Research Article

A Computer-Based Security System for Crime Prevention and Control in Kaduna Metropolis

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Abstract: This research study considers the prevention and combating of crime in Kaduna, Nigeria. The use of Close Circuit Television (CCTV) was examined to determine how best to fight Crime and Criminality in Kaduna. Also countries that have successfully Combat Crime through the use of CCTV were mentioned. Study shows that with the use of the CCTV, Countries like America, British and others were able to reduce its crime rate by a reasonable degree. The use of Solar Power System was introduced as alternative to power the CCTV Cameras to reduce cost in all the locations and also the introduction of the solar power System is expected to alleviate the problem of erratic power supply experienced in Nigeria.

Keywords: Crime and security, digital video recorder, Ethernet, multi-camera, wireless system

INTRODUCTION

Kaduna is among the few cities in Nigeria that became capital city during the colonial period. This status of Capital City is maintained up till today. It was first seen as the headquarters of the West African frontier force, WAFF, during the conquest of northern Nigeria in 1907. The capital of the defunct northern Nigeria Protectorate 1913-1957, when the regional government was introduced, Kaduna was maintained as the capital of the northern Nigeria regional government from 1957-1967 (Okonkwo, 2008).

Later it remained as the capital of the north central state by late General Murtala Mohammed regime as Kaduna state. It comprises of the defunct Zaria and Katsina provinces, Kaduna still remained the state capital between 1975 and 1987. The creation of Katsina state out of the then Kaduna state, Kaduna has been the capital city of the present Kaduna state.

The creation of Kaduna primarily is to serve as a convenient capital for the West African Frontier Force (WAFF) in northern Nigeria and later as the administrative capital of the Northern Nigeria Protectorate (NPP). Its creation was indeed a turning point in the history of urbanization and metropolitan development in Nigeria.

It also marked a great departure from the history of the formation and existence of hither-to traditional cities in northern Nigeria in particular and the country in general.

In establishing Kaduna as a capital city therefore, not only the British colonial administration made virtue and of expediency, but that since then, the town has remained as the nerve centre in the political economic and social history relations and development not only in the present 19 northern states in Nigeria but the entire country.

Therefore, Kaduna has continued to serve as one of the most important centre of military organizations, institutions and activities and has continued to attract people from all over Africa and the world. Kaduna is a mini-Nigeria. The plurality of Kaduna, the multiplicity of Kaduna and the diversity of Kaduna as such an important thing.

Kaduna being a mini-Nigeria means that it has a lot of people and so you should expect some problems. Some of the problems need not be categorized as religious or ethnic. Most of the problems are political and economic.

Kaduna occupies part of the central position of the northern part of Nigeria and share common boarders with Zamfara, Katsina, Niger, Kano, Bauchi and Plateau states. To the south-west the state shares a boarder with the Federal Capital Territory Abuja.

The global location of the state is between longitude of 96° 15'E and 80° 60'E of the Greenwich meridian and also between latitude 09° 02'N, 11° 32'N of the equator.

The state occupies an area of approximately 48, 475.2 km^2 and has projected population of 5, 055, 684. The entire land structure consists of an undulating plateau with scattered settlement as one move to the southern part of the state (Saidu, 2011).

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Crime: Crime is defined as harmful act or omission against the public which the State wishes to prevent and which, upon conviction, is punishable by fine, imprisonment and/or death. No conduct constitutes a crime unless it is declared criminal in the laws of the Country. Some crimes such as theft or criminal damage may also be civil wrongs for which the victim may claim damages in compensation (Oxford Dictionary).

According to The Prevention of Crime Act 1908 of England, Crime means "Any felony or the offence of uttering false or counterfeit Coin or of possessing counterfeit Gold or Silvger coin or the offence of obtaining goods or money by false pretence or the offence of conspiracy to defraud, or any misdemeanor".

