

The Use of Electronic Access Control Equipments in Monitoring and Supervision of Educational Institutions in Nigeria

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Abstract

This paper sets out to examine the influence of electronic access control equipments on school monitoring and supervision. The current technological advancement in the global electronic environment has made significant impact in virtually every field of human endeavour. In education, technology has created electronic access control equipments such as weapon detectors, surveillance equipments, Emergency Notification Systems (ENS), electronic fence system as well as alarm and communication tools. These electronic systems could be used to protect educational institutions against vandalism, violence and intrusion within their enclave. The benefits of these equipments range from protection of school buildings to generation of an enabling school climate. The paper recommends that Nigerian schools (from kindergarten to tertiary institutions of learning) should adapt and adopt this technology in order to strengthen monitoring and supervision within the educational institutions.

Keywords: Monitoring, Supervision, Educational Institutions, Electronic Access Control Equipment, Technological Advancement.

Introduction

The rapid technological advancement in the current global electronic environment has launched a silent revolution in virtually every facet of human endeavour. Research in human medicine for instance, has recently produced hardware –software complex called “Sensitive Imago,” for full testing of human organism conditions. The equipment, which has the capacity to diagnose deviations in health status can detect helminthes, bacteria, allergens and virus that are present within the organism as well as other relevant information. In Architectural Engineering, new technologies of BIM, environmental simulation, logistics virtual scheduling and construction software have been developed to fully realize a building’s lifecycle. In Agricultural science, animal production experts in Iowa, U.S.A, have recently designed new barns capable of capturing the sun’s heat during cold winter months as well as protecting livestock from the sun in summer, thus, encouraging continual growth and potentially increasing days to market. Similarly new trend in software engineering has created many wonders in web software, embedded software, infrastructure software and enterprise software to mention just a few.

Education, perhaps, has presented the best example of new trends in technology, providing schools with electronic security equipments often referred to as access control systems. These gadgets include weapon detectors, Emergency Notification Systems (ENS), alarm systems, communication equipments, electric fence system and smart phones. These access control tools, which have merely evolved from an exotic possibility into a very essential requirement for the

protection of educational institutions, have a wide range of implications for school monitoring and supervision. This paper focused on significance of access control systems in educational institutions, the features and characteristics of these electronic gadgets, and the basic functions the modern electronic devices could perform in schools. Attempts were made to answer the questions: How could these equipments serve the purpose of monitoring and supervision within our educational organizations? How could the electronic tools be managed by educational administrators in order to achieve the goals and objectives of education?

Significance of access control tools in educational institutions

Access control tools are modern electronic equipments that safeguard educational institutions against unauthorized actions and undesirable behaviour that are capable of endangering the school environment. According to Homeland Security Primer (2012), access control refers to any combination of barriers, gates, electronic security equipment or guns that can deny entry to unauthorized persons or vehicles. The presence of these tools in schools could prevent intruders and create an enabling environment for effective teaching and learning.

The significance of access control equipments in today's world where terrorist attacks and school shootings have become rampant cannot be over emphasised. The system has the potentials to keep shooters completely out of the vicinity of educational buildings. Even where attackers are crafty enough to gain entrance into school premises, the access control devices installed should have the capacity to close entry points or secure all doors and windows remotely, thus limiting open access to targeted areas. Primer (2012) maintained that limited access forces a shooter to spend more time searching for targets, giving the building occupants more time to evacuate to a safe area or seek cover in safe rooms. This delay also gives the police or other response forces enough time to arrive at the scene of attack to neutralize the danger or reduce the casualty level. Moreover, the system has the potentiality to entrap violent intruders in confined area thereby increasing the chances of arrest or other positive outcomes. According to Schneider (2010), access control tools play important roles where vandalism, thuggery, bullying or other problem behaviours persist despite all other interventions. The system becomes even more significant when offenders or intruders need to be identified and have their actions appropriately monitored. An effective access control system further ensures that access to classrooms, hostels, cafeteria and other interior spaces are strictly controlled to protect against intruders. Kennedy (2012) pointed out that visitors entering a school building for instance, should be directed to a single control point and required to pass directly through to administrative area.

Access control systems in educational institutions are installed to ensure that security personnel can equally monitor lobby doors, staircase and perpendicular hallways without any obstructions. Access control equipments help educational administrators to keep detailed and accurate records of service and delivery personnel including a log to record full names, organization's name, vehicle information and other identification information of visitors.

Features and characteristics of access control equipments in schools

Modern access control tools used in educational institutions are numerous. The most common devices (in broad terms) used today include surveillance equipments, weapon detectors, emergency notification systems, electric fence system, alarm and communication equipments.

