

Comparative Analysis of the Digital Classifier Models for Real-Time Voice Recognition System

W.O. Adesanya

General Studies Department
Federal College of Agriculture, Akure, Nigeria
Department of Computer Science
Tai Solarin University of Education, Ijagun, Ijebu-Ode, Nigeria
sanyalanre2003@yahoo.com

J. O. Okesola

Department of Computer Science
Tai Solarin University of Education
Ijagun, Ijebu-Ode, Nigeria
School of Computing
University of South Africa (UNISA)
48948535@mylife.unisa.ac.za

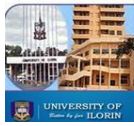
ABSTRACT

The study gives the analysis of different classifier models, in terms of their processing time and memory requirements to identify and verify person through his or her voice in order to access restricted information or resources. Voice was chosen as a means for identification and verification purpose, since password can be lost or stolen or even counterfeited. The classifiers compared were the VQ, DTW, HMM and ANN. For the purpose of simulation and comparison, the voice recognition system has both the components of speaker identification and verification. At each stage of identification and verification, the voiceprint is compared with model voices of all speakers in the database. The comparison is a measure of the similarity (score) from which rejection or acceptance of the verified speaker is chosen. The Linear Predictive Coding (LPC) and Cepstral analysis for feature extraction techniques were used for damping. The DTW was found to be more suitable for real-time application with the real-time average speaker recognition time of 7.80 seconds. The system was able to make access decision in an average of 2.80 seconds after the voice sampling was completed. In general, our model compares favourably with literature with better recognition and access decision times.

Keywords - Voice Recognition, Real-time, Dynamic Time Warping, Vector Quantization, Linear Predictive Coding

1. INTRODUCTION

Each person has unique anatomy, physiology and learned habits that familiar persons use in everyday life to recognize the person such as signature, fingerprints, voice, facial, etc. Increased computing power and decreased microchip size has given impetus for implementing realistic biometric authentication methods. Spoken language is the most natural way used by humans to communicate information. The voice signal conveys several types of information. From the voice production point of view, the voice signal conveys linguistic information (e.g., message and language) and speaker information (e.g., emotional, regional, and physiological characteristics). From the voice perception point of view, it also conveys information about the environment in which the voice was produced and transmitted. Even though this wide range of information is encoded in a complex form into the voice signal, humans can easily decode most of the information. Such human ability has inspired many researchers to understand voice production and perception for developing systems that automatically extract and process the richness of information in voice Qin (2007).



The voice technology has found wide applications such as automatic dictation, voice command control, audio archive indexing and retrieval etc. The application defines which information in the voice signal is relevant. For example, the linguistic information will be relevant if the goal is to recognize the sequence of words that the speaker is producing. The presence of irrelevant information (like speaker or environment information) may actually degrade the system accuracy. Voice recognition is a biometric modality that uses an individual's voice for recognition purposes. The speaker recognition process relies on features influenced by both the physical structure of an individual's vocal tract and the behavioural characteristics of the individual. Accessing protected resources is always carried out through the use of personal tokens like a key or badge, knowledge of certain information like a password or combination of numbers Aladesanmi et al (2012).

A password is a string of characters used to login to a computer and other systems for files access, program access, and other resources. They are used to ensure that people do not access any system unless they are authorized to do so Aborisade et al (2013). It is however observed that these passwords (or keys or badges) can be lost, stolen or counterfeited, thereby posing a threat to information or data security. Thus, in order to reduce this security threat and for real-time operation, there is the need for the comparative analysis of classifier models that can aid the security of real-time utilization of voice-driven access to the restricted resources, since voice is unique to each person and cannot be lost or stolen. The remaining section is organized as follows: section 2 reviews a number of relevant literatures on speaker recognition system; section 3 describes the methodology for the analysis while 4 and 5 describe the results and concludes the work respectively.

2. RELATED WORK

There have been numerous researches in the application of techniques and models used in extracting voice feature or matching feature in order to identify and verify speaker in speaker recognition system. A number of such relevant researches were reviewed in this paper. David (2004) found that Verification system authenticates a person's identity by comparing the captured biometric characteristic with its own biometric template(s) pre-stored in the system which conducts one-to-one comparison to determine whether the identity claimed by the individual was true. A verification system either rejects or accepts the submitted claim of identity and that the identification system recognizes an individual by searching the entire template database for a match which conducts one-to-many comparisons to establish the identity of the individual. The delimitations of David (2000) were that the rate of fingerprint capture and feature extraction were not considered, although in a real-time world scenario, this is an important factor.

In Julius et al (2005), a stochastic model was developed to solve the problem of speech processing in speaker recognition. The research was able to develop a high-quality, multivariate and Hidden Markov Model (HMM) by means of Hidden Markov Toolkit (HTK) tool software to determine the speaker but provision for grammar testing enlargement as the new models are needed for the new words training. However, the limitations of the research were the direct counting of the probability was very complicated; and that the current state depends on the previous state. A new feature selection method for speaker recognition was proposed by Hauwu et al (2008) to keep the high quality speech frames for speaker modelling and to remove noisy and corrupted speech frames. The research adopted spectral subtraction algorithm to estimate the frame power. An energy based frame selection algorithm was then applied to indicate the speech activity at the frame level. The research was able to use the eigenchannel based GMM-UBM speaker recognition system to evaluate the proposed method. However, the research required long-term spectral analysis and computation found to be complex. Sara (1998) concentrated on optimized speech processing in the DSP56001 hardware platform, especially in the application of noise reduction and speech enhancement. Kwek (2000) worked on a hardware based speech recognition system.

Both work by Sara (1998) and Kwek (2000) were hardware based but were not concentrated in the area of speaker recognition, which is the focus of this paper, based on the observation that the size of the speaker database grows when the number of speakers in a system is increased. This poses two problems in terms of memory requirement for voice database storage, and processing time required by the system and these problems are being analyzed in this paper using a comparative analysis on Dynamic Time Warping (DTW), Vector Quantization (DQ), Hidden Markov Models (HMM) and Artificial Neural Networks (ANN) based models to determine a suitable model with better response time in real-time application for voice-driven recognition system.

3. METHODOLOGY

The classifiers compared were the VQ, DTW, HMM and ANN. For the purpose of simulation and comparison, the voice recognition system has both the components of speaker identification and verification. A user has to first utter a phrase to identify his or her self, similar to giving a "login name". The system performs a speaker identification routine based on the login utterance. The user is later required to give a text prompted four combination digit, for example "3-6-7-4". This prompted password is edge detected, and sliced into four different utterances of digits ranging from 0 to 9. A speaker verification routine is executed based on the database of the person verified during the "login" phase.

All classifiers are trained or implemented on digits 0 to 9, and each digit being sampled in 1 second duration. 5 samples are taken for each digit during the training phase. For speaker identification, 5 samples of 2 second phrase were recorded for each user. All 50 digit samples and 5 identification phrases were used to train the VQ, HMM and ANN implementation. Only 1 sample of digits and recognition phrase was used for the DTW implementation. The memory requirements for VQ, DTW, HMM and ANN were computed when implemented on a voice recognition system. The memory required for the types of classifier implementations were noted along with the execution time.

The total memory required for VQ is calculated as follows:

$$\text{memory required} = (\text{number of users}) \times (\text{codebook size}) \times (\text{coefficients per frame/codebook entry}) \times (\text{bytes per coefficient}) \dots\dots\dots (1)$$

The amount of storage required for DTW is completed as follows:

$$\text{memory required} = (\text{number of users}) \times (\text{number of models per user}) \times (\text{number of frames per model}) \times (\text{coefficients per frame}) \times (\text{bytes per coefficient}) \dots\dots\dots(2)$$

The storage required to store the neural network depends on the number of nodes contained in the network. The storage is needed to store the weights of interconnecting nodes, and the offset of each node in the hidden and outer layer.

The storage required for three layer network is computed as following:

$$\text{total storage} = H(I+1) + O(H+1), \text{ where } H \text{ is the number of hidden nodes, } I \text{ is the number of input nodes, and } O \text{ is the number of output nodes.} \dots\dots\dots (3)$$

The storage allocation to store the HMM parameters required for each word is calculated as:

$$N(N+M+1) \dots\dots\dots (4)$$

where N and M represent the number of state and the number of symbol respectively.

The real-time clock (RTC) was used to keep track of time on events and activities within the system. The execution time was only given for the classifier training and recognition routine. The memory and processing time results were recorded. Voice access was only granted if both identification and verification were successful. An application software was developed using C programming language with Code Composer Studio (CCS) to generate the source codes for autocorrelation analysis, LPC Cepstrum and DTW. The DSP Starter Kit (DSK) Debugger was used to download source code to the speaker recognition system, which executes decoding and monitoring.

4. DISCUSSION OF RESULTS

The total memory and processing time is summarized in Table 1. The training time listed is for each enrolment session. The speaker identification time is calculated on assumption that there are 100 enrolled users. The storage requirement needed for the ANN implementation is the least, with the DTW and HMM implementation requiring larger storage area. The VQ implementation requires a comparatively moderate amount of memory. All the classifiers evaluated require memory location which is easily made possible in current designs.

Table 1: Storage and Processing Time for different Classifiers

	Storage Location	Training Time	Speaker Identification Time	Speaker Verification Time
VQ	1.0Mb	8.40s	15.75s	0.16s
DTW	4.0Mb	0.00s	0.80s	0.02s
HMM	5.2Mb	250.0s	1.23s	0.02s
ANN	0.3Mb	1400.s	13.40s	0.26s

The time needed to enroll a user varies drastically between the other types of classifier. The DTW implementation requires no training at all. The VQ implementation requires training time which is acceptable, and may be used for online training. A person can be made to wait during an enrolment session, and thereafter the trained database may be verified. If the verification is unsuccessful, speech samples may be prompted again from the user to retrain the user database. The training time of HMM and ANN is well beyond the waiting time for a user who is enrolling. The training may be done offline, during the idle processing time of the speaker recognition system. The HMM training time does not show a significant change, but the ANN training time varies drastically.

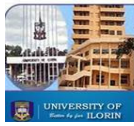
The speaker identification time for DTW and HMM classifiers are within acceptable limit. The identification time of the VQ and ANN are quite long and may not be suitable in certain applications like door-access. The training time can be reduced by using a more powerful DSP. The usage of a more powerful DSP has its drawback in actual application due to extra power consumed by the DSP. Power consumption is a major design trade-off in hand-held applications, especially systems that run on battery, or systems being battery backed-up in the absence of power. It is apparent that the speaker identification is still feasible using any of the classifiers when the population is up to 100 users. The identification time increases when the number of users increase, which causes speaker identification not feasible in application like banking. The speaker verification is computably feasible using any of the classifier evaluated here. The verification time is not affected by the number of enrolled users.

5. CONCLUSION

This paper presents a platform for comparing classifier models for maintaining data security and authenticity in voice-driven system in terms of memories and data acquisition modules that were well suited for a voice recognition system. Evaluations of various classifiers have shown that speaker recognition is feasible to be implemented in a real-time environment, and in a stand-alone hardware platform. The training time of certain classifier which is lengthy may be done offline or during the system's idle time. The speaker identification may not be feasible in application with a large population of users. A security system may alternately apply speaker verification along with conventional identification token or another biometric feature instead of applying speaker identification. A conventional token like an ATM card or key may be used to identify the user before speaker verification is performed.

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Power Analysis For Machine Tool States: Critical Factors Towards A More Robust Machine Tool Energy Model

Vincent Aizebeoje Balogun

College of Engineering

Department of Mechanical & Mechatronics Engineering

Afe Babalola University

Ado Ekiti, Nigeria.

balogunav@abuad.edu.ng

+2348036434484

ABSTRACT

The research work aimed to investigate the effect of machine modules and auxiliary units on the power and energy consumption for machine tools. The total electrical current consumption of machine modules and NC codes was measured. The power demand was evaluated and analyzed statistically to define the significance of machine events on power and energy consumption. The paper provides valuable information on the impact of machine modules, auxiliary units and motion states on the energy demand budget for a machine tool resource. This knowledge is fundamentally important in developing energy models for machining, in process planning for machining and in re-designing the machine tools to make them more energy efficient. The paper's contribution should feed into the knowledge base for redesign of machine tools and decision making in planning energy efficient machining processes.

Key words: Auxiliary units, machining, machine tools design, carbon footprint, energy in machining, environmental impact of machine tools.

1. INTRODUCTION

It is obvious that manufacturing industries consumes electrical energy during the production processes. For example in Nigeria, manufacturing contributed 6.3% to the GDP between 1996 and 1998 [1]. Also, Corporate Nigeria [2] reported that manufacturing contributes 4.2% to the GDP in 2009, up from 3.6% in 2008. There are an increasing trend of electricity demand in Nigeria and globally. In the year 2010, 17.3% of energy consumption in the UK is attributable to industrial sectors [3]. This places a high demand on the supply of electricity. In most cases, this electricity is predominantly generated through the use of fossil fuel. The use of carbon rich electricity generation sources is of critical global interest as these processes produce CO₂ emission. It simply implies that the higher the consumption of electricity in manufacturing industries, the higher the carbon footprints left by such processes and end products. As a result, the Global communities, comprising of all stake holders (i.e. UK government, European Commission and other nation's), through the United Nation Environment Program UNEP [4], states policies and sometimes laws for an increasing demand for energy efficiency throughout the manufacturing cycle.

It is reported that the bulk of electricity consumption in manufacturing is due to the use of machine tools for machining operations. The European Commission cites machine tools as a top three priority for inclusion into the product categories to be regulated through the eco-design directive [5]. Hence the urgent need for manufacturing sectors to reduce the demand for energy to meet eco-design directives and CO₂ emission targets cannot be overemphasized. For designers of machine tools and manufacturing companies, this calls for an increased understanding of energy use by different design features of a machine tool and optimizing the use of energy in available numerical control motion states.

The Cooperative Effort in Process Emission (CO₂PE!) proposed a unified taxonomy [6] and methodology [7] so that energy data collection could be standardized and presented in a globally compatible approach. In this paper the author build on from the CO₂PE! approach and adopted the strategy for classification proposed by Balogun and Mativenga [8]. Initially, the various states of machine tools are reviewed in relation to CO₂PE taxonomy [6]. In a case study on a MHP Open CNC lathe, power usage on a machine tool was characterized focusing on power consumption of the machine tool modules and auxiliary units. An assessment of the critical machine tool processes was made and this information is discussed with the vision to integrate NC codes into machine tool energy models and to improve the detail and utility of mathematical energy models for machine tools.

