

ICT Implementation Framework for Integrated National Security, Emergency and Disaster Management for Nigeria

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Abstract

The role of Information, Communication and Multimedia Technology in the management of national security, emergency and disasters can never be overemphasized. In its goodwill, the Federal Government of Nigeria (FGN) has made concerted efforts by formulating deliberate policies on national security, emergency and disaster management. The implementation of these policies brought about the establishment of agencies and parastatals, which have been working efficiently and impressively – in isolation, though. This paper will demonstrate the role of Information, Communication and Multimedia Technology in synergizing the activities of the various stakeholders of national security, emergency and disaster management. Consequently, the paper will propose a new Integrated National Security, Emergency and Disaster Management Information System (iNSEDMMIS) – a repository of data and information that is of public concern. This system is intended to play a central role of a clearinghouse in providing the enabling environment for the stakeholders to work in synergy – in order to ensure responsible and responsive collection and dissemination of information.

Keywords: Information and Communication Technology (ICT), Multimedia Technology, Information System, Security, Emergency and Disaster.

Introduction

Emergency management generally refers to activities associated with avoiding and responding to natural and human-caused hazards [2]. An emergency is a routine and is part of the day-to-day life of a public safety. Organizations face new and unforeseen challenges. There are far more organizations involved than in an emergency and it is not always clear what are the dependencies between them [1].

It is an accepted practice to from time-to-time to review the goals of the organizations depending on the evolution of the disaster response. New plans have to be made and integrated with other plans and activities within and without an organization.

Kruger, Drevin and Steyn [3] have opined that the ICT and security fields are dynamic and are constantly influenced by new developments and technologies. It poses ongoing challenges to both researchers and practitioners and by applying the proposed framework.

According to Franke and Charoy [1], current practices for managing activities without or only with unsophisticated ICT support, such as e-mail, have several flaws

and current practices are criticized by all stake holders.

ICTs and Multimedia Technologies include a heterogeneous series of products and services. The ICT sector itself includes semiconductors, voice telephony technologies, and technologies supporting high-speed data and audio-visual/multimedia systems as well as computers and packaged and customised software. There is no single technological pathway that must be followed by countries that are seeking to enhance and extend their national infrastructures or to connect them to global information networks [5].

Using ICT devices to communicate and interact will increasingly become a key imperative to getting information, real-time alerts, performance dashboards and access to information systems which are based on multimedia content [4].

Background

Besides the armed forces, the FGN has also in the recent past established other agencies and parastatals responsible for ensuring information sharing, national

security, emergency and disaster management. Some of them include: NAFDAC, NIMET, NEMA, FRSC, NITDA, NASRDA, NCS, etc.

It is the duty of the government to protect the health of the citizens; and in Nigeria, this is the responsibility of the Federal Ministry of Health. This led to the birth of NAFDAC as a parastatal of the Federal Ministry of Health. NAFDAC was thus established by Decree No. 15 of 1993 to register, regulate and control the importation, exportation, manufacture, advertisement, distribution, sale, use, quality and safety of drugs, cosmetics, medical devices, bottled water and chemicals. In addition, it is responsible for compiling and publishing relevant data resulting from the performance of the functions of the Agency or from other sources [6].

The National Emergency Management Agency (NEMA) was established via Act 12 as amended by Act 50 of 1999, to manage disasters in Nigeria. Therefore, from inception, NEMA has been tackling disaster related issues through the establishment of concrete structures and measures. Such measures, for instance, include educating the public in order to raise their level of awareness and reduce the effects of disasters in the country. The Agency has also put in place structures that enable it detect, respond and combat disasters in a timely manner [7].

The Nigerian Meteorological Agency (NIMET) came into existence in June 17, 2003 by an act of parliament. Before its enactment, the agency had operated as a department in the Federal Ministry of Aviation and rendered meteorological services principally in the areas of Aviation, Water Resources, Marine, Education, Healthcare, Agriculture and Construction Industries. NIMET is committed to effective and efficient prescription of climatic requirements for all sectoral activities in Nigeria [8].