1. Surveillance equipments

Ingya (2012) observed that school surveillance equipments comprise of cameras planted in strategic and obscured places to track undesirable actions or behaviour that is likely to disrupt the school climate. There are numerous types of school surveillance cameras in vogue. These include hard-wired camera systems, repeater cameras, industrial strength router cameras, high-definition cameras, analog cameras as well as simple video cameras. According to Sonitrol Pacific (2013), these camera systems are further classified into daytime video surveillance cameras, emergency-only surveillance cameras, night-time recording systems and alarm activated cameras. Surveillance cameras are programmed record-keepers that work day and night with mathematical accuracy. For this reason, they have proved to be very useful in suspect-identification after-the-act. They are extremely efficient tools; performing the functions of surrogate guards because employees are incapable of constantly watching other electronic monitors to catch misbehaviour at the time of its occurrence.

Basically, school surveillance cameras can be grouped into two major categories: the smart video cameras and the conventional type which are mostly analog devices that impassively collect images. Smart cameras however, have the capacity to analyse questionable behaviour within a defined area because they use algorithms to identify shapes and movements - such as people passing through an exit, leaving a suspicious package in an environment or merely lingering in a suspicious location, hopping over a perimeter fence and blocking, attacking or tempering with the camera itself. Schneider (2010) explained that these electronic cameras can sort images based on time, date, alarm notification, objects, size, location and colour. They have the capacity to count the number of people who move through a door, determine attendance at large events, help analyze pedestrian traffic pattern and read license plates.

Other surveillance options

- a) **Mobile “push” technology:** School administrators have the option to capture images from surveillance cameras directly to mobile devices such as smart phones, mobile digital terminals in police or in Mobile Incident Response Vehicles (MIRVs) and to hand-held equipments such as *iGuard* and the *Blackberry*.
- b) **Bus-mounted systems:** There are simple surveillance cameras that cover the interior of school buses with both video and audio sound features. Images from bus-mounted systems are easily monitored through remote viewing and even wireless downloading by school administrators.
- c) **Video Recording Systems: VCRs, DVRs, NVRs:** Other surveillance equipments include Video Cassette Recorders (VCR) and Digital Video Recorders (DVRs). In the current global electronic environment however, VCRs and DVRs have gradually been surpassed by Network Video Recorders (NVRs). A good NVR is most reliable because it has the capacity to send alerts to members of a school community when alarms are triggered as well as the tendency to achieve self-repair and self-diagnosis. The major advantage of this technology according to Schneider (2010), is that images can easily be uploaded on the internet either in recorded or live mode and can be useful for emergency responders or school administrations. Also it is easy to install, particularly on Local Area Network (LAN), NVRs can easily be made part of an IP (internet protocol) Digital Video System (IPDVS). As the memory needs of this equipment continue to grow, its server memory unit can be appropriately upgraded without necessarily overhauling the entire system.

In conclusion, modern surveillance technology in educational institutions has now made available Digital Machines that can convert analog data from archaic recording systems into digital information in an appropriate video recording format. This implies that both old and new technologies are relevant to school security in the present millennium.

2) Weapon detectors

The Encarta Electronic Dictionary (2013) has defined the term *weapon* as a device designed to inflict injury or death on an opponent. A weapon detector is a device that has the capacity to identify a weapon. Ingya (2012) observed that weapon detectors are designed to carry out electronic sensitization of instruments, objects or substances that can cause injury on a person or other tangible object(s). There are various categories of weapon detectors used in educational institutions. Fisher Lab (2012) identified some of these as hand-held concealed weapon detectors, pop-up shelters, floor mat, battery charger cables, protective covers and operational test piece. The installation of these devices in schools however poses much administrative problems. Apart from the huge costs of these equipments, they require the creation of special portals and trained personnel to provide effective management. Besides, school security portals serve no useful purpose if doors and windows have not been fitted with anti-intrusion mechanisms. In addition, security portals require the use of X-ray scanners especially if such portals are fitted with backpacks or other items containing metal objects.

In spite of these shortcomings, Mokeyane (2013) observed that “by installing metal detectors, a school may be shielding many students and teachers from the potential harm of deadly weapon”. The presence of weapon detectors in schools tends to ease the concern of parents who are comforted by the knowledge that offensive instruments can easily be detected by school officials if their users seek entry into the school compound. But most importantly, the installation of weapon detectors in schools helps in identifying violent students who may be bold enough to bring offensive weapons to school for whatever reasons. This notwithstanding, the attitude of violent students place school administrators in a better position to counsel or help such troubled students.