A normative definition view Crime as "Deviant behavior that violates prevailing norms-cultural standards prescribing how humans ought to behave normally". The approach considers the complex realities surrounding the concept of crime and seeks to understand how social, political, psychological and economic conditions may affect changing definition of crime and the form of Legal Law-enforcement and penal responses made by society.

Identify and select countermeasures of combating crime: Security countermeasure can be technological or procedural and operational and cover a wide range of sophistication, cost and level of integration. Government should consider measure that are feasible, that address the Identified problems and that work within the existing security framework. Government should keep in mind that many countermeasures exist and that a complete feasibility assessment of all alternatives can generate solution that best fit the State's needs. Measure such as Staff training, appropriate facility design and well planned procedures may prove more effective and economical in some circumstances than high-tech admission control or vehicle control system (Abolurin, 2010).

Evaluate countermeasure of combating crime: Government should consider the following factors when selecting and evaluating countermeasure: performance characteristic, proven track records and future needs.

- **Performance characteristic:** Security system needs to have a high degree of reliability. Government should consider evaluating the potential for the selected technology to introduce new vulnerabilities into the system. Potential vulnerabilities may be inherent in a system, or be the result of poor installation or incorrect use. In either case the risk introduced by such vulnerabilities should be known, accepted and addressed where feasible with other measure (Norman, 2009).
- **Proven track record:** Security countermeasure should have a documented record of success, if possible have a unique operating characteristic and may place unusual requirement on security equipment including:
  o Environmental characteristics
  o Asset distribution over wide area
  o Open or public system
  o Operational constraints

Government should consider using the experiences of other countries when selecting equipment. Also this study, if implemented will help in the monitoring and reduction of crime and criminality in Kaduna.

It is expected that the introduction of CCTV will go a long way in fighting Crime in Kaduna Metropolis.

MATERIALS AND METHODS

The working of the Close Circuit Television (CCTV): There are many different types of CCTV systems available-analog and digital, wired and wireless and their modes of operation vary; however, the basic components are in essence the same: a CCTV camera, a CCTV camera lens, a CCTV monitor and (for wired systems) cables that carry the signal from one place to another (Kim, 2009).

- **CCTV with wire system:** The images collected are sent to a CCTV monitor and recorded on video tape via a VCR or as digital information via a DVR (Digital Video Recorder). The CCTV camera lens will determine how far and how much detail the CCTV camera can see.

The CCTV camera picks up the signal from the area being monitored and in a wired system, the CCTV camera sends the signals through a coaxial cable to the CCTV monitor (Fig. 1).

- **Wireless CCTV:** In the wireless systems, no cable is needed; instead the CCTV camera broadcasts the signal. Monitors can be watched by CCTV controllers or left unmonitored.

Recent advances in technology and software mean many DVRs are now equipped with advanced features such as Motion Recording and Event Notification. When set to motion record devices will only record when the CCTV camera detects motion. This saves storage space because the device is not recording during periods of inactivity. Event Notification is the process of sending a text message, recorded telephone messages or email when motion is detected.
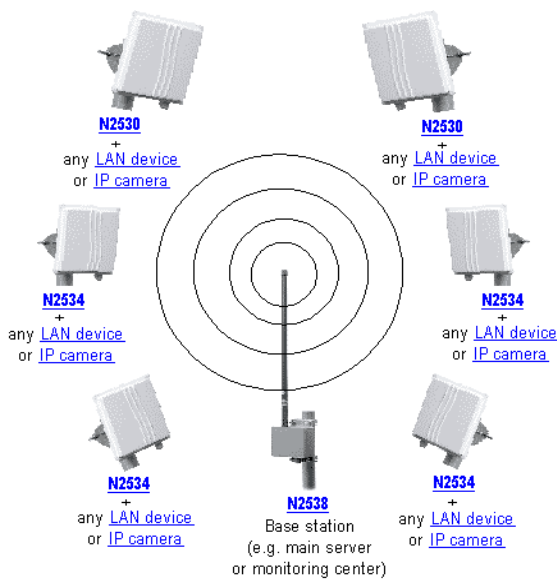
Fig. 1: Simple CCTV with Wire System (Kim, 2009)

Fig. 2: Simple Wireless CCTV (Kim, 2009)

Fig. 3: Pictorial view of a complete CCTV wireless system (Geetaj, 2004)

This is particularly useful for unmanned systems. The recorded information can be stored and/or reviewed by those who have access to the recordings at their convenience. Many of the latest DVRs also have network connections so that saved and live footage can be accessed remotely via a PC over the internet (Fig. 2).

