needed to tackle crime?

It can then lead to the phase of "System Modelling for Admissible Evidence Preservation and Retrieval". Information/Evidences should be collected, preserved and retrieved in a way that is legally, administratively and technically admissible for Investigation, Analysis and Review. Thus, it is not just about automating operations in the megacities, but ensuring that the systems can collect, preserve and output the data generated in such a way that it is compromised. This phase answers the question; How can the current and prospective sources of data be managed to ensure that the data collected represents that true events, or it can be reliably used to model/re-create such events for the purpose analysis or investigation?

Then, the next phase of the actual "Systems Automation and Integration" ensues, which is followed by the phase of "Policy Analysis and Policy Formation". The phase of "Systems Presentation", in which ICT Awareness Training from the top to the grassroots, mass education and personnel training on usage of the built systems. This phase is very important, as it is the phase where the public must understand how and why they should interact the systems put in place. Thereafter, the "Monitoring and Review" phase comes up to continue evaluating the system in place and how its been interacted with by the citizens of the megacity. This provides the basis for a review, if need be.

This model is not rigid. It can flow clockwise or anti-clockwise. Thus, one can move forward or backward in the loop until the requirements are satisfied.

5. Conclusion

We conclude from the above reported figure and from our observations that:

1. Technology is pivotal in effectively curbing crime and effective management of megacities.
2. Forensic readiness, and in fact digital forensic readiness, must be incorporated in megacity systems in order to acquire data/evidence that will help position emerging megacities like Lagos to predict crimes and curb it before it primes.
3. Reactive crime fighting is costly and disruptive to megacity management.
4. The privacy of megacity citizens will be compromised for security, in order to attain a functional digital forensic ready city.
5. Data from all facets of the megacity must be integrated centrally in order to effectively model and predict security concerns and address them even before they prime, or reduce their impact if they eventually happen.

Though, each megacity has her own peculiarity, emerging megacities like Lagos can learn solutions from Matured megacities but implemented based on their peculiarity and better still introduced the from scratch, while developing such cities.

Using the proposed model (MEDFORM) above, in an emerging megacity like Lagos as a case study, further research should seek how data can be aggregated and integrated from the diverse sources in the city, model future events and threats using the data, in order to plan, build and manage such mega cities effectively and from the scratch.

List of References

Assadian, A., & Nejati, M. (2011). Challenges faced by megacities in the future. Information Resources Management Journal (IRMJ), 24(2), 76-88.

Blackburn, W. R. (2007). The Sustainability Handbook: The Complete Management Guide to Achieving Social, Economic and Environmental Responsibility . Washington, DC: Environmental Law Institute.

Cernea, M. M. (1994). Making development sustainable . In Serageldin, I., & Steer, A. (Eds.), Making development sustainable: form concepts to action (pp. 7–10). Washington, DC: World Bank.

Digital Evidence Analysis Tools. Available at http://www.nij.gov/nij/topics/forensics/evidence/digital/analysis/welcome.htm. Accessed on November 5, 2011.

Ericsson (2013). The Next Age of Megacities (pp. 3):Available at http://www.ericsson.com/res/docs/2013/the-next-age-of-megacities.pdf. Accessed 28/04/2014.

Jeremy L. J. (2012). Digital Forensic and Preservation. DPC Technology Watch Report 12-03 November 2012. Preservation Coalition 2012 and Jeremy Leighton John. Available at www.dpconline.org/component/docman/doc.../810-dpctw12-03pdf

Megacity [http://en.wikipedia.org/wiki/Megacity]. Assessed 17th April 2014.

Nejati, M., Md Shahbudin, A. S., & Amran, A. (2010). Sustainable development: a competitive advantage or a threat? Business Strategy Series , 11(2), 84–89. doi:10.1108/17515631011026407

Organized Crime [http://www.fbi.gov/about-us/investigate/organizedcrime/glossary]. Assessed 29/04/2014.

Palmer, G. (2001) A Road Map for Digital Forensic Research. Technical Report DTR-T0010-01, Report from the First Digital Forensic Research Workshop (DFRWS): 16, Available at

http://www.dfrws.org/2001/dfrws-rm-final.pdf (accessed August 2012).

Population [http://www.lagosstate.gov.ng/pagelinks.php?p=6]. Assessed on 17th April 2014.

Robinson, H. S., Anumba, C. J., Carrillo, P. M., & Al-Ghassani, A. M. (2006). STEPS: a knowledge management maturity roadmap for corporate sustainability. Business Process Management Journal ,12(6), 793–808. doi:10.1108/14637150610710936

Siemens, A. (2010). Megacity Challenges. A stakeholder perspective (pp. 52-53): München: Siemens AG. Available at http://w1. siemens. com/entry/cc/features/urbanization_development/all/en/pdf/study_ megacities_en. pdf. Accessed.

Some scientific fields that are currently receiving more attention both from scientific communities and in the general public are competitive intelligence, smart city (intelligent city), and territorial intelligence. Common to all these fields are the concepts of information, information systems, knowledge, intelligence, decision-support systems, ubiquities, etc. The advantages for industries (production and service industries) and governments (federal, state and local governments) cannot be overemphasized. This resurgence is due to the impact of technologies for dematerialization of objects and human activities.

Since the term "intelligence" is central for the theme of this conference, there is need to specify its meaning that we are using for the conference.

Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on," "making sense" of things, or "figuring out" what to do.

Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Although these individual differences can be substantial, they are never entirely consistent: a given person's intellectual performance will vary on different occasions, in different domains, as judged by different criteria.

From this definition, it is obvious that intelligence in a way or the other rely on the process of **observation** (comprehending our surroundings) and ensuring that the observation is transformed into **knowledge** ("catching on," "making sense of things", or "figuring out what to do").

Editors
Prof. Amos DAVID & Prof. Charles UWADIA

978-2-9546760-1-2

9 782954 676012