3) Emergency Notification Systems (ENS)

Wikipedia (2012) has stated that an emergency notification system refers to a collection of methods that facilitate one-way dissemination or broadcast of messages to one or many people with the details of an occurring or pending emergency situation. It will also include two-way communication typically to facilitate communications between emergency communication staff, affected people and first responders in the field. There are two major types of communication devices that constitute an ENS; those utilized by individual people and those for groups of people. Those for groups of people which are often referred to as *public communication devices* include a PA system, radio and television, wall flat panel display and digital electronic sign among others. These tools are designed to deliver emergency communication to groups of people as a single process at a time. *Private communication devices* however, are those that facilitate communication to one person through a single process at a time. Devices under this category include GSM handsets, walky-talky, intercoms as well as software applications such as e-mails and text messages. Today new technologies have ushered into the markets some ENS gadgets under assorted trade names that are broad based, performing both functions of private and public communication tools. Eisele-Dyrili (2008) identified some of these equipments as:

a) React Systems: These are gadgets that have multimodal communications system capable of delivering communications to cell phones, computer desktops and laptops among others. Used by many schools, the equipments can be either fully hosted online or operate on an enterprise client server in an installed appliance. REACT has the scalability to grow from thousands to millions of contacts; contacting first responders with information and instruction.

b) School-Reach: This is a web-based system that is regularly used by school administrators especially in emergencies. The device is capable of sending audio and text broadcasts via phone calls, e-mails and text messages. School-Reach allows schools administrators to deliver personalized phone messages to an entire contact list or select groups. Also, the device has live reporting capabilities as well as language translation features.

c) Blackboard connect: This IP-based server equipment is used by school administrators to record, schedule, track and send personalized voice messages to staff members, students and parents. The gadget can reach out to targeted groups within its calling database. It can equally engage recipients in a two-way communication through survey questions via their phone keypads.

d) Other ENS devices: Other ENS devices currently on the market include CIS Tere Networks, Xtremealerts, Honeywell instant Alert, Teleparent, Send word now, School messenger, Prepared response, K12 Alerts and Alert Now among others. The main advantages of these equipments include their capacity to provide instant alert to first responders and other features designed to offer critical school building information to first responders such as the best access routes to use during emergency and incident response plans among others.

4. Alarm systems

An alarm system is a device that signals the occurrence of some undesirable event. Ingya (2012) pointed out that alarm systems are extremely sensitive electronic devices that can easily be triggered even by a slight touch, smoke, a lit match, noise, unauthorized movements and flames. Schools use various kinds of alarm systems. Some of these include:

a) Annunciators: Annunciators are often called door-guards because they make a noise at the points of intrusion and subsequently alert a school administrator or designated security officers at the monitoring station that an emergency door has been opened. Most annunciators are usually supported with surveillance equipment to enhance instant viewing of unwarranted visitors or intruders.

b) Fire alarms: These are extremely sensitive devices that can be triggered by smoke or flame. Fire alarms have the capacity to detect movements of people tempering with firefighting equipments or room detectors. These alarms can respond with recorded messages or by triggering an alert at the monitoring station.

c) Wireless alarms: Wireless alarms can be classified into *body alarms* that merely make noise and *second generation alarms* that can send messages and pull up a person's data such as a photograph and other personal features.

d) Burglary alarms: Burglary alarms can easily be triggered by window or door intrusion. This alarm system also uses the mechanism of passive infra-red (PIR) detection to sense room temperature changes induced by a person's entry. Most schools in the developed world augment this device with daytime video surveillance cameras, night-time recording gadgets as well as emergency-only surveillance cameras that transmit both images and sounds to security monitoring stations and designated web-sites. Burglary alarms fitted in schools are also programmed to respond to vibration-based glass breakage by unseen intruders. These alarm systems do not only enhance an efficient access control in schools but they serve the purpose of assuring parents that the school environment is safe for a conducive academic programme of their wards.