- **A Multi camera CCTV system:** Most systems today comprise of more than one camera, but you don't need a monitor and recorder for each camera; several cameras can share one monitor and hard disc recorder.

Equipment is available that will split the monitor into four separate screens displaying four cameras, or a four way sequence unit can be used which allows you to choose which camera you would like to view. Alternatively, the automatic mode it will sequence through the four cameras that are connected.

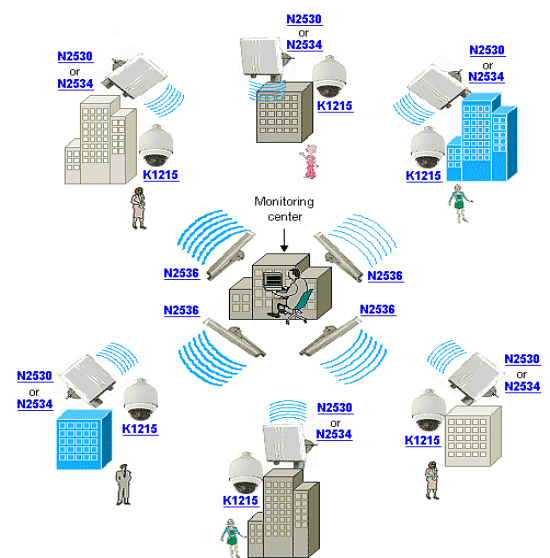However, the most common way of controlling multiple cameras is via a multiplexer.

To keep it simple, a multiplexer incorporates the above facilities but also has the ability to individually code mark each image from each camera and because of this, a multiplexer allows all of the cameras on a system to be recorded onto one tape or hard drive unit. The multiplexer then uses these code marks to play back the recorded picture from the camera that you wish to view.

Historically multiplexers and recording units were separate pieces of equipment, but over recent year's manufacturers have developed units that do both jobs (Kim, 2009).

- **Ethernet:** A local-Area Network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the

CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.

A newer version of Ethernet, called 100 *Base-T* (or *Fast Ethernet),* supports data transfer rates of 100 Mbps. And the newest version, *Gigabit Ethernet* supports data rates of 1 gigabit (1,000 megabits)/sec (Fig. 3) (Geetaj, 2004).

RESULT AND DISCUSSION

Introduction: This Chapter presents the major Areas in Kaduna according to the prevalent rate of crime. It must be clearly stated that not all the Areas of Kaduna metropolis was captured, but the major Areas where crime rate is high (Security Council Report, 2013).

Table 1 shows the major Areas in Kaduna metropolis with their Geographical measurement (Latitude and Longitudes) (Okonkwo), Population estimate and the proposed number of CCTV Camera required in each Area base on the crime rate.

Estimate: Table 2 shows the estimated cost of installing CCTV system at a cost of Eighty Nine Million Nine Hundred and Fifty Three Thousand One Hundred Twenty Five Naira Only. (₦ 89, 953, 125: 00k). The Unit Prices were arrived at after obtaining the price list from the shop floor.