NITDA is the clearinghouse for IT projects in the public sector. The Agency is committed to the drive to bring government and its services closer to the people through IT. Entrusted with the implementation of the National IT policy, which seeks to make Nigeria an IT capable country in no distant

future, NITDA has been mandated to supervise the management of the country code Top Level Domain as a national resource [9].

Public Service Information Network (PSnet) – Psnet, under the auspices of NITDA, involves the development of a National Information Backbone (NIB) for IT development in Nigeria. It will form the bedrock of other technology initiatives in the country. The deliverables of the PSnet include: Internet access, messaging, collaboration and Virtual Private Network (VPN) [10].

NASRDA is tasked with implementing the National Space Policy. Some of the focus areas of the National Space Programme (NSP) include [11]:

1. The establishment of a national earth observation station for remote sensing and meteorological data acquisition to help understand and manage our environment (atmospheric and weather conditions) and natural resources using space-acquired information.
2. Information and Communication Technology – Provision of efficient and reliable telecommunications services for Nigeria in order to enhance the growth of the industrial, commercial and administrative sectors of the economy.
3. Defence and Security – The establishment of a Defence Space Command in the Ministry of Defence. The Command shall comprise representatives of the defence, intelligence, security and law enforcement services and report through the Ministry of Defence to the National Space Council.

The NigComSat-1 is a Nigerian communication satellite. It became the first African geosynchronous communication satellite, when it was launched on 13 May 2007. The spacecraft is operated by NigComSat and NASRDA [12].

Trends in ICT in Nigeria

There is no doubt that a number of measures have been taken by the Federal Government of Nigeria (FGN) [26] to improve the presence of ICT. Some of such policies include:

National policy on telecommunications (2000)

- a. Deregulation of the telecommunications industry. The reform saw the emergence of Mobile

Telecommunications Network (MTN) and the ECONET complementing the Nigerian Telecommunications Limited (NITEL).

b. Government waived payment of tax and import duties on telecommunications equipment coming into the country.

National policy on information technology (2001)

a. To ensure that Information Technology (IT) resources are readily available for efficient national development.

b. To guarantee that the country benefits maximally and to contribute meaningfully to the global solutions of the information age challenges.

c. To establish an awareness and ensure universal access in order to promote IT diffusion in all sectors of national life.

d. To build a mass pool of IT literate manpower.

e. To establish an IT infrastructure and maximize its use nationwide.

The Nigerian telecommunications sector was deregulated under the military regime in 1992 with the establishment of a regulatory body, the Nigerian Communication Commission (NCC). Since then, the NCC has issued various licences to private telephone operators. These licences allow private telephone operators (PTOS) to roll out both fixed wireless telephone lines and analogue mobile phones. The return of democracy in 1999 however paved the way for the granting of the global system for mobile communication (GSM) licences to three service providers, MTN, ECONET and M-TEL in 2001; with GLOBACOM joining in 2003 [13].

The initial release of GSM was called GSM Phase I, and it is commonly referred to as the 1st generation. This release made provision for the basic voice, SMS and circuit switched data (CSD) services. CSD allow a maximum data rate of 9.6kbs and was capable of fax transmission as well. Supplementary services at that point were very basic consisting of call forward and called barring capabilities [13].

The second generation (GSM Phase 2) was released in 1995 and provided enhanced supplementary services, amongst which were calling line identity (CLI), all waiting and multiparty services. Data services however remained limited to 9.6kbs. GSM Phase 2+ was an enhancement to GSM Phase 2 and was released two years later in 1997. Realizing the need for enhanced data service, Phase 2+ address this requirement by making provision for high-speed circuit switched data (HSCSD) and General Packet Radio Services (GPRS). HSCSD and GPRS allowed maximum data rates of 48kbs and 177kbs respectively [13].

UMTS (Universal Mobile Telecommunications System) is a so-called "third-generation (3G)," broadband, packet-based transmission of text, digitized voice, video, and multimedia at data rates up to and possibly higher than 2 megabits per second (Mbps), offering a consistent set of services to mobile computer and phone users no matter where they are located in the world. Based on the GSM communication standard, UMTS is the planned standard for mobile users, computer and phone users to be constantly attached to the Internet through a combination of terrestrial wireless and satellite transmissions [14].

