

Educational Management: Thoughts and Practice

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The Use of Computer in Educational Management

A.T. Alabi

Introduction

In the management of education, at both the ministry and the school levels, decision-making is a very basic process. Decisions are made on future plans, present activities and the monitoring of such plans and activities. Effective decision-making requires adequate, timely and reliable information and data. There is thus the need for effective Management Information System (MIS) to generate information through which sound decisions could be made.

In view of the new technologies of the information age, education is experiencing "a shift from formal, centralized and segmented operations to increasingly complex, decentralized and integrated levels of organization" (Uys, 2000). Expectedly, therefore, administrative functions in schools are becoming increasingly complex in terms of enrolments, population mobility and social problems (Ghaemian, 1998). This complexity requires the use of powerful administrative tools resulting in better communication, efficient operations and better personnel (staff and student) services. One of such tools is the computer. Computers, if properly programmed, could help educational managers take decisions to ease the burden imposed by many administrative tasks such as:

- i. Attendance records and projections;
- ii. Scheduling of students and teachers;
- iii. Inventory control;
- iv. School records and data files;
- v. Library circulation;
- vi. Building maintenance, and
- vii. Services such as health, counselling, food and transportation.

Decisions on these tasks and other vital aspects of school administration could be programmed into the computers, using decision tables (DT) and decision support systems (DSS). Decision support systems allow educational managers to select appropriate formats for displaying information and analytical results, thereby

increasing managerial understanding of information towards effective planning, decision-making and control of the Nigerian educational system.

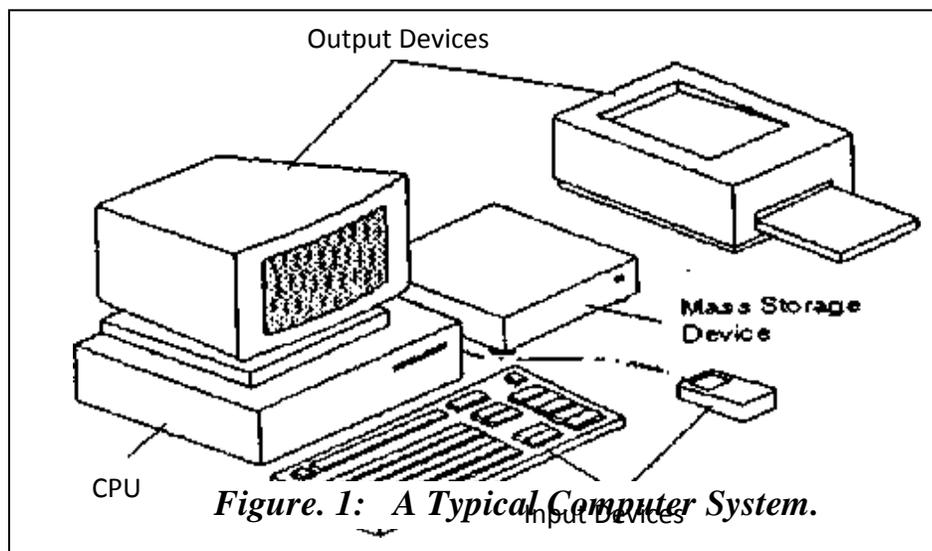
The Computer

Computer is a programmable machine designed for the input, storage, processing and output of data and information. The computer may also be defined as an electronic device, which accepts and processes data by following a set of instructions (programmes) to produce accurate and efficient results at a high speed (Gbadeyan, 2005). The two principal characteristics of a computer according to Webopedia (2002), are:

- i. It responds to a specific set of instructions in a well defined manner, and
- ii. It can execute a pre-recorded list of instructions called a programme.

The data management function of the computer is accomplished in three stages, namely, input, process and output. During input, data, which is a collection of raw unprocessed facts, is fed into the computer. Process ensures the conversion ' of data into information, useful for decision-making while output refers to the desired result obtained from the processed data (information).

Modern computers are electronic and digital. The actual machinery - wires, transistors, and circuits - is called hardware, while the instructions and data are called the software.



Source: What is a Computer? A Word definition from the Webopedia Computers Dictionary (p.1) <http://www.webopedia.com/term/c/computer.html>.