1. 1. Machine Tool States Characterization

According to According to CO₂PE! [7], screening and in-depth approach was identified as the approaches to studying a unit process and the development of acceptable dataset. CO₂PE! classified machine tool states into two categories of 'Basic State' and 'Cutting State' based on operational characteristics of the processes. In the 'basic state', electrical energy is needed to activate required machine components and ensure the operational readiness of the machine tool. In the 'Cutting State' the electrical energy is demanded at tool tip to remove workpiece material as well as for modes of energy loss e.g. through machine noise, friction etc. Furthermore, a new 'Ready' state was proposed by Balogun and Mativenga [8, 9] to represent a third and intermediate state. This is required because after the machine is started more electrical energy is needed for the drives and spindle of the machine tool to bring the tool and workpiece to the correct, about to cut position and to set-up the necessary cutting velocity.

Researchers are constantly investigating, analysing and modelling power and energy consumption of machine tools with much emphasis on reducing energy consumption during the machine idle stages [10, 11]. The energy consumption of machine tools during actual cutting processes was 14.8% of the total energy consumed by the machine tools throughout the machining process of a unit. The auxiliary units consume 85.2% [10, 11]. This implies an increasing carbon footprint and cost of the product produced with the equipment. Vijayaraghavan and Dornfeld [12] used event streaming of energy in machine tools to predict energy consumption in automated machine tools. In the analysis, it was shown that energy consumption increased during the start-up and idle states. Diaz, Nancy et al., [13] also reported that among the auxiliary units, the servo and the spindle consumes the most energy in the basic and idle states as investigated on the Mori Seiki NV1500DCG milling machine. However, to further prove and identify the auxiliary units that consume the most energy and modelled to an acceptable criterion in machine tools development, it is important to conduct more research to further analyse and validate the model using other machine tools as required by CO₂PE! and for standardization. Li et al., [14] and Li and Kara [15] reported that the energy requirement of a machine tool consists of the tool tip energy also refer to as the cutting energy and other numerous auxiliary units.

Kara and Li [16] modelled energy consumption for material removal processes of a unit process called specific energy consumption SEC. The SEC can be defined as the specific energy consumption to remove 1 cm³ of the workpiece material during a mechanical machining process. The authors further decomposed the SEC into specific fixed energy (SFE), specific operational energy (SOE), specific tool tip energy (STE) and specific unproductive energy (SUE). The decomposition can account for the various energy consumption of machine tools states as defined by Gutowski et al., [10], and Vijayaraghavan and Dornfeld [12] categorizes the energy state as basic, idle and cutting energy. However, the model cannot be generalized as it varies with machine tools and process parameters.

The work of Mativenga and Rajemi [17] analyses the impact of optimum cutting parameters on energy consumption and energy footprints of machine tools and further classified the energy consumption of the auxiliary units as 'idle energy' with the assumption that each of this units contribute to the total energy consumption. Hence, Equation (1) was modelled as:

$$E = E_1 + E_2 + E_3 + E_4 + E_5 \quad \dots\dots\dots(1)$$

Where, E is the total energy consumption, E_1 is the energy consumed by the machine during setup operation (Idle energy), E_2 the cutting energy, E_3 the tool change energy, E_4 is the embodied energy of the tool and E_5 the embodied energy of the material. However, a clear distinction was not mentioned of machine tools energy states. Mori et al., [18] went further and modelled the total energy consumption during the manufacturing processes as it includes several processes (i.e. positioning and acceleration of the spindle following a tool change, machining, returning the spindle to the tool exchange position after machining, and stopping the spindle).

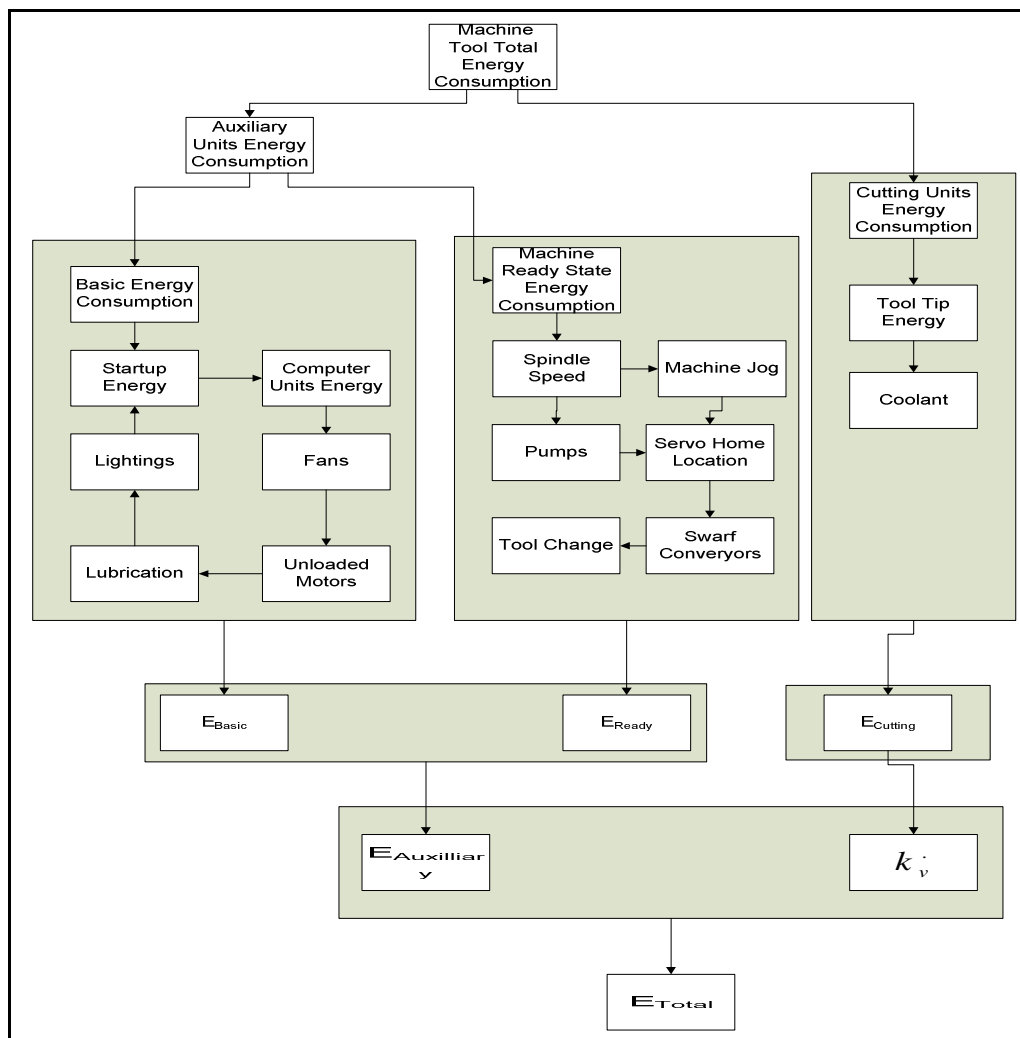


Figure 1: Machine tool energy consumption model adapted from [8]

Rajemi et al., [19] suggested that machine modules are a major power and energy consumers during the cutting process. The authors reported the machine module and idle power consumption to be within the range of 25% to 36% and 34% to 38% respectively. This further proved the high energy consumption of machine tools in the idle mode which in this case goes up to 74% of the total energy demand of machining processes. Li et al., [20] however, disintegrated energy consumption into fixed, operational, tool tip and unproductive states of machine tools.

1.3. Energy Consumption Of Machine Modules And Auxiliary Units Of Machine Tools

The improvement in machine tool development over the years has shown that considerations have been given to the optimization of machining processes and improved functionality to reduce electricity consumption and CO₂ emission associated with it. In line with this systematic approach, machine tools can be disintegrated into states to enable machine tool designers and manufacturers alike to quantify energy use and analyse ways to optimize its uses for Life Cycle Analysis, LCA at the use phase [21]. The proposed and expanded disintegrated model is as shown in Figure 1. The basic and ready power consumption of the machine tools encompasses the power consumption of the auxiliary units [18]. This is the work in progress for many researchers in reducing energy consumption during manufacturing processes. At the same time, energy reduction during the manufacturing processes will ultimately reduce its electricity consumption and carbon footprints. The basic power consumption is the power demand of machine modules for start-ups, computers units, lightings, fans, lubrications and unloaded motors. This power demand could be somewhat constant for specific machine tools and efforts to reducing its impact on the total power demand are being investigated [20].

2. STATEMENT OF PROBLEM

Since energy demand for each of the machine tool states can be said to be machine tool specific, generalizing the energy demand of mechanical machining processes might be futile. It is therefore obvious the need to clearly define the machine tool state and auxiliary unit's energy consumption of the machine tools to determine the contribution of each unit towards the total energy consumption during a machining operation. Hence, the needs for this research work to clearly define energy consuming units of each brand of machine tools. This is required in order to populate the database used for the evaluation of life cycle inventory and analysis of a manufactured product.

3. OBJECTIVE

The aim of this research is to investigate the effect of machine modules and auxiliary units on the power and energy consumption for machine tools at zero load and idle states. In view of that, the total electrical current consumption of machine modules and NC codes was measured. The power and energy demand was evaluated and analyzed statistically to define the significance of machine events on power and energy consumption.

4. METHODOLOGY

4.1 The Research Design

The MDSI Open CNC Lathe machine was used for the study. At zero load cutting, the electricity demand for each disintegrated machine module were classified and evaluated. The electrical current consumption was measured with the Fluke 345 power clamp meter attached to the machine tool power buss to monitor various events/tasks during the machining processes at both zero load cutting and idle states. The machine tool auxiliary units comprises of operation computer, fans, three phase motors, hydraulic pumps, coolant pumps, tool change units, servos, lubricating pumps and other relatively smaller units of negligible power consumption. The electrical current were recorded when the machine tool was switched 'ON' and at this stage individual auxiliary units were been isolated through the electrical panel at the back of the machine. Each measurement was recorded using the Fluke 345 power clamp meter. The readings were recorded without cutting. The servos and spindle were then manually indexed through the jog mode to measure the electrical current for positioning of the cutting tools, acceleration and deceleration of the spindle.

5. RESULT AND DISCUSSIONS

From literature [7], the power consuming units of machining operation can be divided into three groups, basic, idle and cutting power. The basic and idle groups are the power for non-cutting operations which is the scope of this study. The non-cutting operation includes the power required to switch 'ON' the machine modules and auxiliary units without cutting. Figure 2 shows the power consuming auxiliary units of the MDSI Open CNC Lathe machine while Figure 3 shows the contributing percentage of each of the power consuming units. The electrical current needed for switching on the machine modules was 1.71 A (i.e. $P = 410.4 \text{ W}$). The machine start-up consumes 3536.5 W. This is due to the fact that at start-up, most of the auxiliary units are powered and at the ready position for actual cutting. The power demand for the rapid movement to home (axes jog to home) was 799.2 W while for rotating the spindle without cutting (idle condition with spindle 'ON') consumes 1200 W. It can be observed that the power consumption of the auxiliary units are comparatively higher compared to actual machining power demand reported in literature [8, 10, 22] which is between 10 and 48% (depending on the cutting load and material characteristics of machining).

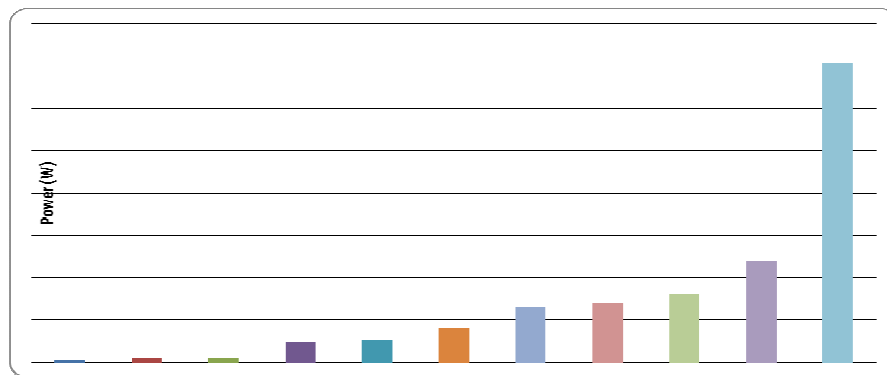


Fig. 2: The power distribution of MDSI Open CNC Lathe machine.

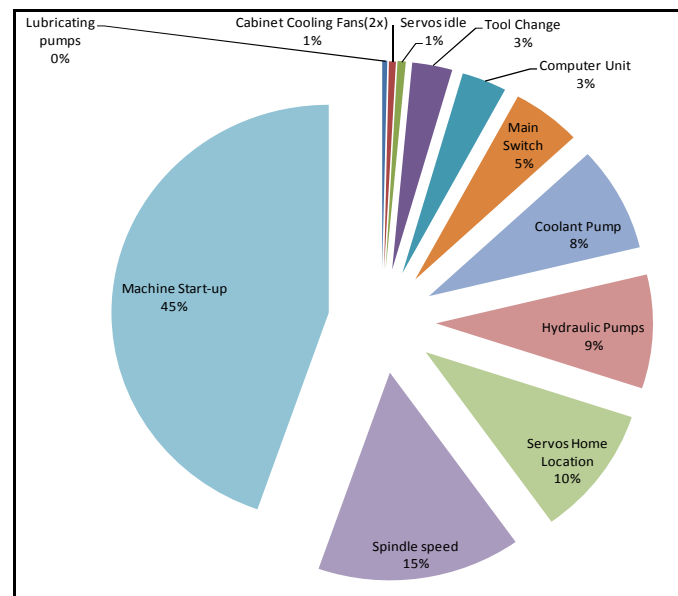


Fig. 3: Auxiliary Units Power Consumption in percentage.

The results also shows an interesting fact, that machine start-up, spindle, servo home location, hydraulic pumps and coolant pumps consumes over 80% of the power demand on the MDSI Open CNC Lathe machine as shown in Figure 4. Note that power demand was evaluated at no-cutting and idle condition of the machine tool. Thus switching on such a machine has major impact on the energy consumption, optimum cost criterion of products and carbon footprint of the entire machining process. It further proves that the MDSI Open CNC Lathe machine should not be left in 'stand-by' or 'idle' position from energy footprint consideration for a considerable amount of time.