Table I: Statistics of the Presence of Information Technology in African Countries in 2000

Country	Compute	Cell	Fax	Telephon	TV	Radio	ISP
Nigeria	4.1	197	0.1	NA	3.6	25	30.67

Source: World Bank and UNESCO as report to by computer in African (2000) P8-9

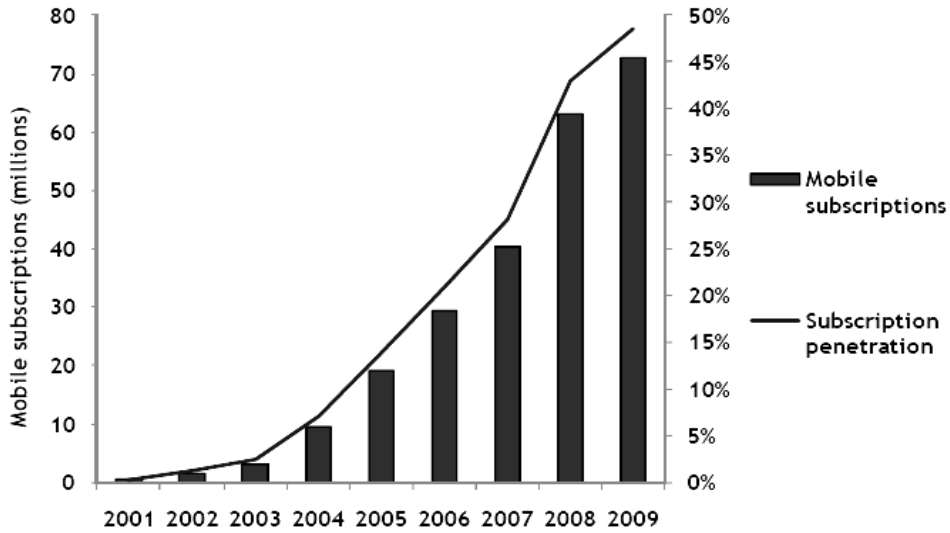
*NB: (1) Internet service provider per 10,000 persons (2) Others per 1000 persons.

Table II: Telecommunications usage 2001 (Source: [15])

Country Year 2001	Fixed lines 000s	Penetration % Population	Mobile Users 000s	Penetration % Population	Public phones 000s
Nigeria	500	0.43	330	0.28	1.6

Table III: African Internet Statistics 2002 (Source: [15])

Country	Dialup Internet Subscribers	International Outgoing Bandwidth Kbps	Population Millions 2000	GDP/Capita USD 1999	Cities with POPs (Points of Presence)
Nigeria	60000	15000	113,5	551	2



Source: Pyramid Research Mobile Data Forecast, 2009

Fig. 1 Mobile subscriptions and mobile subscriptions penetration of population in Nigeria, 2001-2009 [16]