Components of Computer Hardware

Hardware components are the mechanical and electronic parts of a computer system that are seen and touched. They include:

- i. *Input Devices:* These are usually a keyboard and a mouse. They are the conduit through which data and instruction enter a computer by procedures such as typing and copying files.
- ii. *Output Devices:* These include a display screen (monitor), printer or any other device that brings out what the computer has accomplished, on screen, paper or disk.
- iii. *Memory:* This enables a computer to store, at least temporary data and programmes.
- iv. *Mass Storage Devices:* These include hard/disk drives, and tape drives that allow the computer to permanently retain large amounts of data. In addition to these fixed and permanent storage devices, removable storage devices such as diskette/floppy disks, hard disks and compact disks (CD) exist which allow information to be saved and retrieved from the computer.
- v. *Central Processing Unit (CPU):* This is the brain within the computer. The CPU /micro processor is mounted on the system board of the computer (the mother board). It is the component that actually executes instructions by controlling and manipulating all data within the computer.

Computer Software

The software is the non-physical aspect of the computer system. It is a series of simple computer instructions carefully organized to complete complex tasks. Software can be divided into two, namely:

- i. *System Software:* used by the computer itself to carry its basic operations; and

- ii. *Application Software*: designed and introduced into the computer by the user to perform specific tasks such as:
 - a. Word Processing for typing documents such as Microsoft Word and WordPerfect;
 - b. Graphics such as Corel Draw and Instant Artist for graphic production; and
 - c. Data banking work in form of Dbase and Oracle for data analysis.

These instructions are written in programming languages, which are of three levels:

- *Machine Language (ML)*: The only language understood by the computer. It is in form of binary digits, i.e. series of zeros and ones.
- *Low Level Language (LLL)*: It is symbolic in nature. This consists of codes, using few English letters, forming symbolic codes such as STO for STORE, PRN for PRINT, etc.
- *High Level Language (HLL)*: This is machine- independent programming language in English. It is close to the human language and thus requires a translator into-machine language. Examples include BASIC, COBOL and FORTRAN.

Computers have some performance characteristics, which make them amenable and appropriate for management decision-making. These characteristics, according to Gbadeyan (2005), account for the supremacy of their functions over manual operations. These characteristics include accuracy, speed, consistency and repetitiveness. Other characteristics are automatic control, storage and networking,

- i. *Accuracy*: This refers to the correctness of the output, based on input and instruction to the computer.
- ii. *Speed*: Computers have a very high processing speed, thereby giving answers to requests in the twinkling of an eye.
- iii. *Consistency and Repetitiveness*: Computers give the same results when presented with the same data over and over again, using the same programme. Similarly, they repeat the same process times over.
- iv. *Automatic Control*: Computers can operate virtually without any human interference. This is possible through the use of an 'in built' software called the

- operating system, which once initiated, continues with all the steps until a job is completed.
- v. *Storage*: Computer storage could store data and information on long term basis, in both main and temporary storage facilities.
 - vi. *Networking*: Computer network refers to the interconnection of two or more computer systems with data communication devices. Computer networking reduces duplication of computer resources and thus enables the scarce resources to be shared among the computer systems. Files, software products, printer, disk, CD-ROM and E-mail facilities can be shared among various users.

Types of Computer

Computers can be generally classified by size and power. Computers can also be categorized into types by purpose, operation process and age of technology (Yusuf 85 Onasanya, undated).

Types of Computers by Size and Power

- i. *Microcomputer*: This is the smallest single-user computer based on microprocessor. It is usually referred to as Personal Computer. It is the slowest and with the least memory capacity. It is portable and used as desktop in offices and homes.
- ii. *Laptop Computer*: A small portable computer that could be used on a person's lap. (It is usually used on desks and this gives an idea of size.)
- iii. *Notebook Computer*: A portable computer that is usually the size of A4 files.
- iv. *Palmtop Computer*: A small portable hand-held computer. Though handled and operated like a calculator, it performs word-processing and data analysis functions like other microcomputers but at a lower speed and volume. Examples are calculators, organizers, digital wristwatches and GSM handsets.
- v. *Workstation*: This is a powerful, single-user computers. A workstation has a more powerful microprocessor and a higher-quality monitor than a PC.
- vi. *Minicomputers*: This is a mid-range multi-user computer, usually the size of a small filing cabinet capable of supporting ten to hundreds of users simultaneously, thus forming part of a network of computer systems.
- vii. *Mainframe Computers*: These are large and powerful multiuser computers capable of supporting many hundreds and thousands of users simultaneously. They are very expensive and only found in big organisations like banks and industries.