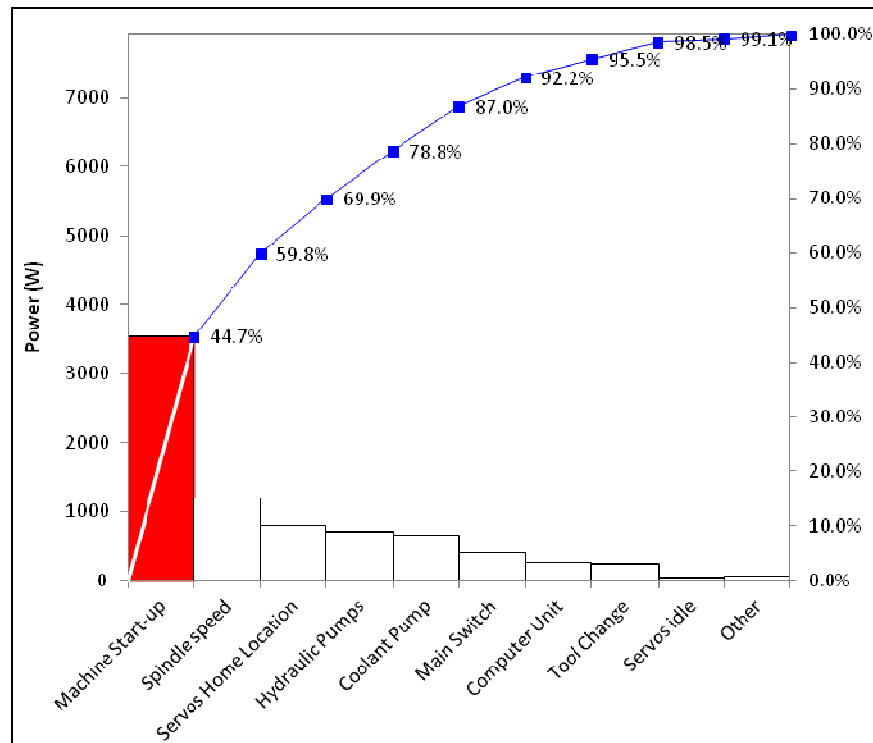


Fig. 3: Power Consumption of MDSI CNC Open Auxiliary Units.

The chart above shows an examination on whether members of the family browse the internet to solve school work. The finding shows that 18.6% of the respondents said they strongly agreed that members of the family browse the internet. The chart above shows an examination on whether members of the family browse the internet to solve school work. The finding shows that 18.6% of the respondents said they strongly agreed that members of the family browse the internet to solve school work; 13.1% were also in agreement to that while 10.1% of the were undecided; 15.2% of the respondents indicated their disagreement while 43.0% of them strongly disagreed that members of the family browse the internet to solve school work. The result signifies that majority of the respondents agreed that members of the family browse the internet to solve school work.

6. CONCLUDING REMARKS AND CONTRIBUTIONS TO KNOWLEDGE

This research investigated the power consumption of machine tool states using the MDSI Open CNC Lathe machine as a case study in order to provide data for energy demand modelling of machining processes and to track the source of carbon footprint during mechanical machining processes for optimum performance. From the study, the following conclusions can be deduced:

1. The basic machine state of the MDSI Open CNC Lathe machine consumes 63% of the total power during a zero cutting operation. Bulk of the power demand was for the machine start-up (45%), spindle power (15%), servo home location (10%), hydraulic pumps (8.9%) and coolant pumps (8.2%). The machine can therefore be redesigned to target a lower power footprint resource.
2. Fluid pumping is a major power consumer as it required 17.1% of the total power at zero load. The design of more energy efficient pumps should be a target.
3. The MDSI Open CNC Lathe machine power consuming units are also in agreement with the CO₂PE! methodology of power consumption characterization of 'Basic', 'Ready' and 'Cutting' states.
4. Machine tool designers can improve on the technology development to reducing power consumption of the preparatory units; however more research is needed to optimize power consumption of the auxiliary units for sustainable machining processes.

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Effects Of Cooperative And Problem-Solving Learning Strategies On Students' Achievement In Financial Accounting In Ibadan, Oyo State

Junaid, Ikmat Olanrewaju PhD

Institute of Education,
University of Ibadan
+2348068063892

iojunaid@yahoo.com

&

Balogun, Rukayat Temitope

Institute of Education,
University of Ibadan
+2347038331670

talk2brukayat@yahoo.com

ABSTRACT

The increasing level of poor performance of students in Financial Accounting calls for a need to ascertain students' learning styles that promote the achievement in the subject. The study investigated the effect of learning strategies as determinant of achievement in Financial Accounting. The study adopted a non- randomised pre-test control group quasi-experimental design using 3x2x2 factorial design. Multistage sampling technique was used and data were collected from 184 SS II Financial Accounting students from six public senior secondary schools in Oyo State. Seven hypotheses and three instruments guided the study with reliability coefficient of 0.75 for FAAT, 0.72 for LSI and 0.75 for SHI. Data were analysed using Analysis of covariance. Results indicated that cooperative and problem-solving learning strategies had significant main effect on students' achievement in financial accounting $F_{(2,171)} = 63.185$ with partial eta square of 0.425; Learning style has significant main effect on students' achievement $F_{(1,171)} = 11.842$ with partial eta square of 0.065; Study habit, learning strategies, Learning styles and had no significant interaction effect on students' achievement. Learning is internalised faster and better, when students are given opportunity to interact with one another in small groups; when topics are structured to solve real life problems, studying becomes fun and learning is facilitated and internalised; students learn better when a problem is used as a starting point for new knowledge and adjustment of instructional strategies will enhance achievement in Financial Accounting.

Keywords: Learning strategy, Achievement, Learning style and Study habit.

INTRODUCTION

Financial accounting is an indispensable field of study in education. It is a subject that is very essential for business. In the secondary schools, the objective of teaching this important subject is to provide students with the basic method of processing data in order to develop arithmetic skills and provide knowledge for career advancement in the field of accounting. The subject, at secondary school level, also aims at developing the student in the understanding of business and financial vocabulary as well as the understanding of basic accounting concept and principles. In summary, the subject moulds the student to build a level of confidence in the field of accounting and develops them to be self-reliant in the world of business.

According to the National Examination Council (NECO 2004), the objectives of studying financial accounting at senior secondary school are as follows:

- i. To enable senior secondary school students appreciate the basic rules, functions and principles of accounting
- ii. To lay proper foundation for further study of accountancy and allied courses at higher level and
- iii. To enable the students understand basic accounting principles, practice and their applications to modern Business activities.

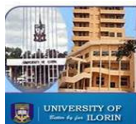
Unfortunately, students nowadays perform poorly in this important subject; the poor performance of students in this subject area has become a matter of concern to stakeholders especially not only to the academic world, but also to business owners who are the potential employers of financial accounting students. Akintelure (1998) blamed the problem on accounting teachers' insensitivity to the nature of financial accounting when planning instructional activities in the classroom. According to her, financial accounting is not one of the subjects that can be mastered by mere memorization of the basic rules. It requires total determination, sound theoretical knowledge and intensive practice in application.

Learning style has been defined in several ways by many authors, yet the most representative definitions refer to two essential aspects: learning style represents an individual's preferred ways of responding (cognitively or behaviourally) to learning tasks which change depending on the environment or context (Peterson, et al., 2009). Learning style refers to the idea that individuals differ in regard to what type of instruction is most effective for them (Pashler, et al., 2008).

The Kolb model is one of the theoretical perspectives that have been applied to the investigation of learning styles. The model has been widely used throughout the field of education. The Kolb's Learning Styles Inventory (LSI) has been the most widely documented test to assess learning styles. Kolb suggests that experience, and the analysis of it can assist in the formation of concepts; then the concept, after being assimilated and organized, may be applied to new experiences. In this model, learning is conceived as a process through which the transformation of experience creates knowledge. In Kolb's model, the person is required to employ each of the four key learning abilities: concrete experience (CE), abstract conceptualization (AC), reflective observation (RO), and active experimentation (AE) (Kolb, 1984). The form of learning styles is a combination of four learning abilities: CE, AC, RO, and AE (Kolb, 2005).

According to Kolb, there are four fundamental learning styles. The diverging learning style specializes in the two learning abilities of CE and RO. In contrast, the converging learning style specializes in the two abilities of AC and AE. The assimilating learning style specializes in the two abilities of AC and RO. In contrast, finally, the accommodating learning style specializes in the two abilities of CE and AE. Notably, both converging and assimilating learning styles have a higher score in abstract conceptualization (AC) and lower score in concrete experience (CE). Abstract conceptualization which actualized in adolescence is conceived to be a higher level ability rather than concrete experience (CE).

The Convergent thinker is someone who is personally best at solving problems with single correct solutions. The Convergent learning style makes use of Abstract Conceptualization to process experience and Abstract Experimentation to transform experience. Convergers tend to take abstract ideas and actively experiment with them to find the best solutions to problems. Such thinkers perceive abstractly and process actively. This style has advantages in completing traditional intelligence tests and in making decisions. Persons with this learning style tend to do well in technical tasks and less well in interpersonal relations.



The Divergent thinker is different in being someone who is able to generate and explore multiple answers to problems. To Kolb (1984), the Divergent learning style depends on Concrete Experience to process reality and Reflective Observation to transform reality. Divergers perceive concretely and think reflectively and imaginatively. Divergent thinking is related to fluency (i.e., the ability to produce multiple ideas in response to a task rapidly), flexibility (i.e., the capacity to consider multiple approaches to a problem), originality (i.e., the tendency to produce novel ideas in response to a task), and elaboration (i.e., the ability to consider the implications and consequences of ideas). Divergent thinkers tend to choose the liberal arts and humanities. A third learning style is that of the Assimilator who perceives information through Abstract Conceptualization and transforms that information through Reflective Observation. Assimilators tend to be rational, unemotional, and more interested in abstract concepts than in people. They tend to be solitary and avoid practical activities.

Finally, Accommodators perceive information through Concrete Experience and process it through Active Experimentation. They base their decisions on feelings and prefer to work with people. In summary, the four Kolb learning styles result from different combinations of perception, Abstract Conceptualization (AC) vs. Concrete Experience (CE), and subsequent information processing, Active Experimentation (AE) vs. Reflective Observation (RO). However, some more recent studies suggest that this Converging style may not be as universally applicable to accounting students as once thought, as studies have shown that accounting students are also Assimilators. Teaching activities that suit convergers are small group discussion and class room participation, they dislike lectures, while for assimilators teaching activities that suit them are case studies and Problem-solving (Jawahitha, 2013). Cooperative learning refers to an instructional method in which students at various performance levels work together in small groups toward a common goal. Zakaria and Iksan (2007) agree that in cooperative learning students work face to face to complete a given task collectively. Cooperative learning also encourages students to interact and to communicate with peers in harmony (Webb, Troper, & Fall, 1995). In this way, cooperative learning promotes values such as honesty, cooperation, mutual respect, responsibility, tolerance, and willing to sacrifice a consensus. Execution of duties in cooperative learning can develop self-confidence in pupils.

On the other hand, Problem-solving learning strategy is also a model which centred on students, develops active and motivated learning, Problem-solving skills and broad field knowledge, and based on the deep understanding and Problem-solving (Major et al, 2000). In those classrooms in which problem-solving learning method is used for instructional process, the students take much more responsibility of their own learning. They have become independent and long life learners, and can continue to learn in their whole life. In the Problem-solving learning model the students' turn from passive listeners of information receivers to active, free self-learner and problem solvers. It also shifts the emphasis of educational programs from teaching to learning. It enables the students to learn new knowledge by facing the problems to be solved instead of feeling boredom. Problem-solving learning impact positively in certain other attributes such as information acquisition. In addition, Problem-solving is a deliberate and serious act which involves the use of some novel method, higher thinking and systematic planned steps for the acquisition set goals. The basic and foremost aim of this learning model is acquisition of such information which based on facts (Yuzhi, 2003 & Mangle, 2008).

Closely related to learning strategies and learning styles is the concept of study habit. Education leaders agree that study habit have an important function in education. Study habits are learning tendencies that allow students to study privately. Echebe (2008) opined that study habit are extra learning ability which an individual acquires for the success of his academic endeavour, and it is a propeller to better academic performance. He further stated that the ability of a student to study carefully after normal classroom study builds in such students study skills necessary for better academic growth while non – practice after classroom study created room for poor study habit and poor academic performance.

Statement of the Problem

Many attempts have been made to address the problem of low academic achievement and some factors have been identified. Among the numerous variables researched are demographic status, behavioural characteristics and psychological factors such as attitudes and self-concept, have been used to explain academic achievement in financial accounting. Learning style is another area that is greatly gaining research attention. The increasing level of poor performance of students in financial accounting calls for a need to ascertain students' learning styles that can promote the achievement in financial accounting because it is envisaged that the poor performance of students could be as a result of lack of relationship between strategies of teaching of teaching financial accounting and students' learning styles. Many learning strategies and approaches have been introduced but student performance in financial accounting has not reached the satisfactory level.

Nevertheless individual differences play important role in academic achievement of students. Apart from differences in ability which are not easy to control, students have specific learning styles that may influence their academic achievement in financial accounting. However, there appears to be dearth of literature on effect of the combination of learning strategies (cooperative and Problem-solving), learning styles and study habit variables together and their effect on learning outcome in financial accounting. Therefore this study investigated the effect of learning strategies (cooperative learning strategies and Problem-solving learning strategies) based on learning styles in determining student achievement in financial accounting among secondary school 2 students' in Ibadan, Oyo State.

Research Hypotheses

Base on the stated problems, the following hypothesis were tested:

- H₀₁:** There is no significant main effect of treatments on students' on achievement in financial accounting.
- H₀₂:** There is no significant main effect of learning styles on student achievement in financial accounting.
- H₀₃:** There is no significant main effect of study habit on students' achievement in financial accounting.
- H₀₄:** There is no significant interaction effect of treatments and learning styles on students' achievement in financial accounting.
- H₀₅:** There is no significant interaction effect of treatments and study habit on students' achievement in financial accounting.
- H₀₆:** There is no significant interaction effect of learning styles and study habit on students' achievement in financial accounting.
- H₀₇:** There is no significant interaction effect of treatments, learning style and study habit on students' achievement in financial accounting.