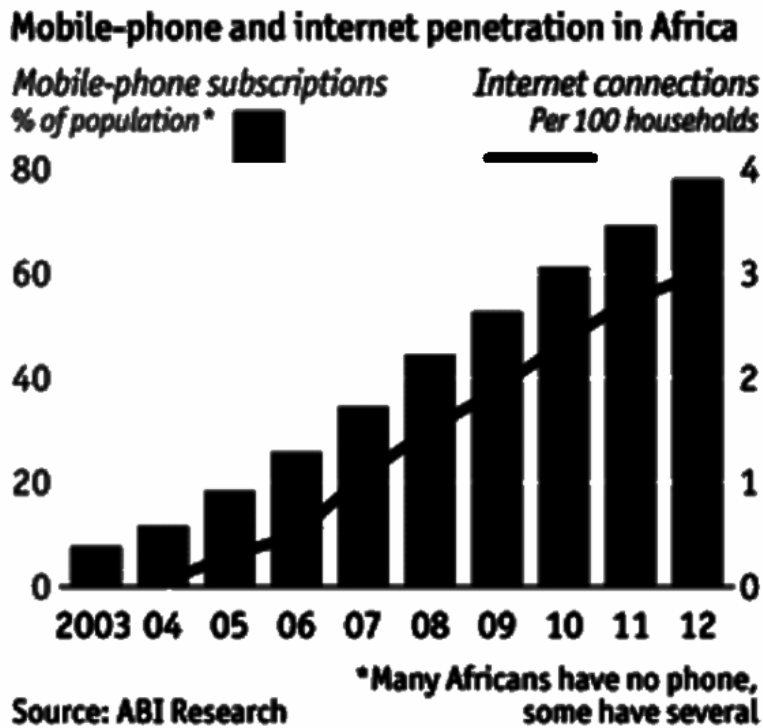
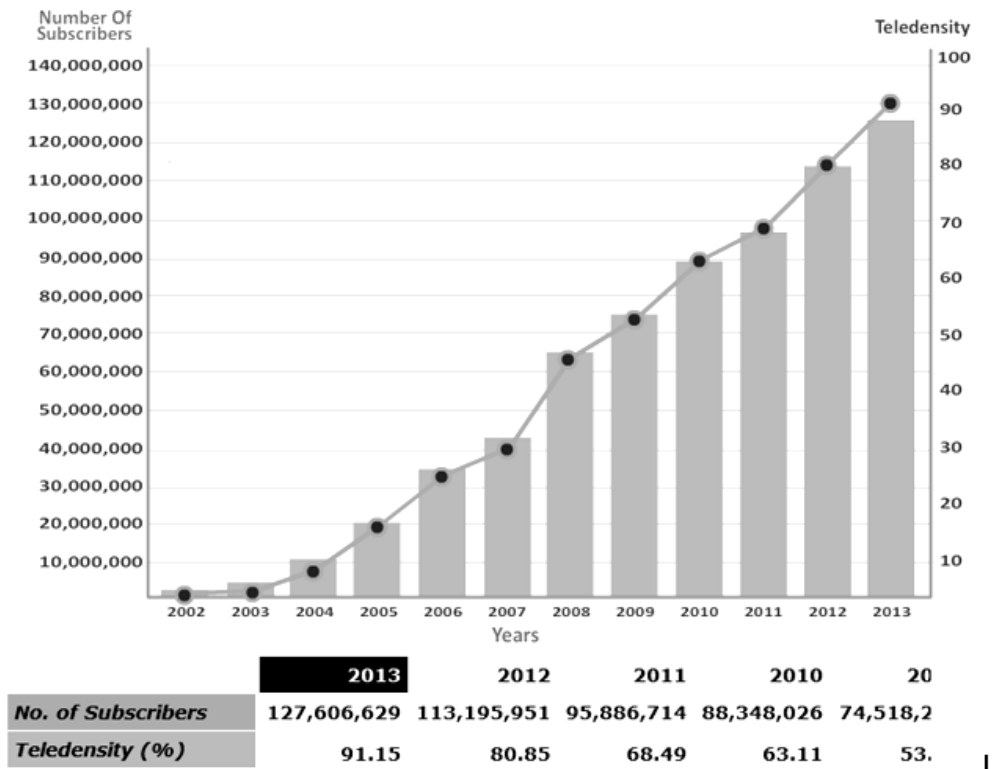


Fig. 2 Mobile-Phone and Internet Penetration in Africa ([17]).



1. Teledensity was calculated based on population estimate of 126 million up till December 2005; from December 2006, teledensity was based on a population estimate of 140 million.
2. Teledensity from December 2007 is based on active subscribers.
3. Teledensity from December 2001 to 2006 was based on connected subscribers.

Source: [18] Nigerian Communications Commission, 2014
Fig. 3 Subscriber/Teledensity Data 2002 - 2013

According to Iboma [19], the current global revolution created by mobile telephony use has been predicted to continue with over 50 per cent global penetration expected in 2008. A report from a United Kingdom-based research firm, Portio Research, indicated a further 1.5 billion mobile phones users are expected over the next four years to bring the overall penetration rate to 75 per cent by 2011. The report entitled, “The Next Billion: Strategies for driving growth and making profits in low-Average Revenue Per User Mobile markets”, noted that there would be rapid rise in mobile owners in emerging markets, such as Nigeria, Ghana and Pakistan. According to figures released by the Nigerian Communications Commission (NCC), Nigerian subscriber base has reached an all-time high of 46.2 million users at the end of the third quarter of 2007. The report also said that Nigeria’s teledensity, considered the number of telephones to 100 people, is 27.1. The figures represented some of the fastest growth rates anywhere in the world, considering that mobile telephony started in

Nigeria 2001. Furthermore, the total connected lines at the end of the third quarter of 2007 stood at 46.2 million lines with GSM users dominating with 43.6 million lines (94 per cent) [19].