5. Communications equipments

The FARLEX Free Dictionary (2013) has defined *communication equipment* as facility consisting of the physical plant and equipment for disseminating information. Schools make use of different kinds of communication equipments. The common ones are two-way radios, mobile phones, GPS, e-mails and web services among others.

a) Two-way Radios: Two-way radios are very popular communication tools used for emergency purposes in many parts of the world due to their daily application in school administration and security purposes. School-radio com. (2013) pointed out that in modern societies, radios are even more crucial to emergency preparedness and student safety. For instance, schools in the developed world have realized the significance of this device and have continued to place two-way radios in all class rooms as an integral part of the schools' security programme.

b) Mobile phone: The mobile phone technology has become one of the commonest methods of communication in modern societies. Mobile phones which come in different makes and modes enable school managers to track, record, receive and send information as a routine activity and during emergencies. For example, School News (2010) reported that Evansville Vanderburgh School Corporation in Indiana has equipped all teachers with hand-held VoIP telephones that are easily moved about throughout the school, even on playgrounds. This initiative also enabled the school administration to use single wire software's InformaCast to broadcast messages to teachers exclusively rather than use a PA system. The initiative equally enabled them to use *blackboard connect* for external messaging in school.

c) Global Positioning System (GPS): The GPS is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites" (Wikipedia, 2013). GPS functions noticeably with the use of a receiver. A GPS receiver is a device that calculates its position in any part of the earth by timing the signals sent by GPS satellites very high over the earth. Because of its global outreach therefore, the GPS has become a very valuable communication tool where the database of lesser communication equipments cannot reach. It is therefore suitable for use during emergencies in schools.

d) E-mail: Electronic mail or e-mail (also email) as it is commonly called, is a method of exchanging digital messages from a communicating author (also called the sender) to one or more recipients across the internet and other computer network. The e-mail as a messaging technique serves very useful purposes during emergencies in schools.

6. The Electric Fence System

The technology of access control systems in schools today has rapidly assumed a higher dimension with the recent introduction of the electric fence system. This technology is a psychological barrier that keeps intruders out of school buildings. The electric fence is embedded with a low tension wire that carries electric current which can generate about one pulse per second from a grounded energizer. The electric fence system is designed to complete the circuit between it and the ground; releasing a short, sharp and invariably safe but memorable shock when touched by an intruder. Electric fences do not require much physical strength. They are however built to resist pressure from storm, wind or animals. Alibaba (2013) observed that an electric fence has the following advantages: the fence is 50% less expensive to build and maintain than barbed wire; it is easy to construct; it serve as a psychological and physical barrier and its maintenance is generally low. He stated further that the fence is very durable due to low physical contact, easy to construct, potable and has power consumption below 10W. The electric fence can integrate with CCTV, GSM and alarm panels as a perfect security system, he concluded.

Electronic access control systems in school monitoring and supervision

The concept of monitoring, according to the e-advanced English dictionary (2006), refers to the act of observing something, with the aim of making improvements. School administrators are often concerned with making observations about educational projects and programmes with the ultimate objectives of improving the quality of teaching and learning. Supervision of instruction in the same vein is a behavior designated to improve the instructional programme of the school system (Ogunsaju, 1983). School monitoring and supervision therefore, have the same goals and objectives.

Over the years, there has been a hue and cry among Nigerians about school insecurity (Adejumo, 2011) and the seemingly dwindling standards of education in schools (Ijaiya, 2001). While Adejumo linked school insecurity to administrative laxity on the part of government, Ijaiya attributed the problem of falling standard of education to the decline in educational quality and wastage as a result of dropout and failure rates, rampant examination malpractices and poor reading and writing skills among students at all levels of education. Olayemi (2001) maintained that these enigmas stem from a systematic decay of public education, leading to the emergence of private schools. Fischer (2013) pointed out however, that through effective supervision of instruction and monitoring of schools, administrators can reinforce the security of schools and enhance a teaching culture that will contribute to improved students' academic performance. The presence of electronic access control equipments in schools according to Ingyia (2012), can further enhance school monitoring and supervision. For example, school supervisors and monitors can implement school safety programmes in which students are taught basic skills of problem solving that can be applied to a wide range of school safety issues capable of generating school effectiveness. Kenney and Watson (1999) noted too that teachers who are school mowers as well as instructional supervisors and facilitators of knowledge can collaborate with school resource officers in dealing with crime and disorder within the school system in order to create a harmonious atmosphere for effective teaching and learning.

School access control facilities such as weapon detectors, alarm systems, surveillance cameras, gates, doors and window shutters, deadbolt locks on doors and windows as well as security doors that open only from inside have become a very effective means of securing school buildings in which school monitoring and supervision takes place .

School managers such as principals, rectors, provosts and vice chancellors, and their immediate lieutenants have responsibilities towards supervision and monitoring of teachers and other personnel such as learners, librarians, school gardeners, counselors, and health officers. They are internal supervisors of their school activities, school facilities and entire school environment (Fasasi, 2013). Access control tools such as surveillance cameras enables the school administrators to supervise and monitor the staff and school environment since the cameras normally have *footage* linked to monitoring stations as well as the offices of school administrators. By the same token, a school manager is well equipped, using these electronic gadgets to monitor the movement of visitors within the school vicinity. The advantage of this system is that unwanted visitors or criminals can easily be detected before they gain entrance to the school compound.