METHODOLOGY

The study adopted a non- randomised pre-test control group quasi-experimental design using 3x2x2 factorial design. The population will consist of all Senior Secondary School II Financial Accounting Students in public schools in Ibadan, Oyo State constitute the target population for this study. The study adopted a multi-stage sampling technique. In the first stage, stratified random sampling technique was used to select two Local government Areas (L.G.As) one from city and less city. In the second stage, three (3) secondary schools were randomly selected from each of the two selected Local Government Areas. And lastly, intact class of Senior Secondary School II Students were used for each selected schools. The intact classes were randomly assigned to treatment group. Data were collected through Financial Accounting Achievement Test ($r = 0.76$), Learning Style Inventory ($r = 0.72$), Study Habit Inventory ($r = 0.75$) and were analysed using Analysis of Covariance.

RESULTS

Hypothesis 1: There is no Significant Main Effect of Treatments on Students' Achievement

Table 1: Effect of treatments on student achievement in Financial Accounting

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	788.610 ^a	12	65.718	16.801	.000	.541
Intercept	1632.808	1	1632.808	417.437	.000	.709
ACH1	82.180	1	82.180	21.010	.000	.109
TRT	494.301	2	247.150	63.185	.000*	.425
Learning Style	46.319	1	46.319	11.842	.001*	.065
Study Habit	.950	1	.950	.243	.623	.001
TRT * Learning Style	38.208	2	19.104	4.884	.009*	.054
TRT * study Habit	6.992	2	3.496	.894	.411	.010
Learning Style * study Habit	3.574	1	3.574	.914	.341	.005
TRT * Learning Style * study Habit	1.009	2	.504	.129	.879	.002
Error	668.868	171	3.912			
Total	18910.000	184				
Corrected Total	1457.478	183				

Significance at $P < 0.05$ R Squared = .541 (Adjusted R Squared = .509)

The result in Table 1 indicate that there is significant main effect of treatment (cooperative and Problem-solving learning strategy) on students' achievement in financial accounting $F_{(2,171)} = 63.185$; $P < 0.05$. The null hypothesis H_0 was therefore rejected. The partial eta squared of 0.425 implies that the treatment (cooperative and Problem-solving learning strategy) account for 42.5% of the observed variance in the post – test scores of students' achievement in financial accounting.

Table 2: Estimated Marginal Means and Standard Error of Treatment Groups

TREATMENT	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
cooperative learning	11.038 ^a	.253	10.539	11.537
Problem-solving	10.636 ^a	.277	10.089	11.182
Conventional	7.248 ^a	.263	6.730	7.767

Table 2 shows that the mean post test scores of students exposed to cooperative learning is the highest ($x = 11.038$) followed by Problem-solving learning strategy ($x = 10.636$) and conventional learning strategy ($x = 7.248$).

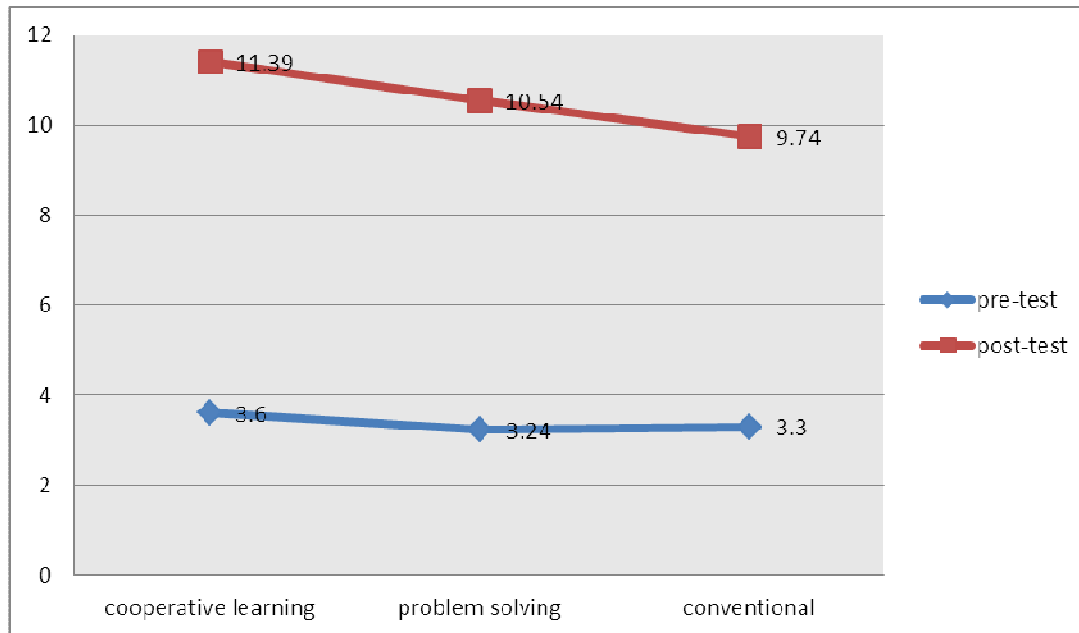


Figure 1: Effect of Treatment on Achievement

Figure 1 shows that cooperative learning group achieved best which have the highest point plot followed by Problem-solving and lastly the conventional learning strategy.

Table 3: Scheffe Post Hoc Multiple Comparison of Academic Achievement in Financial Accounting Treatment

(I) TREATMENT	(J) TREATMENT	Mean Difference (I-J)	Std. Error	Sig.
Cooperative learning	Problem-solving	.851	.400	.107
	Conventional	4.086	.384	.000
Problem-solving	Cooperative learning	-.851	.400	.107
	Conventional	3.235	.406	.000
Conventional	cooperative learning	-4.086	.384	.000
	Problem-solving	-3.235	.406	.000

Table 4: Summary of Mean Difference for Groups in Homogeneous Subset by Treatment

TREATMENT	N	Subset for alpha = 0.05	
		1	2
Conventional	63	7.30	
Problem-solving	54		10.54
cooperative learning	67		11.39

All the significant mean differences observed are all in favour of cooperative learning. The result on tables 3 and 4 shows that there is significant difference between the mean of conventional learning strategy and Problem-solving learning strategy, conventional learning strategy and cooperative learning strategy but there is no significant difference between the mean of Problem-solving and cooperative learning strategy.

The findings in this study support the findings of Zakaria, Chin, and Daud (2010) found that cooperative learning improves students' achievement. The result also support the claims of Shimazoe & Al-drich, (2010) that cooperative learning promotes deep learning of materials and helps students to achieve better grades. Melihan and Sirri (2011) concluded that the cooperative learning method is more effective than the traditional teaching method in the academic success of students.

Hypothesis 2: There is no significant main effect of learning styles on students' achievement

The result indicate that there is significant main effect of learning styles on student academic achievement in financial accounting $F(1,171) = 11.842$; $P < 0.05$. The null hypothesis was therefore rejected. The partial eta squared of 0.065 implies that learning style only account for 6.5% of the observed variance in the post-test scores of students' achievement in financial accounting.

Table 5: Estimated Marginal Means and Standard Error of Learning Styles

Learning Style	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Assimilator	9.116 ^a	.217	8.687	9.545
Converger	10.165 ^a	.214	9.744	10.587

The result of table 5 shows the mean post test scores of convergers is the highest ($x = 10.165$) followed by assimilators ($x = 9.116$). That the convergers > assimilators. The result aligns with the results of Holley and Jenklins (1993), Cano-Garcia and Hughes (2000) which found that accounting students with the Converging learning style were more successful is in line with the result of this study. In contrast Geiger (1992) in his study found that in accounting class assimilators outperformed their peers. In an attempt to conceptualise view of Holley and Jenklins (1993), this point out the direction which posited that converger perform in financial accounting class.

Hypothesis 3: There is no significant main effect of study habit on students' achievement

The result in table.1 indicate that there is no significant main effect of study habit on student academic achievement in financial accounting $F_{(1,171)} = 0.243$; $P > 0.05$. The null hypothesis was therefore not rejected. The partial eta squared of 0.001 implies that learning style only account for 0.1% of the observed variance in the post-test scores of students' achievement in financial accounting. The result support Adesoji and Oladele (2003), who revealed that study habit, had no significant and direct relationship with secondary school students' academic achievement. Fakaye (2013) also found out that there was no significant relationship between study habit and student achievement in literature in English.

Hypothesis 4: There is no significant interaction effect of treatment and learning styles on students' achievement

The result on table 1 indicate that there is no significant interaction effect of treatment and learning styles on student academic achievement in financial accounting $F_{(2,171)} = 4.884$; $P > 0.05$. The null hypothesis was therefore not rejected. The partial eta squared of 0.054 implies that learning style only account for 5.4% of the observed variance in the post-test scores of students' achievement in financial accounting. This result is in support of the view of (Fox and Bartholomae, 1999; Rogers, 2009; Tulbure, 2010) that designing and implementing teaching strategies that meet the learning needs of the students have positive effects on learning outcomes, attitudes toward course contents and learning motivation, and consequently, lead to higher academic achievement. This result is in contrast with the view of Massa and Mayer, (2006), Pashler and et al (2008) that there is no adequate empirical support to justify the incorporation of learning style assessments into the educational practice by matching teaching strategies with students' learning styles to improve student performance.

Table 6: Estimated Marginal Means and Standard Error of Learning Styles

TREATMENT	Learning Style	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
cooperative learning	Assimilator	9.856 ^a	.393	9.081	10.631
	Converger	12.220 ^a	.318	11.593	12.847
Problem-solving	Assimilator	10.499 ^a	.345	9.818	11.179
	Converger	10.773 ^a	.433	9.919	11.627
Conventional	Assimilator	6.993 ^a	.391	6.222	7.764
	Converger	7.504 ^a	.352	6.808	8.199

Table 6 and graph below indicate that irrespective of teaching method used, student with Converger learning style scores the highest.

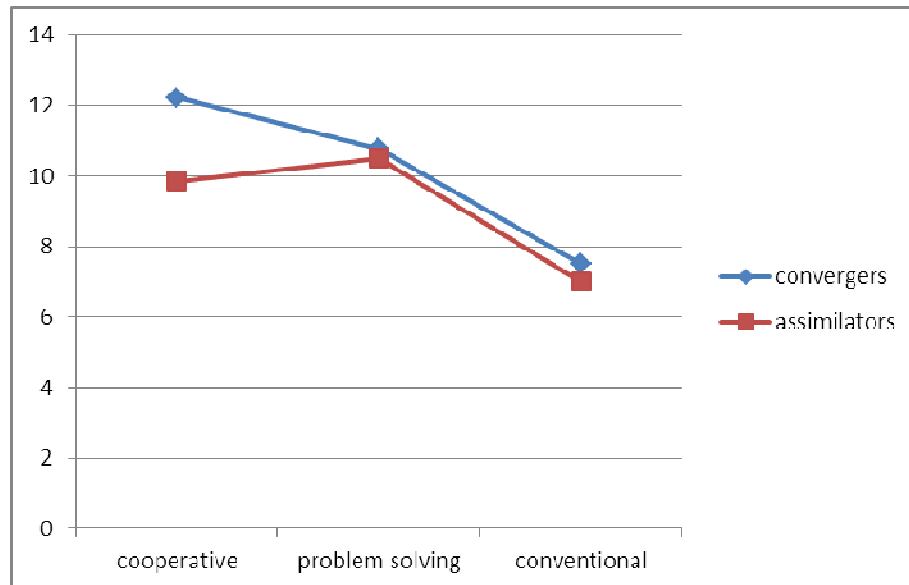


Figure 2: Graphs Illustrating the Interaction Effect of Treatments and Learning Styles

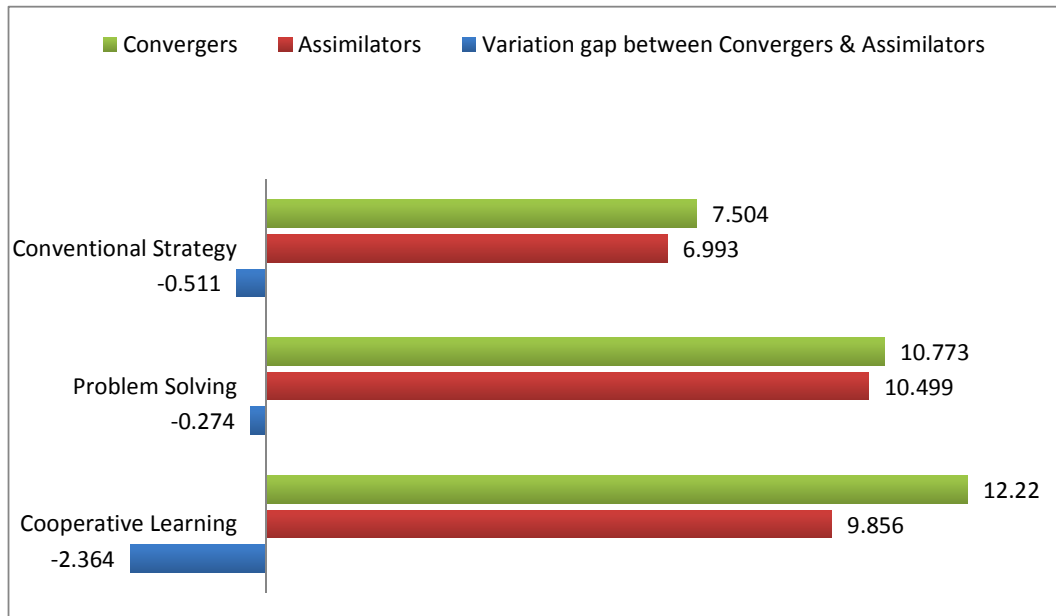


Figure 3

Hypothesis 5: There is no significant interaction effect of treatment and study habit on students' achievement.

The result on table 1 indicate that is no significant interaction effect of treatment and study habit on student academic achievement in financial accounting $F_{(2,171)} = 0.894$; $P > 0.05$. The null hypothesis was therefore not rejected. The partial eta squared of 0.010 implies that study habit only account for 1% of the observed variance in the post-test scores of students' achievement in financial accounting. The result has a mirror of the work of Adesoji and Oladele (2003), who revealed that study habit had no significant and direct relationship with secondary school students' academic achievement. The result, however, is in contrast with Crede & Kuncel (2008) claim that teaching method and study habit interaction has statistically significant effect on students' achievement in physics. In an attempt to conceptualize the differing views of Adesoji and Oladele (2003) and Crede & Kuncel (2008), it is essential to understand that the interaction of both the study habit and learning strategies cannot be explicitly measured on performance unless the instructor has incorporated activities that would trigger such action of after class study; hence, developing their study habit unconsciously.