Recent statistics (in Figs. 1, 2, and 3) show a drastic improvement of the penetration of ICT in Africa and in Nigeria in particular. As at the end of 2013 there are about 127 million connected lines – representing about 91% teledensity. So far, the trend in ICT in Nigeria is very promising; considering the fact, that it provides the backbone and serve as the nerve centre for the implementation of the iNSEDMS.

Synergetic Implementational Framework of iNSEDMS

The applications of iNSEDMS range from emergency response planning to short-range early warning to long-range mitigation and disaster prevention planning. This system will enable leaders and administrators to make sound security and disaster management decisions – to analyze risks and decide upon

appropriate counter-measures, which, according to Rego [20], can be greatly enhanced by the cross-sectoral integration of information.

It is a well known fact that natural disasters (such as flood, earthquake, cyclone, landslide, wildfire, famine, epidemics, pandemics and so forth) strike countries, both developed and developing, causing enormous destruction and creating human sufferings and producing negative impacts on national economies [21]. Therefore, access to information is crucial for the effective management of disasters. All those who are concerned with managing disasters necessarily have the need to access timely and accurate information. Normally, a considerable amount of money is spent on just finding the relevant information. This happens because the information is stored redundantly in several places and in several formats [22].

Therefore, iNSEDMMIS shall provide an enabling environment for effective disaster management, which requires assimilation and dissemination of preplanned, historical and real-time information to many sources. This information must be relayed and understood in the shortest amount of time possible to carry out the required activities. Police agencies, for instance, must communicate with government departments, which in turn notify emergency medical professionals and paramilitary forces. The channels of communication must be open at all times under extremely hostile conditions; earthquakes, tornadoes, hurricanes, floods and other events are time sensitive and don't leave much room for delay or faulty communications [22].

According to [23], security, emergency and natural disaster management can be supported by using various information sources. The methods of mapping and image analysis (via Synthetic Aperture Radar (SAR)) make it possible to provide up-to-date and accurate near real-time satellite information for the early warning, mitigation, and management of natural disasters. Thus, iNSEDMMIS in collaboration with NIMET is responsible for integrating earth observation data analysis and modern information, communication and multimedia technology (including mobile communication and web

technology) into the operative disaster management process. The objective of iNSEDMMIS here is to make use of remote sensing data in the operative process of early warning, mitigation and management of natural disasters. The system is aimed to be the base for future development of automated real-time information dissemination.

Advancement in Information Technology in the form of Internet, Geographic Information System (GIS), Remote Sensing, satellite communication, etc. can help a great deal in planning and implementation of hazards reduction measures. For instance, GIS can improve the quality and power of analysis of natural hazards assessments, guide development activities and assist planners in the selection of mitigation measures and in the implementation of emergency preparedness and response action [21]. GIS provides a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types for both scientific management and policy oriented information. This can be used to facilitate measurement, mapping, monitoring and modeling of variety of data types related to natural phenomenon [24].

Remote sensing makes observation of any object from a distance and without coming into actual contact. Therefore, remote sensing can gather data much faster than ground based observation, can cover large area at one time to give a synoptic view. Remote sensing comprises Aerial Remote Sensing which is the process of recording information, such as photographs and images from sensor on aircrafts and Satellite Remote Sensing which consists of several satellite remote sensing system which can be used to integrate natural hazard assessments into development planning studies [21].

Remote Sensing as a tool can very effectively contribute towards identification of hazardous areas, monitor the planet for its changes on a real-time basis and give early warning to many impending disasters. Communication satellites have become vital for providing emergency communication and timely relief measures. Integration of space technology inputs into natural disaster

monitoring and mitigation mechanisms is critical for hazard reduction [24].