- viii. *Super Computers:* These are very large and extremely fast computers that can perform hundreds of millions of instructions per second. They are designed with speed in mind, usually for specialized applications that require intensive calculations such as weather forecasting. Other uses are animated graphics, nuclear energy research- and petroleum exploration.

II Types of Computers by Purposes

- i. *Special Purpose Computer:* This is designed for specific job performance only. Examples are adding machine and petrol pumping machines.
- ii. *General Purpose Computer:* This can be used for variety of purposes. An example is the microcomputer used for word processing, data processing, graphics, etc.

III. Types of Computers by Operations

This classification is based on the computer's mode of operation

- i) *Analog Computers:* They represent data in a continuous manner using physical variables such as pressure and temperature. Physical quantities measured are converted to numbers, which are usually represented in the form of smooth curves or graphs. This class of computers is used for scientific and engineering purposes.
- ii) *Digital Computers:* They represent data in discrete or discontinuous manner using binary systems. The outputs from digital computers are usually in form of discrete values. They are commonly found in the commercial data processing business environment. Examples are microcomputers, desk calculators and adding machines.
- iii) *Hybrid Computers:* These combine the features and operations of both analog and digital computers. This combination is made possible through the use of an interface which provides a communication link between analog and digital, making it possible for the conversion of analog data to digital and digital to analog. Hybrid computers, commonly found in scientific environments, are applicable in solving problems of optimisation and simulation in dynamic systems.

Types of Computer by Age or Generation

Generations of computers have evolved through some technological sophistication. These are the first to the fifth generations of computers.

First Generation: These first generation computers, manufactured in the 1920s, used vacuum tubes as the basic logic parts. They were very robust, had slow access time, small internal memory and could only work on one job at a time. The available models include ENIAC, EDVAC, EDSAC, UNIVAC - I and II, IBM Mark I and II.

Second Generation: These computers that came up around 1948 used transistors instead of vacuum tubes. They used chips for their memory with faster access time and larger internal memory. Examples are Control Data 850,000,200 General Electric (GE) 635, IBM 7070,7080,7090 and so on.

Third Generation: Integrated circuit technology was introduced into the logic elements of these computers soldered together on a chip. The physical size was reduced, memory access time was fast and many jobs could be performed at a time. Examples are IBM Data General, Digital Equipment (DEC) and Honey Well.

Fourth Generation: These are computers manufactured in the 1970s with improvement in integrated circuit technology. Their CPU is fabricated on chips with improvement in speed and reduction in size and cost. They are adaptable to programmes like Database, Graphics, Games, etc.

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Fifth Generation: These computers came in the 1990s. They are data driven, fast and compact. They are in different sizes and designs.

Application of Computers to Educational Management

Educational management, in a broad sense, is a systematic process of planning, organising and controlling education. If these functions of management are to be practised in the context of the emerging global information society, then appropriate use of computers becomes mandatory.

Administrative uses of microcomputers fall into four broad categories. These are data management, data analysis, word processing and communications.

- (i) Among the school records that can be stored and manipulated by microcomputers are students' records, personnel records, financial records, inventories of school equipment, and special management records such as transportation, food service, energy management and sports programme management (Ellis, 1984). The information derived from these records could be used to take administrative decision, towards achieving the school goals.

- (ii) In addition, microcomputers can be a potent tool in analysing data. The analysed data can be presented in various concise ways such as graphs and tables from which sound administrative decision, are taken.
- (iii) Word processing programmes enable administrators to compose, address, edit and produce written copy in a wide variety of formats. These written reports form a very versatile tool for written communication.
- (iv) Data and information communication is possible through the linkage of microcomputers with one another or with a mainframe computer. For instance, messages can be sent and received through such applications such as e-mail. Through the use of a modem, administrators can also send or receive information, via telephone lines, to and from another computer anywhere in the world.