Hypothesis 6: There is no significant interaction effect of learning style and study habit on students' achievement.

The result in table 1 indicate that there is no significant interaction effect of learning styles and study habit on student academic achievement in financial accounting $F_{(1,171)} = 0.914$; $P > 0.05$. The null hypothesis was therefore not rejected. The result of this study slightly differs with the findings of Deniz, S. (2013) that there is a significant relationship between study habits and learning styles.

Hypothesis 7: There is no significant interaction effect of treatment, learning style and study habit on students' achievement

The result in table 1 indicate that there is no significant interaction effect of treatment, learning style and study habit on student academic achievement in financial accounting $F(2,171) = 0.129$; $P > 0.05$. The null hypothesis was therefore not rejected. The partial eta squared of 0.001 implies that learning style only account for 0.2% of the observed variance in the post-test scores of students' achievement in financial accounting. The adjusted R square value of .514 indicates that the independent variables accounted for 51.4% of the variation in students' academic achievement in financial accounting. It shows that treatment, learning style and study habit combined and jointly influenced achievement in financial accounting. This implies that the effect of treatment does not significant change at the different levels learning style and study habit. The higher level of students' achievement in financial accounting observed as a result of treatment in this study did not depend on both learning style and study habit. The variable of this study still interact with themselves. Though may be negligible, but still plays important roles learning because teacher and student variables will continue to play simultaneous role in the end product of achievement

SUMMARY OF FINDINGS

From the results and discussion of findings, the following summaries are recorded in this study:

- There was a significant main effect of treatments (Cooperative and Problem-solving learning strategies) on students' academic achievement in financial accounting.
- Financial accounting students' exposed to cooperative learning strategy had higher academic achievement followed by Problem-solving learning strategy and conventional learning strategy had the lowest mean score.
- There was significant main effect of learning styles on students' academic achievement in financial accounting
- Majority of financial accounting students' are convergers
- Financial accounting student with converger learning style had higher academic achievement than students with assimilator learning style.
- The match between the students' learning styles and the learning strategies affect the students' achievement in financial accounting.
- There was no significant main effect of study habit on academic achievement in financial accounting
- There was interaction effect of treatment and learning style on students' achievement in financial accounting
- There was no interaction effect of treatment and study habit on students' achievement in financial accounting
- There was no interaction effect of learning style and study habit on students' achievement in financial accounting
- There was no interaction effect of treatment, learning style and study habit on students' achievement in financial accounting

CONCLUSION

The significant main effects of learning strategies and learning style as well as the significant interactive effect of learning strategies and learning styles on students' academic achievement in financial accounting is an indication that; learning is internalized faster and better when students' are given opportunity to interact among themselves in small groups and when learning topics are structured to solve real life problems hence, studying becomes fun and learning is facilitated and internalized. Students' also learn better when problem is used as a starting point for new knowledge. Also, adjustment of instructional strategies that will be suitable and appropriate for the students' learning styles will not only improve their thorough understanding of the subject but will enhance academic achievement.

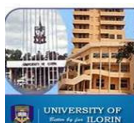
RECOMMENDATIONS:

Based on the findings of this study, it is recommended that:

- Financial accounting teachers should be sensitized to accept that there is an urgent need for a paradigm shift from the age long conventional teaching/learning approaches to a more student-centered and result oriented approaches. This shift could mean effective combination of the conventional and the cooperative and Problem-solving learning strategies in whatever proportion in the teaching of financial accounting. They should also be aware that most financial accounting students are convergers and more so convergers perform better in financial accounting. Hence this should be taken in consideration by incorporating learning strategies that is embedded on student active participation, group discussions as well as creating opportunities for feedback on difficult areas. Teachers should Adjust instructional strategies according to the student learning styles enhances achievement in Financial Accounting.
- The Federal Ministry of Education can organize workshops and seminars where experts in this field will train the teachers on the implementation of these approaches in the teaching of financial accounting. Vice Principals academics and Heads of Science Departments who are going to ensure and monitor the implementation aspects should also take part in the training programmes.
- School administrators should regularly inspect the teachers' lesson plans to ensure they are prepared in accordance with the new approaches emphasizing full participation of the students.
- Students should be encouraged to open-mindedly co-operate with the efforts of the financial accounting teacher and the school authority in general in the use of these learning approaches. For instance, every financial accounting problem and assignment must be done and submitted promptly as well as contribute fully during group exercises and discussions.
- Financial accounting students should take into consideration their learning styles into order to understand how they learn best.
- Parents on their own part should endeavour to buy the recommended textbooks and other textual materials for their children and wards to enable them participate fully in the class as lessons go on and during their personal reading time.

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Eradication of Violence and Terrorism: Perspectives from Islamic Education

Ahmed El-Murdi Saeed Omar PhD

Associate Professor

Department of Islamic Studies

Faculty of Arts

Kaduna State University

Kaduna, Nigeria.

GSM: 08060560023/08068646588

Email: ahmedelmurdi@yahoo.com & ahmedelmurdi@gmail.com

ABSTRACT

By this conference paper which titled "Eradication of violence and terrorism with reference to Islamic Education perspective" the research will intent to discuss: definition of terrorism, highlighting its type providing the legal framework that governing terrorism, explaining the characteristics of university student terrorism, the role of Islam to specify the lawful and unlawful terrorism and setting some strategies formulated by specialist in Islamic education to combat and eradicate domestic or international terrorism in Nigeria universities.

Keywords: Eradication, Violence, Terrorism: Peace, Conflicts & Islamic Education

PREAMBLE

This paper will examine the terrorist as prohibited threats exposes it's types, including strategies stated by scholars in the field of education on how to control terrorism either nationally or internationally.

1. DEFINITION OF TERRORISM ITS TYPES-

According to Garner who define terrorism and classified into three types-⁽¹⁾

- **Terrorism:** defined as the use of threat of violence to intimidate.⁽²⁾
- **Cyber terrorism:** defined as terrorism committed by using a computer to make unlawful attacks and threat of attack against computers, networks and electronically stored information and actually causing the target to fear or experience to harm.⁽³⁾
- **Domestic terrorism:** defined as terrorism that occurs primarily within the territorial jurisdiction.⁽⁴⁾ it also defined as: terrorism that is carried out against one's own government of fellow citizen.⁽⁵⁾
- **International terrorism:** defined as terrorism that occurs primarily outside the territorial jurisdiction of United State, or that transcends national boundaries by the means in which it is carried out, the people it is attended to intimidate, or the place where the perpetrators operate or seek asylum.⁽⁶⁾

⁽¹⁾ Bryan A. Garner: Black Law Dictionary, eight edition, Thomson, West (1990) ppi 1512-3

⁽²⁾ Garner: (bid) p. 1513.

⁽³⁾ Garner: (bid) p. 1513.

⁽⁴⁾ See Act no (18) of United States Criminal Act section 2331.

⁽⁵⁾ Garner: (bid) p. 1513.

⁽⁶⁾ See Act no (18) of United States Criminal Act section 2331.

2. THE LEGAL FRAMEWORK OF INTERNATIONAL AND DOMESTIC TERRORISM

There are various national criminal acts prohibiting and stating penalties on acts assume terrorist, Nigeria Saudi Arabia, Britain, Canada, France, Sudan, Malaysia, Germany and most of global countries formulating domestic criminal laws for combating terrorism. Moreover, United Nations testifying various international conventions and treaties to combat international terrorism in particular convention for protection internationally protected persons, convention for protection maritime navigation, treaty for protection acts against highjacking air planes, treaty for combating financing terrorist organization. Every convention or treaty including definition to international terrorism. Let me provide some quotations to those definitions in this regard:

2.1 International convention for the suppression of the financing of terrorism, 1999

This convention provides the definition of terrorism according to article 2 as follows:

(1) Any person commits an offence within the meaning of this Convention if that person by any means, directly or indirectly, unlawfully and willfully, provides or collects funds with the intention that they should be used or in the knowledge that they are to be used, in full or in part, in order to carry out:

(a) An act which constitutes an offence within the scope of and as defined in one of the treaties listed in the annex; or

(b) Any other act intended to cause death or serious bodily injury to a civilian, or to any other person not taking an active part in the hostilities in a situation of armed conflict, when the purpose of such act, by its nature or context, is to intimidate a population, or to compel a government or an international organization to do or to abstain from doing any act.

2.2 Convention on offences and certain other acts committed on board aircraft signed at Tokyo, on 14th September, 1963 (Tokyo Convention)

According to article 1 providing the definition of international terrorism against aircraft to be read as follows:

This convention shall apply in respect of offences committed or acts done by a person on board any aircraft registered in a contracting state, while that aircraft is in flight or on the surface of the high seas or of any other area outside the territory of any state.

For the purposes of this convention, an aircraft is considered to be in flight from the moment when power is applied for the purpose of take-off until the moment when the landing run ends.

This convention shall not apply to aircraft used in military, customs or police services.

2.3 Convention for the suppression of unlawful seizure of aircraft signed at the Hague, of 16 December 1970 (The Hague Convention 1970)

According to article 1 providing the definition of unlawful seizure of aircraft to be read as follows:

Any person who on board an aircraft in flight:

Unlawfully, by force or threat thereof, or by any other form of intimidation, seizes, or exercises control of, that aircraft, or attempts to perform any such act, or is an accomplice of a person who performs or attempts to perform any such act commits an offence.

2.4 Convention on the prevention and punishment of crimes against international protected persons, 1973

According to article 2 providing the definition of attacking against internationally protected persons to be read as follows:

The intentional commission of: a murder, kidnapping or other attack upon the person or liberty of accommodation or the means of transport of an internationally protected person likely to endanger his person or liberty; a threat to commit any such attack; an attempt to commit any such attack; and an act constituting participation as an accomplice in any such attack shall be made by each state party a crime under its internal law.

2.4 International convention against the taking of hostages signed at new York on 18 December 1979

According to article 1 providing the definition of unlawful taking of hostages to be read as follows:

Any person who seizes or detains and threatens to kill, to injure or to continues to detain another person (hereinafter referred to as the "hostage") in order to compel a third party, namely, a state, an international intergovernmental organization, a natural or juridical person, or a group of persons, to do or abstain from doing any act as an explicit or implicit condition for the release of the hostage commits the offence of taking of hostages ("hostage-taking") within the meaning of this convention.

2.6 Convention for the suppression of unlawful acts against the safety maritime navigation signed at Rome, 10 March 1988

According to article 3 providing the definition of unlawful acts against the safety maritime to be read as follows:

Any person commits an offence if that person unlawfully and intentionally: Seizes or exercise control over a ship by force or threat thereof or any other form of intimidation; or performs an act of violence against a person on board a ship if that act is likely to endanger the safe navigation of that ship; or destroys a ship or causes damage to a ship or to its cargo which is likely to endanger the safe navigation of that ship; or places or causes to be placed on a ship, by any means whatsoever, a device or substance which is likely to destroy that ship, or cause damage to that ship or its cargo which endangers or is likely to endanger the safe navigation of that ship; or destroys or seriously damages maritime navigational facilities or seriously interferes with their operation.

2.7 International convention for the suppression of terrorist bombings (New York: 12 JANUARY 1998)

According to article 2 providing the definition of bombing as terrorist acts to be read as follows:

Any person commits an offence within the meaning of this convention if that person unlawfully and intentionally delivers, places, discharges or detonates an explosive or other lethal device in, into or against a place of public use, a stage or government facility, a public transportation system or an infrastructure facility;

With the intent to cause death or serious bodily injury; or with the intent to cause extensive destruction of such place, facility or system, where such destruction results in or is likely to result in major economic loss.

Any person also commits an offence if that person attempts to commit an offence as set forth in paragraph 1 of the present article.

Any person also commits an offence if that person: participates as an accomplice in an offence as set forth in paragraph 1 or 2 of the present article; or organizes or directs others to commit an offence as set forth in paragraph 1 or 2 of the present article; or in any other way contributes to the commission of one or more offences as set forth in paragraph 1 or 2 of the present article by a group of persons acting with a common purpose; such contribution shall be intentional and either be made with the aim of furthering the general criminal activity or purpose of the group or be made in the knowledge of the intention of the group to commit the offence or offences concerned.

3. EFFECTS OF TERRORISM IN NIGERIA UNIVERSITIES ACCORDING TO SPECIALIST IN THE FIELD OF ISLAMIC EDUCATION:

Terrorism causing very fatal dangerous consequences such as follows:⁽⁷⁾

1. Clashes:

Clashes are the common terrorism in Nigerian University. different political parties clash with each other on different minor reasons like on hoisting flag, chalking, banners and on sitting places etc.

2. Bomb Blast:

Bomb blast is a serious major act of terrorism in Nigerian Universities. It is an unbearable action in any education institution. Nigerian Universities has to face these disguising attacks. It becomes the causes of injury of different student.

3. Threatening Teachers:

Threatening teachers is an openly terrorism in Universities of Nigeria. students have links with different political parties to threat teachers on different situations and conditions like short of attendance and illegal way to sit in examination hall.

4. Cancellation Of Interruption During Teaching Learning Process:

Classes are also going on in Nigerian Universities. Due to different events of political and religious parties like rallies, clashes, protests and conflicts become the reason for classes cancel. Students who are ambitious and willing to get education in some Universities of Nigeria suffer a lot. It is an example of terrorism because these political parties want massive crowd of students in their events. For that purpose they do not feel ashamed to cancel classes.

5. Paper Postponement:

Paper postpone is also a kind of terrorism in some Universities of Nigeria. Students prepare their mind for paper but different stressful elements become a reason to postpone papers.

6. Stress on Students:

In University of Nigeria terrorism is present in shape of stress on students as well. Students have to attend different events of parties unwillingly. Their way of conversation capture students and invite them to join their parties.

7. Cheating:

Cheating is another source of terrorism in some Universities of Nigeria. It snatches the right of studious students who really struggle to achieve education. Students have to face this act in some Universities of Nigeria.

8. Favoritism:

Favoritism between students is terrorism in classrooms of in some Universities of Nigeria. It comes from teacher side. It creates differentiation among students. It effects psychologically on students' performance during studies. Like if a teacher has any sort of favor with any political party he/she gives priority to them.