In the present era of electronic communication, the Internet provides a useful platform for disaster mitigation communications. Launching of a well defined web site is a very cost-effective means of making an intra-national and international presence felt. It provides a new and potentially revolutionary option for the rapid, automatic, and global dissemination of information.

For instance, iNSED MIS in collaboration with NIMET could provide national meteorological services via the Internet for real-time dissemination of weather observation, forecasts, satellite and other data. In the most critical phase of natural disasters, electronic communication have provided the most effective and in some instances perhaps the only means of communication with the outside world.

Internet-based GIS can play a key role in this aspect by providing cost-effective information at various stages of the disaster life cycle, with a much wider reach. The World Wide Web is an effective tool for communication. It provides a platform for people across the world to exchange ideas, knowledge and technology. Furthermore, there is a move towards globalization of disaster networks to provide speedy assistance to every disaster victim, irrespective of the national boundary and geographical location. This globalization will have far-reaching impacts, and hopefully, the catastrophic events will become less disastrous with the increasing use of the World Wide Web and networks [22].

iNSED MIS allows several agencies operating on different technology platforms

and using different communication channels to use the Internet and Virtual Private Networks (VPN) to collaborate while managing the natural disasters like floods, wildfires, cyclones, earthquakes etc. It provides a platform for exchanging ideas, knowledge and the latest update during the event of any disaster, which is of utmost importance.

Fig. 4 shows the synergetic implementational framework of the iNSED MIS with the various stakeholders, ICT tools (hardware and software), Multimedia Technology and the general public. Based on this, therefore, the various stakeholders (using the iNSED MIS) could gather facts, process such data and disseminate them (various multimedia contents) to the public in different formats via several technological means. For instance, NAFDAC could use the iNSED MIS to publish a list of fake drugs; and the public could use either the conventional media (TV, Radio, Print media) or the Cellular network (mobile phones, mobile TV, mobile Internet, etc.) or Internet on their Computers to get access to such vital information. Here, the various stakeholders could create a mailing list, where members of the public could receive breaking news, alerts and emergency-related information.

In the same vein, the public through the iNSED MIS could supply very vital information to the various stakeholders. For instance, any patriotic citizen can use the iNSED MIS to perform his civic duty (while preserving his anonymity – for security reasons) by furnishing the security agencies with any information that could help in protecting the lives of the people.