Decision Table

A decision involves making a selection from a set of alternative choices. Decision-making is an integral part of management. In fact, decision-making, according to Swann (1993), is synonymous with management. It is the dynamic element that activates and sustains the managerial process (Harrison, 1987). The decision-making process relies on information about the alternatives. The quality of information in any decision situation determines to a very large extent the quality of the decisions made. There is thus the need for methods and techniques that can assist in information processing at the various stages of the decision-making process. These stages, according to Donnelly, Gibson and Ivancevich, (1995) are:

- i) *Problem Identification:* This requires correct information, otherwise the decisions made are directed towards solving the wrong problems.
- ii) *Developing Alternatives:* Once the problem is diagnosed and defined, feasible alternatives (actually potential solutions) to the problem should be developed. This search process according to Cowan (1991), investigates the relevant internal and external environments of the organisation to provide the relevant information that can be developed into possible alternatives
- iii) *Evaluating Alternatives:* The developed alternatives are compared and evaluated, using the available information, towards the set objectives.
- iv) *Choosing an Alternative:* The best alternative is chosen based on the gathered and analysed information. Evaluating each choice on a set of criteria, which must be measurable, facilitates the selection.
- v) *Implementing the Decision:* The chosen alternative is put into use. Implementation often includes the allocation of funds and other resources.

- vi) *Control and Evaluation:* After implementation, decision outcomes must be monitored and assessed, using the built-in information. Each of these stages requires accurate and timely information to be analysed in order to arrive at sound decisions. Computers, if programmed correctly, can make a lot of decisions without human intervention. Criterion outcomes of decision alternatives can be collected in a table called decision matrix or decision table.

A decision table is a tabular form that presents a set of conditions and their corresponding actions. In decision tables, all the possible situations that a decision may encounter are laid out and the action to be taken in each of these situations is specified. According to Carey and Kacmar (undated), a decision table is a problem analysis tool that can help organise decision outcomes. It is useful in managing programmes that require multiple decisions.

A decision table is partitioned by vertical and horizontal lines and structured as follows:

- a) The portion of the table above the horizontal lines specifies the condition, and the portion below those lines indicates the action.
- b) The portion to the left of the vertical lines contains the stub (or tag), and the portion to the right, the entries.
- c) The columns in the entry part of the decision identify decision rules.

This is represented graphically as in figure 2:

	Condition	Entries
Stub		

Figure 2: Building Decision Tables

Source: Computers-Aided Process Planning (CAPP) http://www.salhieh.com/CAD/04_CAPP.pdf (p. 14).

The components of the figure are explained thus:

- *Condition Stubs:* These describe the conditions or factors that will affect the decision or policy.
- *Action Stubs:* These describe, in the form of statements, the possible policy actions or decisions to be made.
- *Rules:* These describe which actions are to be taken under a specific combination of conditions. First inserting different combination attribute values and then putting Xs in the appropriate columns of the action section of the table specify them.

For example, in a university, a decision table can be constructed on the movement of students to higher academic levels based on their academic good standing status as shown in Figure 3.

- * New students in good academic standing moved to the next level.
- * New students not in good academic standing placed on one-year probation in another programme
- * Probation students not in good academic standing withdrawn from the university.

Condition	In Good Academic Standing	Rule 1	Rule 2	Rule 3
	Not in Good academic Standing			
Decisions	Move to the Next Higher Level	X		
	On Probation in the Same Level		X	
	Withdraw from the University			X

Figure 3: Decision Table on Academic Movement of University Students

Decision tables are of three types. These, according to Salhieh (2004) are:

- i. Limited entry decision tables in which the condition stub specifies the conditions (the value of the input variable(s). Condition entry could be 'move', 'stay' or 'leave'.
- ii. Extruded entry decision tables in which the condition stub specifies. The values are specified in the condition.
- iii. Mixed entity decision tables in which sequenced as well as unsequenced actions can be identified.