9. Chalking:

Chalking on different walls, paths, classes, stairs are terrorism as well. It creates religious, linguistics and caste differences between students. It develops anger which shown by terrorism.

⁽⁷⁾ Rizwana Muneer(2012):To study the role of education to overcome terrorism in University of Karachi published Interdisciplinary journal of contemporary research in business pp 439-461

4. SUGGESTED STRATEGIES BY SPECIALIST IN ISLAMIC EDUCATION.

The following strategies and recommended by educationalist⁽⁸⁾

1. Students should be drawn away from the act of terrorism.
2. Education should build a strong foundation of students.
3. Counselling should be provided to students.
4. Motivation should be created by teachers to enhance a positive attitude.
5. Justice in behaviour, attitude academic activities should be to all students.
6. Psychological satisfaction should be providing to students.
7. Frustration should be decreased due to fulfilment of their rights.
8. Solution should be given to students according to their problems.
9. Discrimination should not be done with the students.
10. Administration should play its role strictly to stop terrorism.
11. Healthy co-curricular activities should be arranged by University.
12. Learning and to get education should be the main purpose of students only in the university.
13. Stratification should not be developed among students.
14. Students and teachers should obey rules and regulations of university.
15. Different political groups should be stay away from the university.
16. Students and teacher should have a strong relationship.

5. THE ROLE OF SHARIAH LAW FOR ERADICATION OF TERRORISM

5.1 Definition of Terrorism In Islamic Jurisprudence

It derived, from the Arabic word: rahab which means: to threat ⁽⁹⁾

- The noun is "Rahbatan or irhab" or terrorism.
- Technically defines as: terrorist is one who causes fear and threats to other for acquiring political dimensions⁽¹⁰⁾

Types of terrorist according to Islamic shariah law:

There are three types stated in Islamic jurisprudence.⁽¹¹⁾

The first type: When the terrorists having no reasonable or rational justification they will be adapted as criminal and arm robbers

The second type: Those who abuse the companions of the holy prophet they adapted as political deserters or Bughat".

The third type: Those who organize demonstrations and disobedience using their opinion on reasonable rational justification these also adapted as "Bughat" or political opposition leaders.

(8) Rizwana Muneer (ibid)pp459

(8) brahim Anees: Al-mu'ugam Al-waseed, Al-maktabat Al-Islamyyat, (iro) (1991)p. 127

(9) Umarah Mustapa; Al-irahab wa Jaraimuhu, Fi Al-ganon Al-dawli Al-nai Garyonni (1991) p:346

(10) Ibnu Dudama;Al-Kafi Al-figh Al-hanabali, Maktabat Ihya'a Al-turath Al-dwaoly, Ciro, pp;100-1

The first type: When the terrorist having no reasonable or rational justification they will be adapted as criminal and arm robbers

The second type: Those who abuse the companions of the holy prophet they adapted as political deserters or Bughat".

The forth types: Those mobilize, enlist persons by recruiting them to attempt over throw the administrative existing system of the government for a acquiring political ends or achievement, they are adapted as criminal and terrorist.

6. DESCRIPTIONS OF TERRORISM ACCORDING TO TEXT OF HOLY QURAN AND SUNNAH:

With referencing to Quranic and sunnah text they state three descriptions to terrorist acts such as follow:

6.1 The First Is an Ideal Terrorism

This is Islamically recommended for the political existing system, the implication is that the state government should be very powerful economically, diplomatically, with very strong combatant military forces. It's the desirable power which required in whole Muslim states and that described in Holy Quran when the Almighty Gods says: ⁽¹²⁾

SURAH AND AL-ANFAL

"Against them make ready yours strength to the utmost of your power, including steeds of war, to strike terror into (the hearts of) the enemies, and others besides, whom ye may not know, but whom Allah doth know. Whatever ye shall spend in the causes of Allah, shall be rapid unto you, and ye shall not be treated unjustly"

6.2 The second terrorism: The fear from Al-might God, we should observe the Al-mighty and fear him in all our behaviour, worshiping and dealing with others, it is the type of fear which mentioned in various Holy Quran chapters such as: verse No (12) of Anfal, (40) of Baggaret, (90) of Anbiya (32) of Qassas,

6.3 The Third type of terrorists,: Is the one which prohibited and it described and codified as an offense. And stated in verse No (18) of surat Al-kaf.

With reference to Sunnah: There are various sunnah, text narrated by, Muslim, Nasai, ibn maja, Abadawod and Aldarimi implying the fair of Al- mighty God. ⁽¹³⁾

⁽¹¹⁾ Verse No (60) The Holy Quran, Text translation and commentary by Abdullahi yousif Ali, Amama corporation Brentawood Mary Land (1989).

⁽¹³⁾ D.A.Y, Winsik (1943): Al-murajam Al-mufahrasli Al-fath Al-Hadith Al-Nabawi, published by Breel laden, p.212.

7. CONDIFICATION OF CRIMINAL LAWS AND PARTICIPATION TO ADOPT INTERNATIONAL AND REGIONAL CONVENTIONS TO FIGHT AGAINST TERRORISM

The federal government may be required to sign multi literal and bilateral treaties and initiate judicial principals to fight against terrorism.

The judiciary in the federal republic of Nigeria with collaboration with the attorney General, police and Army could initiate the following principles to fight against terrorism: ⁽¹⁴⁾

- Creating a judicial framework that allows substantial international co-operation among judicial authorities;
- Increasing signatures and ratifications of relevant instrument s and encouraging member's states to reconsider existing reservation.
- Reinforcing various forms of mutual co-operation in the criminal field.
- Stepping up the fight against money laundering in the criminal field;
- Security just compensation for victims of terrorism.
- Building on the fundamental principle that it is both possible and necessary to fight terrorism while respecting human right, fundamental freedoms and the rule of law.
- Exploring ways to reduce tensions existing in contemporary societies.
- Promoting inter-cultural and inter-religious dialogue .
- Carrying out activities in the fields of education, youth and the media.
- Ensuring the protection of monitories.
- Prevent terrorism by measures taken at national level and through international co-operation.
- Establish as criminal offences acts, such as public provocation, recruitment and training, that may lead to the commission of acts of terrorism.
- In order to prevent and combat money laundering and the financing of terrorism more effectively, the convention facilitates interalia extradition and matual assistance arrangement.
- Ensure the protection and compensation of victims of terrorism.
- Rapid tracing of property or bank accounts and the rapid freezing of funds.
- Quick access to financial information or information on assets held by criminal organization.
- Setting-up of financial intelligence units in each party to exchange information on suspected cases of money laundering and terrorist financing in order ultimately to confiscate assets.
- Special investigation techniques
- Protection of witness and collaborators of justice
- International co-operation on law enforcement.
- Assessment of the effectiveness of national judicial systems in their response to terrorism.

8. CONCLUSION

Islam as religion containing various principles and directives to determine human rights, obligations and right of rulers and ruled, illustrating classification of lawful and unlawful threat or terrorism and codified just and reasonable criminal law with efficient provisions governing the whole criminals. Hence, the paper suggesting measures to authorize both of political and educational leaders to initiate policies and strategies to suppress terrorism.

⁽¹⁴⁾ Action against terrorism expert PDF Editor trial

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An Adaptive Energy-Aware Transmission Scheme for Wireless Sensor Networks

Abdullahi Ibrahim Abdu, M.B. Mu'azu, P.U. Okorie, B.S. Olaniyi

Department of Electrical and Computer Engineering,
Ahmadu Bello University, Zaria,
Kaduna State, Nigeria.

{aiabdu@abu.edu.ng, teetex4sure@yahoo.com}

ABSTRACT

In this paper, we proposed a scheme to extend the lifetime of a wireless sensor network, in which each sensor node decides whether to transmit a message or not and with what range to transmit the message, based on its own energy reserve level and the information contained in each message. The information content in each message is determined through a system of rules describing prospective events in the sensed environment, and how important such events are. The messages deemed to be important are propagated by all sensor nodes and with different transmission ranges depending on nodes energy resource level, while messages deemed to be less important are handled by only the nodes with high energy reserves level and transmitted with different transmission ranges based on nodes energy resource level. The results show that by adapting the transmission range based on nodes energy reserve and message importance, a considerable increase in network lifetime and connectivity can be achieved.

Keywords: Energy-aware; Wireless sensor networks; Adaptive transmission ranges; Priority balancing.

1. INTRODUCTION

A wireless sensor network (WSN) typically consist of a number of small, inexpensive, locally powered sensor nodes that communicate detected events wirelessly through multi-hop routing [1]. These networks have limited computing capability and memory [2]. Typically, a sensor node is a tiny device that includes three basic components: a sensing subsystem for data acquisition from the physical surrounding environment, a processing subsystem for local data processing and storage, and a wireless communication subsystem for data transmission. In addition, a power source supplies the energy needed by the device to perform the programmed task. This power source often consists of a battery with a limited energy budget. In addition, it could be impossible or inconvenient to recharge the battery, because nodes may be deployed in a hostile or unpractical environment [3]. WSNs are being used in a wide variety of critical applications such as traffic, defence, medical treatment, manufacturing [4], military, health-care applications [5-6], and environmental monitoring [7]. A key research area is concerned with overcoming the limited network lifetime inherent in the small, locally powered sensor nodes [1]. Many of the WSN algorithms designed to extend the network lifetime are modified routing algorithms [8]. However, a low cost and low complexity technique is the motivation of this study.

In this paper, a scheme to extend the lifetime of a wireless sensor network, named as AIRT (**A**daptive **I**nformation managed energy aware algorithm for sensor networks with **R**ule managed reporting and **T**ransmission range adjustments) is proposed. The extension in the network lifetime is achieved by adapting transmission ranges based on nodes energy reserve level and importance of messages. One main advantage of this scheme is that, nodes do not have to transmit messages with their maximum transmission ranges all the time. The node's energy reserve level and message importance are taken into consideration, and therefore the node's transmission range is adapted accordingly. AIRT also maintains high network connectivity by adjusting the minimum transmission range of a node to cover at least one other sensor node.

The rest of this paper is organized as follows: Section 2 presents the related work. Section 3 presents the proposed AIRT scheme. Section 4 gives the performance study (simulation results and discussions). Section 5 provides conclusion and future work.

2. RELATED WORKS

In Merret et. al. [9], IDEALS (Information managed Energy aware ALgorithm for Sensor networks) was introduced as a scheme that extends the lifetime of a WSN through the possible discrimination of low important messages and prioritizing important messages. The IDEALS scheme is built upon the idea of message priorities and power priorities.

Authors in [10] proposed a localized technique to extend the lifetime of a wireless sensor network; referred to as IDEALS|RMR (Information managed Energy aware ALgorithm for Sensor networks with Rule Managed Reporting). The extension in the network lifetime is achieved at the possible sacrifice of low importance packets, as a result of a union between: Information control, quantified by a system of rules, referred to as rule managed reporting (RMR) and energy management, supplemented by energy harvesting, for example, mechanical vibrations. Furthermore, IDEALS|RMR uses a single-fixed transmission range for each sensor node regardless of whether its energy resource is high or low and this causes redundancy in energy consumption as lots of areas are covered by several sensors.

In Mingming et al. [11], the authors developed a power saving technique by combining two methods: scheduling sensors to alternate between active and sleep mode method, and adjusting sensors sensing range method. They combined both methods by dynamic management of node duty cycles in a high target density environment. In their approach, any sensor schedules its sensing ranges from 0 to its maximum range, where 0 corresponds to sleep mode. Adding the system of information control proposed in this paper could significantly save energy.

Authors in [12] try to deal with the problem of energy holes (unbalance distribution of communication loads) in a wireless sensor network. This means that, energy of nodes in a hole will be exhausted sooner than nodes in other region. As energy holes are the key factors that affects the life time of wireless sensor network, they proposed an improved corona model with levels for analyzing sensors with adjustable transmission ranges in a WSN with circular multi-hop deployment. Additionally, the authors proposed two algorithms for assigning the transmission ranges of sensors in each corona for different node distributions. These two algorithms reduce the searching complexity as well as provide results approximated as optimal solution.

Two forwarding techniques were proposed by M. Busse et al. in [13] to maximize energy efficiency. The techniques are termed single-link and multi-link energy efficient forwarding. Single-link forwarding sends a packet to only one forwarding node; multi-link forwarding exploits the broadcast characteristics of the wireless medium. This leads to efficiency because if one node does not receive a packet, another node will receive the packet and performs the forwarding process. There is however a tradeoff of delivery ratios against energy costs.

In [14], we extended the lifetime of wireless sensor network by sacrificing low importance message and also adjusting of transmission ranges based on only *nodes energy reserve*. However, in our proposed AIRT technique, we improved lifetime even better by adapting transmission ranges based not only on nodes energy reserve, but also on *message importance*.

3. THE PROPOSED AIRT SCHEME

The idea of our proposed AIRT scheme was first derived from [9], where the basic principles of IDEALS (Information managed Energy aware ALgorithm for Sensor networks) was introduced as a scheme providing an increase in the lifetime of a wireless sensor network through the discrimination of certain messages.

Additionally, the work of [9] was extended by authors in [10] through coupling IDEALS with a system for determining the messages information content – RMR (Rule Managed Reporting). Furthermore, in our previous research (named as IRT) [14], we extended [10] by introducing adjustable transmission ranges based on nodes energy reserve only. Finally, in this paper, we extended our previous work [14] by

- Coupling IDEALS|RMR with transmission range adjustment (TRA), whereby the TRA is determined as a function of two parameters;
 1. Nodes energy reserve level and
 2. Importance of the message.
- Perform a detailed analysis through the simulation of the AIRT, IRT [14], IDEALS|RMR [9, 10], and traditional [9, 10] schemes to prove that the proposed AIRT technique is the most energy efficient.

The system diagram of the proposed AIRT scheme is shown in Fig. 1. Firstly, upon sensing data, the sensor node passes the information to the controller, which sends the sensed value (e.g. temperature) to RMR (Rule Management Reporting) unit. The purpose of RMR unit is to determine if a message worth reporting has occurred and how important that message is. The value is then received by the *Rule Testing module*. Its responsibility is to determine if a message worth reporting has occurred. It does that by checking the sensed data against the rules in the *Rule Database* module (getting *history* information about the previously sensed values), at the same time, it updates the history with the current information of message and sensed message. Rules may be fulfilled or not, any rules which are fulfilled are passed to the *Message Priority Assignment Module* to determine how important the content of the message is. It does that by assigning message priorities (MP) to each fulfilled rule. In this work, five different MPs are used (MP1-MP5). MP1 denotes the most important message which might represent drastic change in the sensed data value. Conversely, MP4 - MP5 relates to the least important messages which might represents slight or no change in the sensed value. MP2 - MP3 relates to intermediate priorities messages which might represent moderate change in the sensed value. Any number of predefined rules can be entered by the designer, and these rules describe different events that can be detected in the sensed environment.