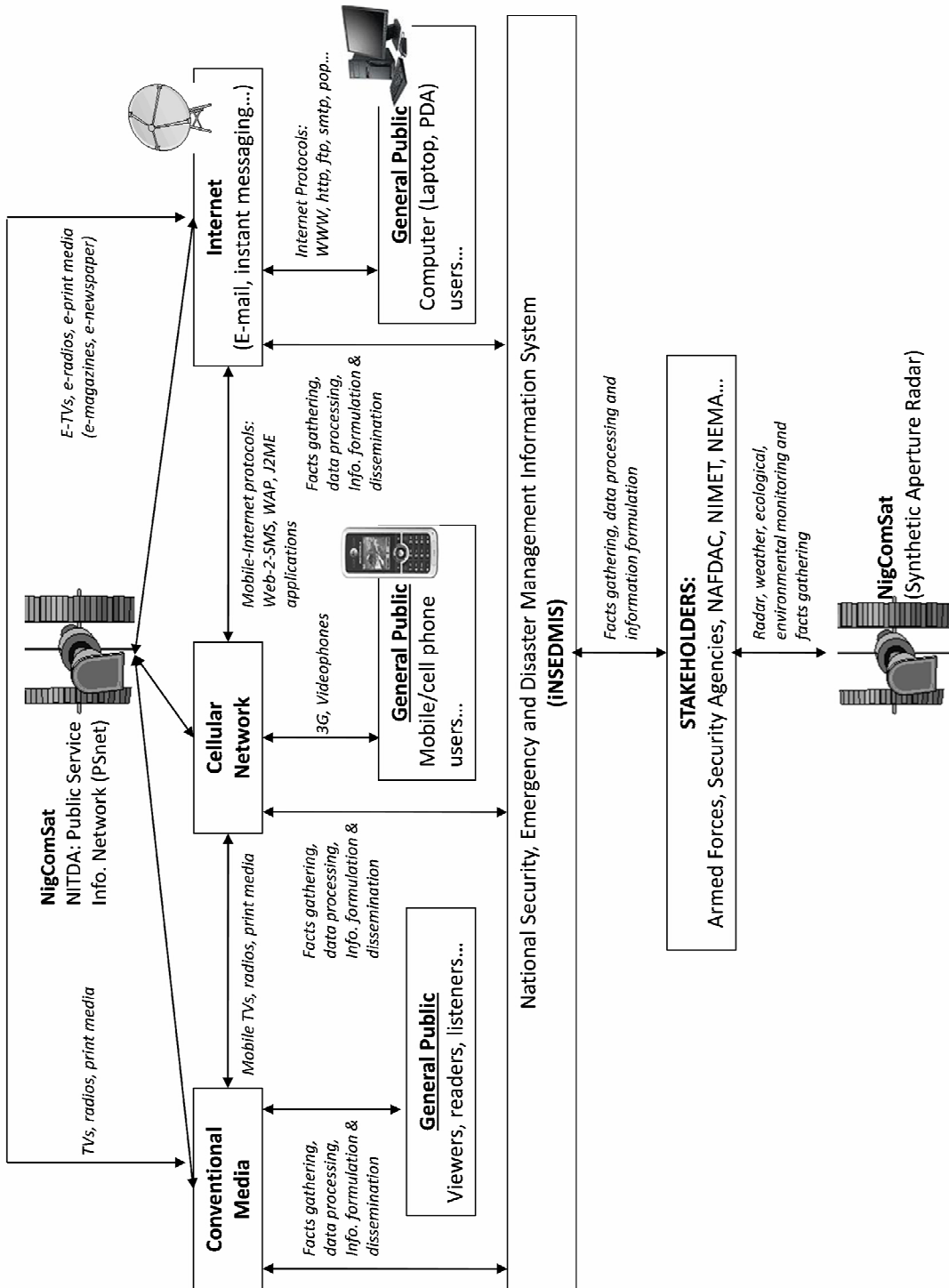


Fig. 4 The Implementational Framework of iNSED MIS

Conclusion and Recommendations

It may be observed that the advancement in Information, Communication and Multimedia Technology in the form of Internet, GIS, Remote Sensing, Satellite communication, etc. can help a great deal in planning and implementation of hazards reduction, security, emergencies and disasters management.

Communication satellites have become vital for providing emergency communication and timely relief measures. Integration of space technology inputs into natural disaster monitoring and mitigation mechanisms is critical for hazard reduction. It is absolutely necessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate

investments in information technology. Awareness and training in Information, Communication and Multimedia Technology in a much greater measure is required to develop human resources, particularly in the developing countries, such as Nigeria.

National ICT strategies are required to provide much needed support for introducing new security, emergency and disaster management frameworks, which promote the selective production and use of ICTs. Such strategies can also be helpful in securing new means of financing ICT investment, strengthening indigenous scientific and technological research capabilities, and helping to improve the capacity to formulate and assess the impact of the new international

governance regimes for ICT services and technologies.

According to Mansell [5], the UNCSTD (United Nations Commission on Science and Technology for Development) suggested that developing countries would be in a stronger position to maximise the potential benefits of the new applications if they establish national or regional ICT strategies.

Bell and Pavitt [25] have opined that rapid innovations in ICT applications and the availability of high-speed networks are creating opportunities for generating and managing increasing amounts of information that can be tailored to security, emergency and disaster management

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Abbreviations

FGN – Federal Government of Nigeria

FRSC – Federal Road Safety Commission

ICT – Information and Communication Technology

NAFDAC – National Agency for Food, Drug Administration and Control

iNSEDMIS – Integrated National Security, Emergency and Disaster Management Information System

NASRDA – National Space Research and Development Agency

NCS – Nigeria Customs Service

NDLEA – National Drug Law Enforcement Agency
NEMA – National Emergency Management Agency
NigComSat – Nigerian Communications Satellite
NIMET – Nigerian Meteorological Agency
NITDA – National Information Technology Development Agency