The construction of decision table, though a creative activity, contains several routine actions that are quite time-consuming. Hence, the need for computer support in constructing decision tables with many advantages such as:

- i. The writing and drawing can be taken over completely by the computer.
- ii. A number of routine jobs that induce many errors when performed manually can be automated.

- iii. It allows for interactive possibilities such as automatic checking for consistency, correctness and completeness.
- iv. It makes for good use of the interfacing features of decision tables to other representation formalisms such as programme codes, trees and rules.

Decision Support Systems

The actual objective of decision-making support is to provide the decision maker with the ability to look into the future and to make the best decisions based on past and present information and future prediction. Decision support systems (DSS) are interactive, flexible and adaptable computer-based information systems, specially developed for supporting the solution of non-structured management problems, for improved decision-making. They use data and models, provide easy user interface, and allow for the decision maker's own insights.

The major characteristics and capabilities of DSS are that they:

- i. provide support for various managerial levels in all phases of the decision-making process,
- ii. are adaptive,
- iii. have user-friendly interfaces,
- iv. have the goal of extend; the range and capability of manager's decision processes to help them improve their effectiveness,
- v. Provide access to a variety of data sources, formats, and types, thereby creating a supportive tool under the manager's control. Thus, the tool does not attempt to automate the decision process,, predefine objectives or impose solutions.

Components of DSS

There are five DSS components. These are:

- i. The Data Management Subsystem which deals with DSS database and data directory.
- ii. The Model Management Subsystem which mirrors the database management subsystem. It models management issues at strategic, tactical and operational levels.
- iii. The Knowledge Management Subsystem which provides expertise in solving complex unstructured and semi-structured problems. It deals with what models to use, how and interpreting results, thereby leading to intelligent DSS.

- iv. The User Interface (Dialog) Subsystem which includes all communication between a user and the management support system. Usually, the user interface is the system.
- v. The User which refers to the managers, staff specialists and other staff members.

Advantages of DSS

Among the advantages of the use of DSS are:

- i. Increased number of alternatives examined.
- ii. Better understanding of the business.
- iii. Fast response to unexpected situations.
- iv. Improved communication.
- v. Cost and time savings.
- vi. Better decisions.
- vii. More effective teamwork.
- viii. Better use of data resources.

There are some specialized softwares for taking decisions on personnel planning and administration. These software packages are described in Table 1.

Table 1: Samples of Educational Management Soft wares

<i>Focus</i>	<i>Software</i>	<i>Use Description</i>
Office Management	i. Word Processing	Prepare document such as notives, letters, reports.
	ii. Database	stores students and personnel information.
	iii. Spreadsheets	stores and updates tables needed for budgeting, projections and planning.
Instructional/Students' welfare management	i. EduTrak software	Scheduling, class registration and credit payment for college education
	ii. ZTrack	Manages students' discipline and welfare

	iii. Modular Management system	Empowers parents, staff and students with online access to view and enter data on students' biographical information, attendance scheduling, grades, discipline, health, fee tracking e.g. ADM 2000 parent WEB, staff WEB and student WEB, financial system, etc.
	iv. Administrative solution 3 (ASS)	Monitors leads and adverts, enrolls a schedules students, tracks grades and attendance, and finds jobs for students within career services.
	v. Grade minder	Automates class grade recording and reports
	vi. Master scheduling	Manages the academic process
	vii. Library Edge	Catalogs all types of media, provides search modes and circulation features.
Personnel Management	i. JOB Plus™	Develops job description, job performance, compensation, evaluates employee performance.
	ii. HRM Plus™	Develops and maintains applicants' and employees' data to efficiently recruit and hire employees and then manage employees' data.
Financial Management	i. Financial Packages	Prepare accounts, pay-payable payroll and a general ledger.
	ii. (Win) Private Fund	Provides a range of reports to assist school bursars to manage school private funds,

	iii. ACCOUNTrack	Provides accurate audit trail
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Sources:

1. Modular Management system: School Administration Software (undated), <http://www.cri-mms.com/index.html>.
2. Ghaemian, K. (1998). School 2. Administration on the fast-track. <http://www.govtech.net/magazine/gt/1998/iune/prodfocus/prodfocus.php>
3. AlaQuest International: Administration made easy (undated). Administrative solution
3.http://www.alaquest.com/t_asS.shtml

The ultimate use of computer in educational management is towards "networked educational management" (Uys, 2000). This stems from the on-going globalisation brought about by the new information age. This globalisation has resulted in "internetworked business, internetworked government, internetworked learning and internetworked health care....."