Examples of such possible rules are:

1. Threshold rules (applied when the sensed value crosses a preset value).
2. Differential rules (applied when the change in the sensed value is larger or smaller than a preset value).
3. Routine rules (applied when a message of a certain importance has not been sent for a preset period) [10].

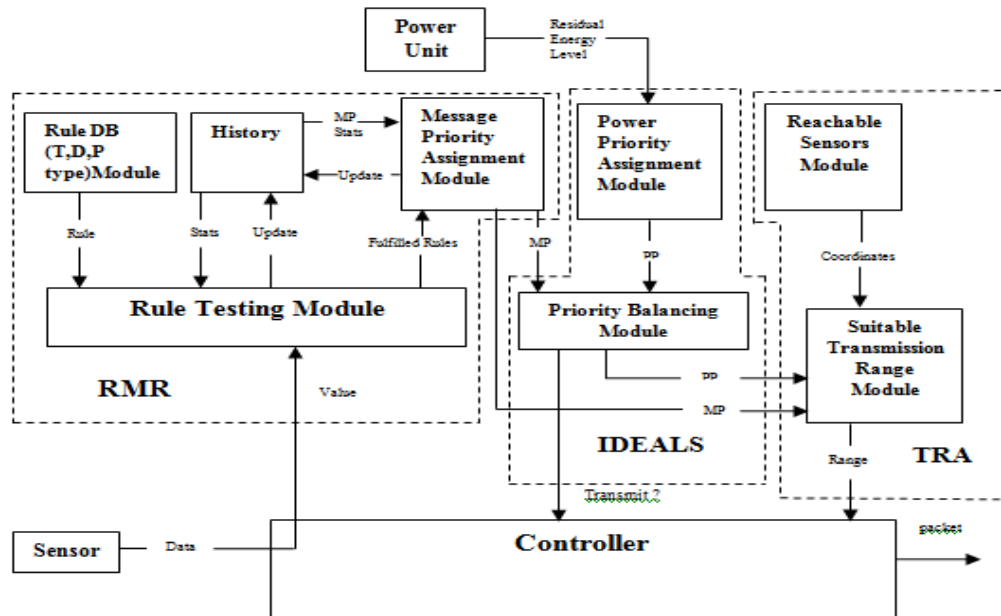


Fig. 1: The Proposed AIRT System Diagram.

Secondly, data from RMR is then passed to IDEALS unit, its responsibility is to decide if the node should transmit a message or not, and it's done by *Priority Balancing Module*. The node's energy resource is characterized by *Power Priority Assignment Module*, which assigns a power priority (PP) for each node based on the state of its battery. A full battery life is assumed to have 100jouls of energy, whereas an empty battery life is assumed to be 0jouls. The 100jouls is divided equally into 5levels, and priorities are assigned to each level. The highest power priority is PP5 and it is assigned to the highest level of energy for a node which is from 80 to 100j. While the lowest power priority is PP1 and it is assigned to the lowest level of energy for a node which is from 0 to 20j. When priority balancing module receives MP and PP, it compares them and if $PP \geq MP$, then the message will be transmitted as illustrated in the priority allocation and balancing process of Figure 2.

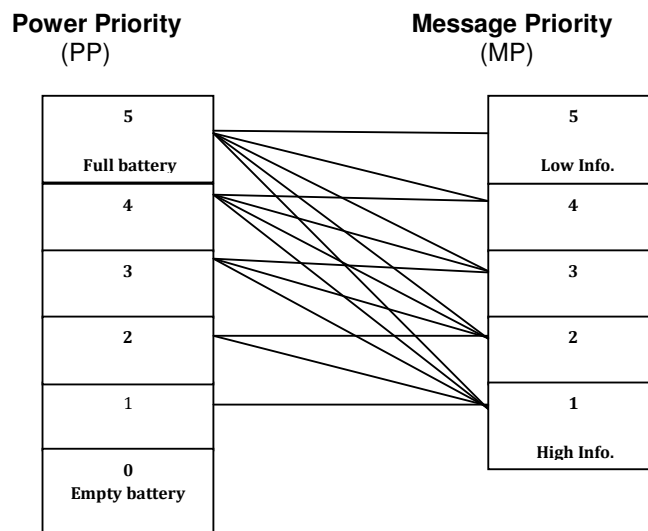


Fig. 2. Priority Balancing

Finally, PP and MP are also passed to the *Transmission Range Adjustment* (TRA) unit in which the *Suitable Transmission Range* module decides with what range a sensor node shall transmit the message. The Suitable transmission range module gets PP from the power priority allocation module, MP from message priority allocation module and coordinates from *reachable sensors module*. The reachable sensors are the entire sensors in the maximum transmission range of a sending sensor node. Now, based on the value of the PP, and MP, a suitable transmission range (TR) is determined and passed to the controller to transmit the message with the new range as illustrated in the heuristic Table 1. In this work, five different TRs are used (TR1-TR5), where TR1 represents minimum transmission range and TR5 represents maximum transmission range. For example, when a node has full battery (i.e. PP5), it will transmit MP1 messages with TR5, MP2 with TR4, MP3 with TR3, MP4 with TR2 and MP5 with TR1. However, if a node's battery decreases to its minimum PP1, it will transmit only messages with the highest message priority MP1 and with the lowest transmission range TR1. It is worth to mention that a power control mechanism is assumed to be embedded in the sensor node for the adjustment of its transmission range.

Table1. Heuristically determined transmission ranges

MP \ PP	5 (Highest)	4	3	2	1 (Lowest)
5 (Lowest)	1 (Min. TR)	0	0	0	0
4	2	2	0	0	0
3	3	4	2	0	0
2	4	4	3	2	0
1 (Highest)	5 (Max. TR)	4	3	2	2

The transmission ranges in Table 1 above were determined heuristically after several runs of simulation with different values of TR. The resultant matrix has a meaningful structure which reflects the trade-offs between MP and PP. These near-optimal TR values for the AIRT scheme improve the network lifetime, connectivity, and maintain a considerable message loss compared to other schemes (IRT, IDEALS|RMR, and Traditional) as will be seen in the performance analysis section. Table 1 can be seen as a matrix A with $i = MP$, $j = PP$, and $A[i,j] = TR$. Then, assuming that the number of levels used for MP, PP and TR is equal to L, the transmission ranges can be derived from the following algorithm:

$$A[i,j] = \begin{cases} 0 & \text{if } i > j \\ 2 & \text{if } i = j \text{ and } j \neq L \\ j & \text{if } i < j \text{ and } j \neq L \\ L + 1 - j & \text{if } j = L \end{cases}$$

4. PERFORMANCE EVALUATION

Performance evaluation of the proposed AIRT scheme is done through extensive simulation. To show that the proposed scheme conserves the most amount of energy, it is compared with other related power saving schemes based on Energy Depletion Times (EDT) and Network Connectivity (NC) performance metrics. Based on these performance metrics, the simulations of Traditional, IDEALS|RMR, IRT, and AIRT schemes are conducted.

4.1 Simulation setup

We simulated 20 sensor nodes in a network size of 70×70 meters. Each node has the same maximum transmission range of 20 meters. A predefined node placement topology has been considered in this study as it can be seen from Figure 4. At the beginning of the simulation, all nodes have the same initial energy of 100 Joules [10]. The following Equation [10] is used for calculating the energy required to transmit a packet:

$$E_{tx}(l, d) = E_{elec}l + E_{amp}ld^2 \quad (1)$$

where E_{elec} [J] is the energy required for the circuitry to transmit or receive a single bit, E_{amp} [J] is the energy required for the transmit amplifier to transmit a single bit a distance of one meter, d is the separation distance in meters and l is the length of the packet. The simulation parameters are given in Table 2.

Table 2. Simulation parameters.

Simulation area	70×70 meters
Number of nodes	20 nodes
Packet length	1000 bytes
Initial node energy	100 Joules
Simulated Node Id	node-08
Minimum transmission range	13.04meters
Maximum transmission range	20 meters
Simulated node Coordinates	(x = 38 , y = 37)
Waiting time 't'	t minutes
Node 08 <i>Traditional Scheme</i> Result, for EDT performance Metric.	9 Hours
Node 08 <i>IDEALS/RMR Scheme</i> Result, for EDT Performance Metric.	34 Hours
Node 08 <i>IRT Scheme</i> Result, for EDT Performance Metric.	63 Hours
Node 08 <i>AIRT Scheme</i> Result, for EDT Performance Metric.	82 Hours
Node 08 <i>Traditional Scheme</i> Result, for NC Performance Metric.	9 Hours
Node 08 <i>IDEALS/RMR Scheme</i> Result, for NC Performance Metric.	MP5 MP4 MP3 MP2 MP1 4h 11h 12h 22h 34h
Node 08 <i>IRT Scheme</i> Result, for NC Performance Metric.	MP5 MP4 MP3 MP2 MP1 13h 26h 29h 47h 62h
Node 08 <i>AIRT Scheme</i> Result, for NC Performance Metric.	MP5 MP4 MP3 MP2 MP1 23h 53h 57h 68h 82h

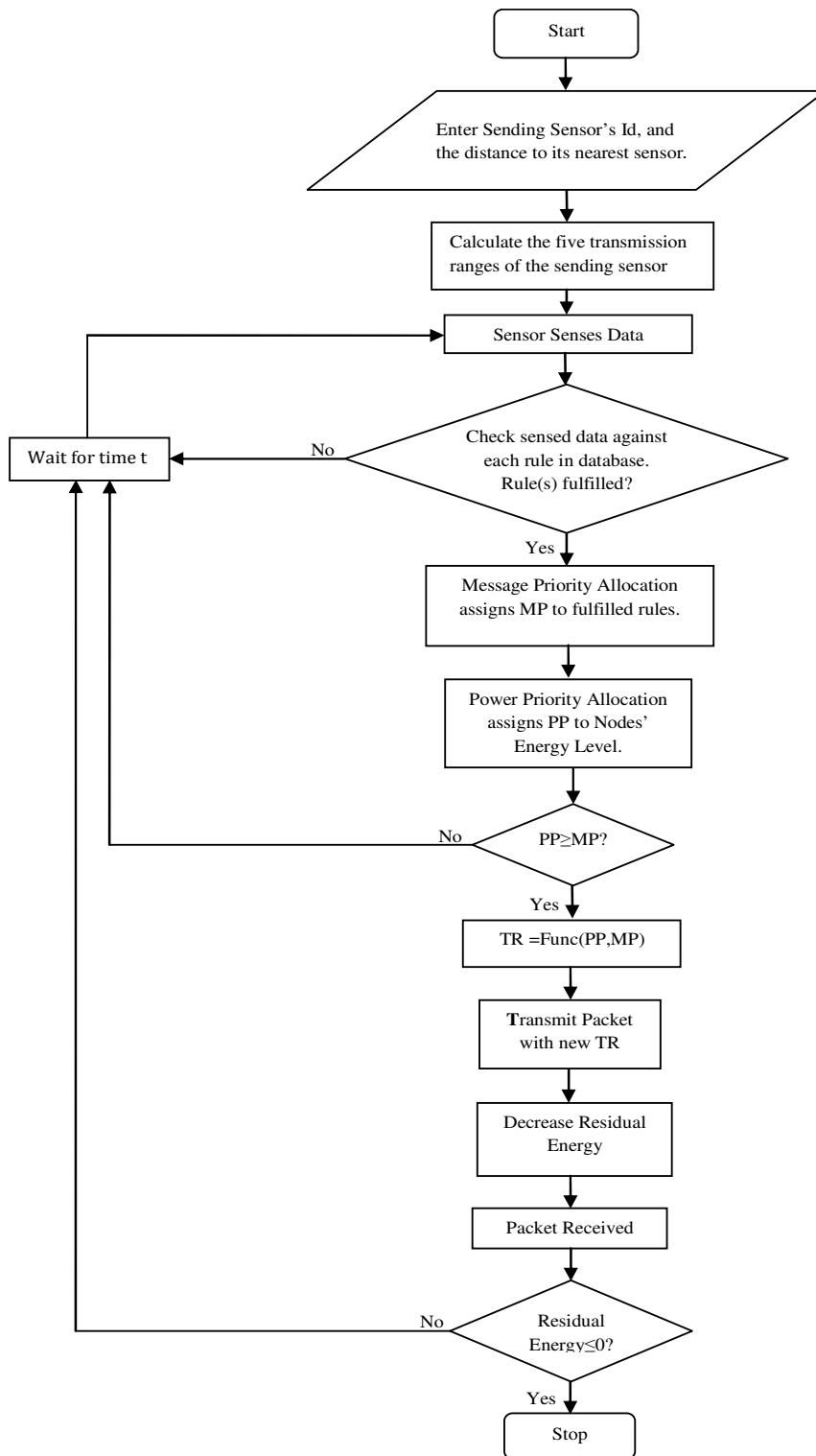


Fig. 3. Simulation Flowchart of AIRT scheme

Only one sensor node is chosen for the simulation as the remaining sensors are assumed to operate in the same way. The chosen sensor node id and the distance to its closest sensor node are given as inputs. The sensor node senses data and the AIRT algorithm is performed as illustrated in Figure 3. Since the maximum transmission range (TR5) is fixed for every sensor, the other transmission ranges can be calculated by considering the minimum transmission range (TR1) as the distance to the closest sensor in the sending sensor's maximum transmission range. So the ranges between TR1 to TR5 are calculated successively by adding $\Delta TR = (TR5 - TR1)/4$. That is, $TR(i) = TR(i-1) + \Delta TR$, for $i=2,3,4$. For example, adding ΔTR to TR1 gives TR2, and so on. To maintain connectivity, we took TR1 as the distance to the closest sensor in the sending sensor's transmission.