In the classroom, supervision of instruction is made easier with the use of two-way radios and other communication equipments and channels such as LANs, WANs, routers, switch boards and telephones. This is important because it saves the school managers' time of having to go round all classrooms, or having to place important information which requires teachers' attention on the school general notice board. Furthermore, DPS Telecom (2012) has maintained that school monitoring and supervision is now made easier with customized alarm monitoring solutions such as T/MonLNx that empowers school administrators to detect and correct specific problems in school administration before they cause network outages or expensive equipment damage.

School access control tools enable school administrators to monitor and supervise violent students who may bring offensive weapons to school for whatever reasons. Electronic equipments such as weapon detectors, hand wads and X-ray scanner can detect or deter the use of machetes, knives, explosives, guns and ammunitions by errant students in school.

Perhaps, the electric fence system as very recent access control equipment has become one of the most useful electronic gadgets to facilitate school monitoring and supervision today. This is because the innovation has the capability to prevent intruders and errant students from gaining access into the school yard. The implication of these features is that staff and students can psychologically feel safe in school to concentrate on the achievement of curricular goals and objectives. In the same vein, school administrators can feel at ease to supervise and monitor instruction in school without obstruction.

In addition, access control equipments such as emergency notification systems can equip school administrators with communication gadgets such as the *Honeywell Instant Alert* (that can send 100,000 messages in 15minutes via landlines, cell phone, pager and e-mails to a specific subgroup or an entire database) or the *K12 Alerts* that sends emergency messages to parents, residents and college staff at a rate of up to 500,000 messages per server per hour via e-mails and, or phone calls (Eisele-Dyrli, 2008). This input can therefore allow a school manager to monitor a large subgroup such as student body or school staff with little or no difficulty. Other access control facilities such as WAN (Wide Area Network) - a computer network that spans a wider area than does a local area network, LAN (Local Area Network), the GPS (Global positioning System), the e-mail (electronic mail) and web services serve as school administrators' aids to monitoring and supervision in the current global electronic environment. School administrators therefore have a wide range of electronic equipments as tools for school monitoring and supervision at the moment.

Challenges

In spite of the efficacy of these electronic access control systems (which have proved to be useful in schools especially in developing countries such as Nigeria where school-killings and other forms of school violence have become rampant), the problems of erratic power supply in

Nigeria, mismanagement of human and non-human resources and the endemic nature of corruption in the country raise serious questions about the effective implementation of access control programmes in Nigerian schools. Nevertheless, an experimentation of this technology can have a profound influence on school monitoring and supervision in the current global electronic environment.

Conclusion and recommendations

An appraisal of the efficacy of electronic security equipments has shown that school access control systems have become a panacea to the problems of school monitoring and supervision in the current global electronic environment. This is particularly true of Nigeria where the absence of these electronic equipments in schools has not only led to poor school management and reduced educational standards, but has suddenly paved way for the growth of school violence and killings. For instance, there has been a hue and cry by the public about the seemingly falling standard of education in Nigeria today. Also, school crimes such as the gruesome massacre of 19 students of the Federal Polytechnic, Mubi in October 2012 has remained fresh in the minds of Nigerians. There is therefore every need for Nigeria to experiment this technology as is the practice in South African schools and colleges. This paper has therefore recommended that:

1. monitoring and supervision of all categories of schools and colleges in Nigeria should be augmented with the use of modern electronic equipments in order to achieve school goals and objectives;
2. all institutions of learning in Nigeria should acquire vital electronic tools such as the electric fence system, surveillance equipments, alarm systems, weapon detectors, emergency notification systems and communication gadgets to protect schools against criminal intrusion and violence that have negative influence on school goals achievement;
3. in view of the enormous costs of procuring and installing access control systems in schools, Parent Teacher Associations (PTA) should be mobilized to support school security projects through appeal funds;
4. there is need for Nigerian schools to seek the intervention of non-governmental organizations such as the World Links for Development (WorLD) programme towards the implementation of school access control projects. WorLD is an innovative and award winning organization that works to provide schools in developing countries with capacity building and self-sustaining computer laboratories and programmes oriented towards integrating computers into the school curriculum;
5. in order to embrace modern technology culture to facilitate school monitoring and supervision, Nigeria should bridge the current digital divide in schools by adapting the American e-rate programme of 1996 that allocated money from telecom taxes to poor schools without technology resources.

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