Discussion with Authorities: Talk was held with relevant agencies of Government on the proposed project work. The agencies include the following:

- **Ministry of works:** The ministry lauded the project that "it is a right step in a right direction" says the Director of Urban Development. And that the Ministry is ever ready to implement the project if approved and fund is released to them.
- **Headquarters operation Yaki:** This is the headquarters of the Joint Security Task Force (JTF). The Joint Task Force Comprises of The Nigeria Army, Nigeria Air force, Nigeria Police Force and The Nigeria security and Civil Defence Corps. Headed by the Special Adviser to the Governor on Security Matters. The Adviser, Col. GD Mamman rtd, who happily said "Project of this nature is what the country needed now considering the fact that we are in the 21st Century and the World is fast becoming a Global Village, which all hands must be on deck to guarantee the Security of life and Properties of the Citizens". He however re-iterated the commitment and the effort of the present Administration in the area of Security of life and Properties and that the project is Capital intensive that need to be captured in a budget. He however promised to push as a matter of Public importance.
- **Nigeria security and civil defence corps:** The NSCDC is one of the Security agencies of Government saddled with the responsibility of

Table 1: Major areas and population estimate with the no of CCTV cameras (Okonkwo, 2008)

Name	Lat	Long	Elev ft.	Pop est	Nos of cctv camera
Abakpa	10.55	7.42	1932	491126	12
Afaka	10.67	7.39	2004	23867	18
Badiko	10.54	7.41	1961	480834	12
Kaduna	10.52	7.44	2011	526201	28
Kawo	10.58	7.45	2020	379412	12
Kurmin Mashi	10.55	7.42	2014	468789	10
Nasarawa	10.56	7.47	1984	392542	16
Rigachikum	10.63	7.47	1893	147544	8
Tudun Nupawa	10.53	7.41	2040	492416	12
Tudun Wada	10.51	7.41	1833	505055	16
Ungwan Rimi	10.53	7.46	1938	445908	14
Ungwan Sarki	10.71	6.54	1437	3725	8
Ungwar Shanu	10.55	7.43	1922	499887	8
Television	10.65	7.51	1623	32765	12
Sabo	10.56	7.49	1734	54765	20

Table 2: Materials and cost of implementations

S/N	Materials	Quantity	Unit price	Total price
1	Camera	170	₦ 57, 999:00	₦ 9, 859, 830:00 k
2	Monitor	45	₦ 108, 000:00	₦ 4, 860, 000:00 k
3	Decoder (DVR)	45	₦ 220, 995:00	₦ 9, 944, 775:00 k
4	Mast	170	₦ 79, 756:00	₦ 13, 558, 520:00 k
5	Networking software	1	₦ 500, 000:00	₦ 500, 000:00 k
6	CPU	2	₦ 40, 000:00	₦ 80, 000:00 k
7	Solar Cell	170	₦ 145, 000:00	₦ 24, 650, 000:00 k
8	Back up Gen.	1	₦ 1, 550, 000:00	₦ 1, 550, 000:00 k
9	Base Station	1	₦ 8, 000, 000:00	₦ 8, 000, 000:00 k
10	Solar power	170	₦ 85, 000:00	₦ 14,450, 000:00 k
11	Labor			₦ 2, 500, 000:00 k
12	Total			₦ 89, 953, 125:00 k

protecting lives and property. The Corps through the Command Public Relation Officer (CPRO) Supt. M.A Oguntuase said "The Corps is in tune with the 21st Century security". He also said, "The headquarters of the Corps is fully monitored through the use of CCTV system". Equally he is of the view that with this system in place, it would go a long way in combating crime and criminality within the metropolis.

- **Nigeria prison service:** The Service Public relation Officer said' "The use of CCTV system has already form part of security system of all Developed country", He also said "This work is a right step in the right direction" and pray that it will be extended to all Prison formations in the country.

CONCLUSION

Future expansion: The countermeasure selected should meet the State's requirements and be consistent with the long-range goals of the State comprehensive security plan and strategy. When selecting security solution, Government should consider future needs and requirements, such as the potential for expansion, scalability, integration and upgrading. Technology factors to consider include:

- Ability to put multiple security functions on the same hardware platform.
- Non-proprietary/Off-The-Shelf (OTS) software/ equipment.
- Support for data collection and storage.

- Automated problem recognition.
- Advanced software options for the operation of integrated control and displays.
- Ability to create single security user profile used/enforced by multiple security applications (Abolurin, 2010).

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