All nodes except the sink node (final destination of messages), performs multi-hop routing of messages by using the flooding algorithm. The simulation program is dynamic in the sense that, different coordinates from the ones used in the simulation can be entered and any node can be chosen for the simulation. Figure 4 shows a snap shot of a predefined node placement topology used in the simulation. Circles represent the maximum transmission range of sensors and lines represent possible communication link [10]. We chose node-8 as it is located in the middle. We assumed messages are transmitted every 5 minutes.

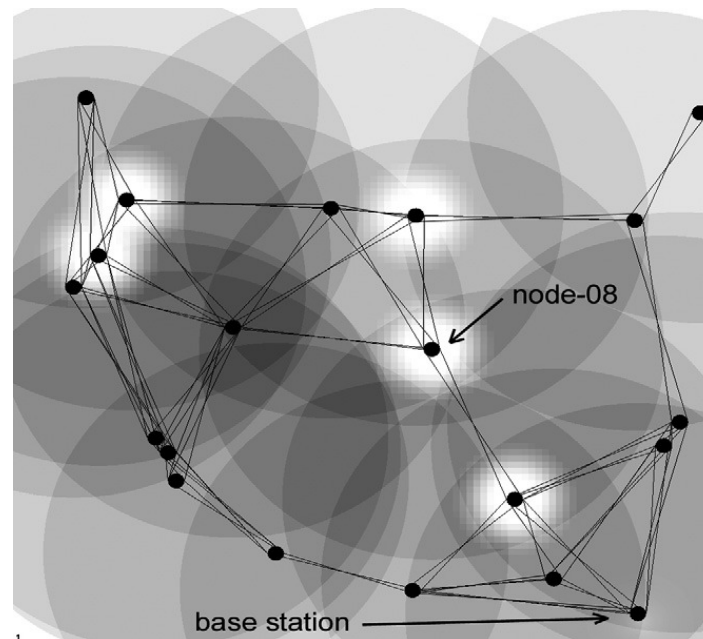


Fig. 4. A snap shot of node placement used in the simulation.

4.2 Simulation Results

Extensive simulation was done to show the effectiveness of the proposed AIRT scheme in extending the network life time. Rather than message generation, the simulator focused on the operation of our algorithm, whereby a data is sensed, if it is worth reporting based on user defined rules, priority is given to the related message, and the message is transmitted if $PP \geq MP$. Furthermore, based on data priority (MP) and battery life (PP), a suitable transmission range is determined using Table 1.

Node Energy Depletion Times (NEDT): Fig. 5 shows node-8 energy depletion times for all the four schemes. In the figure, '100' means that the node energy reserve is full, while '0' means that the energy reserve is depleted. For the traditional scheme, node-8 depleted its energy reserve after around 9h.

This is because it is transmitting messages regularly every 5 minutes, and does not take into account the nodes energy reserve and message importance. For the IDEALS|RMR scheme, it can be seen that the nodes energy level drops suddenly, this is because when the node has high energy reserve, it transmits every message that comes to it. The energy level then remains constant for a while because of less importance messages which are not transmitted. For the IRT scheme, the energy level drops and then remains constant because the IDEALS|RMR scheme is embedded inside IRT. However, the network lifetime increased almost twice that of the IDEALS|RMR due to the adjustment of transmission ranges based on the nodes energy reserve level. Finally, for the AIRT scheme, the same process of sudden dropping of energy level and then remaining constant occurs. However, the network lifetime is significantly enhanced compared to all other three schemes. The achieved improvements of the AIRT scheme over traditional, IDEALS|RMR, and IRT schemes are 720%, 135%, and 33% respectively. This is due to the fact that nodes are adapting their transmission ranges based on both their energy reserve level and message importance.

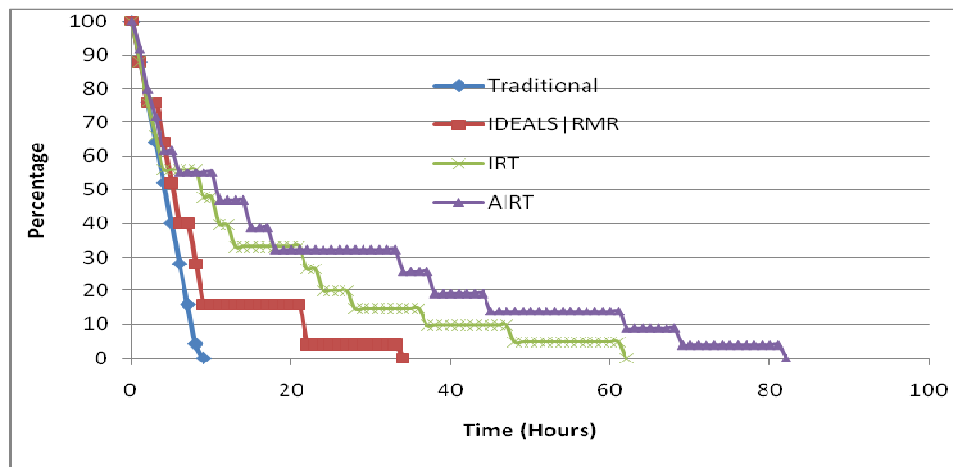


Fig. 5: Node energy depletion times.

5. CONCLUSION

In this paper, we introduced the AIRT scheme, which operates on the combination of information control (deciding if a message is worth processing based on the user defined rules, and how important the message is), energy management (balancing of the energy resource level and message importance) and transmission range adaptation (deciding on the transmission range based on nodes energy resource level and message importance) which we believe have never been considered before. Simulation was performed using C programming language where a single node was simulated to show the operation of our scheme. The results obtained show that the proposed AIRT scheme outperforms the other schemes (IRT, IDEALS|RMR, and Traditional) in terms of lifetime and connectivity. It is interesting to note that this improvement is achieved without significant change in the message loss.

We are currently working on the coupling of the AIRT scheme with fuzzy logic in the sense that decisions on the MP, PP and TR values can be based on fuzzy logic.

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Leveraging Knowledge Assets in Tertiary Institutions using Information and Communication Technologies

Salihu Shakirat. A

Department of Computer Science
University of Ilorin
Ilorin, Kwara State.
shaksoft@yahoo.com

O.V Mejabi

Department of Information and Communication Sciences
University of Ilorin
Ilorin, Kwara State.

Adebimpe, Lateef Adekunle

Department of Computer Science
Emmanuel Alayande College of Education
Oyo. Oyo State, Nigeria
dradebimpela@yahoo.com

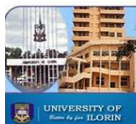
Abstract

The contribution of knowledge asset to organizational effectiveness cannot be overemphasized. However, Information and Communication Technology (ICT) has been identified as a veritable catalyst for leveraging knowledge asset. The adoption of ICT as veritable tools that contribute immensely to the achievement of feats in the educational sector has been lauded. It has served as an eye opener for emerging innovation and landmark discovery, provided an impetus for transmission of knowledge to bridge the gap posed by inadequacy of delivery processes etc. The beautiful contributions of ICT to knowledge acquisition notwithstanding, it is not iron clad to ward off challenges of all kinds, hence; the need to examine the level of applicability of ICT to knowledge management with a view to unveiling the possible real challenges that might hinder its adaptability and to appraise its suitability that would make for full scale adoption.

Keywords: Knowledge Assets, Tertiary Institutions & Information and Communication Technologies

INTRODUCTION

Knowledge Management (KM) involves the process of acquiring, organising and communicating the intellectual capital of staff of an organization for reuse by others (Fairer-Wessels, n.d). KM is a discipline that is concerned with the analysis and technical support of practices used in an organization to identify, create, represent, distribute and enable the adoption and leveraging of good practices embedded in collaborative settings and, in particular, in organizational knowledge processes (Lubega, 2010). As contained in Hardia (2013), Knowledge management is imperative for any business organization. It is essential for any organization to capture, store, retain, and share knowledge for the sustainable growth. According to Ofori-Dwumfuo and Kommey (2013), a Knowledge Management system creates an enabling environment to foster better knowledge and experience sharing, so that the organization can leverage its collective knowledge. KM is evident at all stages of the information life cycle from the identification and acquisition of resources and assets; to storage and retrieval; to the dissemination or sharing of information and knowledge resources and assets to a community of users (Fairer-Wessels, n.d).



The goal of KM is to capture the knowledge required by any process and encourage knowledge workers to share and communicate knowledge with other people (Hardia, 2013). To be able to effectively manage their knowledge resources, higher education institutions need to have appropriate KM framework in place. KM framework refers to integration of organizational knowledge in organizational culture, organizational information technology infrastructure and the organization's store of individual and collective experiences, learning, insights, and values. However, most of the existing frameworks appear to have been derived from the experiences and considerations of business organizations, rather than of higher education institutions. To effectively manage knowledge using ICT in higher education, we need to understand the choices that should be considered to develop an effective KM framework using ICT (Lubega, 2010). The promising benefits of Information and Communications Technologies need be accentuated and institutionalized (Adebimpe, 2012). In this process of creating, accumulating and disseminating knowledge, ICT plays a very important role (Hardia, 2013). The central role technology plays is imperative irrespective of whether it is seen as enhancing or distracting (Fairer-Wessels, n.d). Countries, which have recognized the potential of knowledge management activities, have started developing their information and communication technology (ICT) infrastructures (Hardia, 2013).

The significant role of Information and Communication Technologies (ICTs) cannot be downplayed. It has been celebrated and lauded to be allowed a pride of place. ICT has greatly facilitated access to knowledge information and in the space of time it has changed the global macroeconomic landscape and has opened new possibilities for establishing and delivering advance learning. Today ICT is being used as a tool for improving the quality of life by improved efficiency and enhanced effectiveness. The revolutionary potential of new ICTs lies in their capacities to instantaneously connect vast network of individuals and organizations across great geographic distances at very little cost. As such, ICTs have been key enablers of globalization, facilitating worldwide flows of information, capital, ideas, people and products (Adebimpe, 2012). The emergence of Information and Communication Technologies (ICT) in the last decade has opened new avenues in Knowledge Management that could play important roles in meeting the prevailing challenges related to sharing, exchanging and disseminating knowledge and technologies in the higher education (Toro, 2013).

As such, many researchers and practitioners have developed various frameworks and other relevant approaches to help the emergence of KM into practice (Lubega, 2010). The adoption and use of ICT has raised the need for organizations to come out with new methods, policies, tools and techniques to develop frameworks, processes and technologies so as to promote effective management of knowledge (Ofori-Dwumfuo and Kommey 2013). The adoption and use of ICT to enhance and facilitate Knowledge Management (KM) has brought to focus the urgent need to come out with new methods, tools and techniques in the development of KM systems frameworks, knowledge processes and knowledge technologies to promote effective management of knowledge for improved service deliveries in higher education (Lubega, 2010). Fairer-Wessels (n.d) noted that most respondents expressed the importance of a good ICT system to allow easy access to information. The interviewed managers emphasised the importance of a good telecommunications infrastructure with broadband internet connectivity.

Statement of the Problem

The problem of this study is to examine the level of applicability of ICT to knowledge management with a view to unveiling the possible real challenges that might hinder its adaptability.

Purpose of the Study

The purpose of this research is to investigate the significance of Information and Communications Technologies (ICTs) in broadening the knowledge management capabilities of information managers in tertiary institutions.

RESEARCH DESIGN

Research Hypothesis

Ho₁: There is no significant relationship between the use of ICTs for accessing knowledge asset and effective knowledge management.

Population of the Study

The population of the study was made up of the staff of Ajayi Crowther University, Oyo, Federal School of Surveying, Oyo and Emmanuel Alayande College of Education, Oyo.

Sample and Sampling Technique

The researchers selected one hundred and twenty sample from among the population specified above. Forty Staff were selected from each of the three institutions (Ajayi Crowther University, Oyo, Federal School of Surveying, Oyo and Emmanuel Alayande College of Education, Oyo). This was carried out in such a manner that certain characteristics were given prominence.

Instrument

The data collection instruments used is Questionnaire. It is considered a veritable instrument to obtain data from primary sources and it was accordingly adopted in the study.

Validity and Reliability

The instrument was face-validated by experts in measurement and evaluation while reliability is established for the test through test re-test method.

Administration of the Instrument

The administration of the questionnaire was carried out by the researchers, a measure which yielded a 100% returns rate.

DATA ANALYSIS AND PRESENTATION OF RESULTS

Chi-square was used to analyze data obtained for this study..

The research hypothesis is to determine the applicability of ICTs to knowledge asset for effective knowledge management.

Table 1:

Hypothesis (Ho)	Observed χ^2 value	χ^2 Critical Value	Df	P
There is no significant relationship between the use of ICTs for accessing knowledge asset and effective knowledge management	79.93	23.01	12	0.0001

It is evident that the observed value of χ^2 (79.93) is greater than the critical value (23.01), $\chi^2_{obs} > \chi^2_{crit}$ at 0.05 significant level. Therefore, it falls within the rejection region. Hence, we reject the null hypothesis and accept the alternative hypothesis. Thus, there is a significant relationship between the use of ICTs for accessing knowledge asset and effective knowledge management.

CONCLUSION

It is a well-established fact, that research output will remain beneficial in several quarters and its usefulness far reaching that every research effort is not meaningless, rather an effort is unique and essential in its own right. It is against this backdrop therefore, that the contributions of this research effort provides for understanding of suitability of Information and Communication Technologies in knowledge management. It is an enabler for discerning factors that militate against the adoption of ICT for accessing knowledge assets.

However there may be little challenges in implementing it, which can include having access to an uninterrupted internet services, stable power supply, people's behaviour and notion towards sharing the knowledge they have. These little shortcomings cannot be compared with the enormous advantages associated with managing knowledge with a knowledge repository built with ICT-based infrastructures.

RECOMMENDATIONS

As a result of the fore going discussions and conclusion, the following suggestions and recommendations are made proffered towards ensuring an effective knowledge assets management in an institution:

Comprehensive awareness campaign to enlighten both academic and non-academic about knowledge management in an institution and its benefits

- Adequate and well-functioning knowledge repository must be provided by the institution.
- Staff must be motivated so that they can make the knowledge repository to be effective
- Knowledge should be managed properly and it must be checked to ascertain whether it is making the organisation to get competitive advantage or not.
- Another key features that the researcher discovered in the course of carrying out the research is motivation from the management to the employees. Motivation can be inform of incentives to each employee that has contributed to the knowledge repository of the organization either by uploading its course materials, research or its publications, at least this will encourage them in making use of the knowledge repository and thereby making it to be effective.

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