(Tapscott, 1996,p.55). The resultant networked education, especially at the tertiary level, facilitates connectivity or networking of educational opportunities across the boundaries of space and time.

The proposed networked educational management has many dimensions, including networking, globalisation, boundary orientation, computer mediation and being information-based (Uys, 2000). The main issue in these dimensions is provision of adequate access to educational opportunities anywhere in the world where access to the Internet is possible.

Suggested Measures Towards Effective Application of Computer in Educational Management

The basic measure towards effective application of computer in educational management is computerization of schools at all the levels of educational system. The three basic steps towards computerisation of schools are:

- i. Deciding what tasks should be automated and in what order of priority, after conducting a cost benefit analysis for each task;
- ii. Identifying the software that best automates these functions; and
- iii. Identifying the hardware that runs the selected software (Ellis 1994).

With basic computer knowledge, students, teachers and school administrators would be computer-literate and ultimately be able to apply computers to learning, teaching, and administrative functions. The trend should be towards Local Area Network (LAN), especially in higher institutions, which interconnects computers and their peripherals so that information can be transmitted at higher speed among a large number of users simultaneously

Efforts should be made at the primary and secondary levels, and intensified at the tertiary level of education to apply computers to improve educational efficiency. The first step in this direction is to make students and staff computer-literate.

Thereafter, computer could be used for organisation of information, progress monitoring, enhancement of planning and improvement of communication in the school system. Probably, the realization that computer use enhances personal and institutional efficiency and effectiveness in education informed the National Policy on Computer Education at all levels of Nigerian education. The policy has been backed up with a national curriculum for the secondary school (JSI-SS3) However, only a very few schools (maybe the federal government or state government pilot secondary schools) are implementing the curriculum. For instance, in Kwara State, only nine out of the 235 existing public secondary schools offer computer education up till JS3 (Alabi, 2001). The likely reasons for this situation, according to Alade (2001), could not be far from non-availability of computer systems, inadequate funding of computer policy implementation, shortage of qualified operational personnel and poor infrastructural facilities.

To ensure a successful implementation of the National Policy on Computer Education, specific allocations should be earmarked for computer education by the government on a continuous basis. The financial support of other stakeholders in education should be sought in this direction. The generated funds should be used to procure necessary computers and other IT equipment. The requisite computing skills for IT towards the use of computer for managing education are in short supply in Nigeria. There is, therefore, the dire need to train computer end-users such as students, staff and educational researchers towards acquiring the required degree of sophistication and information management expertise in order to effectively harness the opportunities offered by computerized MIS. Towards this end, the government and educational authorities should give priority to training personnel that would train computer end-users towards effective application of computer knowledge to educational management.

Telecommunications infrastructures are conduit to the interconnectivity of computers needed for accessing information for making sound educational decisions. As such, ensuring "networked educational management" in Nigeria and integrating this globally

requires a functioning, readily accessible and affordable telephone system. There is thus the need for NITEL services to be improved, possibly through privatisation and or improved funding by the government and proper management of the system.

In addition, concrete plans and concerted efforts by the government and other stakeholders in education should be put in place to ensure continuous maintenance of the acquired computers and other IT equipment. The expected IT development by school personnel would rub-off positively on the effective management (planning, decision-making, control) of Nigerian educational system.

Conclusion

In summary, the use of computer can provide a number of benefits to the management of education. In educational management, decision-making for the present and future is very crucial. For effective decisions, data and information must be accurate, timely and up to-date. The computer has capabilities for information gathering, storage, processing, retrievals, and communication. These capabilities are developed into various systems such as DSS for effective planning and administration of education. All hands must be seen to be on deck towards the computerization of schools, towards the globalisation of education and networked educational management. This networked educational management would only be practicable with the provision of necessary computer infrastructure, computer training, appropriate database and Internet connectivity.

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