COMPUTER SYSTEMS APPLICATION IN INVENTORY CONTROL AND MATERIAL MANAGEMENT

BY

Dr. McChester Odoh,

Department of Computer Science
Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
Odo.chester@mouau.edu.ng

Dr. Osita Ebere, Mrs. N. Mbeledogu

Department of Computer Science
Nnamdi Azikiwe University, Awaka, Anambra State, Nigeria

ABSTRACT

This study examines computer application in materials management and inventory control system. Second, to determine the database input and outputs of the inventory control application; the type of data processing system used and to draw the general diagram of the application and to write the FORTRAN Program of the E.O.Q model. The research design was a combination of the survey, case study and the use of computer programming. It was found that 50 out of the 50 respondents making 100% of them said that the computer was applied to the materials management and inventory control functions. Additionally, the inputs of the inventory control system were accepted orders, stock receipts, notices, transaction data and miscellaneous inventory transactions in a descending order of magnitude. It was found that the database constituted of the inventory master file and back order file up data; subsequently, the outputs of the inventory control system were inventory control reports and listings, economic order quantity, filed orders, back orders, miscellaneous transaction data, reorder level, out of stock in that descending order

Introduction

Materials management can be defined as the idea of an integrated management approval of planning, acquisition, conversion, flow, distribution and control of production materials from the raw materials state to the finished product state to the finished product state [1] Banjoko [2] defined materials management as the application and supply of basic matrials, supplies of components or spare parts, work-in-progress and finished goods as to avoid insufficient inventory and the consequent disruption of production or excessive inventory and the consequent liquidity problem. The British Institute of Purchasing defines materials management as the total of those tasks, functions, activities and routins which concerns the transfer of external materials and services int othe organization and administration of the same until they are consumed or used in the process of production, operations or sales. The British Institute of material management defines materials management as the management process which integrates the flow of supplies into through and out of an organization to achieve a level of service which ensures that the right materials

are available at the right quanity and quality and at the right materials handling and storage production and inventory control, packaging, transport and associated information systems and their application throughout the supply of manufacturing services and distribution sectors.

The computer on the other hand is an electronic machine with an internally stored sequence of instructions that guide it automatically through a series of operations which eventually lead the completion of a certain task [3]. A computer can also be defined as a machine used for the collection processing and distribution of facts and figures to achieve a desired result [4]. A computer can also be defined as an electronic device that has the ability to accept data, internally store and automatically execute a program of instructions, perform mathematical logical and manipulative operations on data and report the [3]. The focus of this paper therefore is to look at materials management – procurement, materials handling, inventory control and how to use the computer to perform a program of instructions, perform mathematical, logic, manipulate operations on the data and report result of the earliest possible time for quick decisions in the dynamic world.

Systems Historical Perspective

What we now know as computer started with the work of an eighteen year old Frenchman Blaise Pascal who first developed a mechanical adding machine in 1942. Later this was improved upon by Gottfried Lerbnitz a German mathematican who developed a calculating machine that could multiply by repeated addition and divide by repeated subtraction in 1694. As we entered the machine age in the middle of the 18^{th} century and due to the Industrial Revolution, which brought about the development of modern electrical power machinery and techniques of mass production and the establishment of large companies and institutions, man's need for information and data increased very tremendously and it was not uncommon to find high volumes of paperwork in companies and Government organizations. All these created the need for computers.

The punch card was first introduced in 1880 by Herman Hollerith and was used in the American census of 1890. It was during the World War II that an environment for new data processing methods was created. It was during this time that automatic calculating machine controlled by preset wired control panels, banks of switches, buttons and dials were developed. Here the computation of input data took place automatically. The MARK I was therefore considered to be the first Electric Mechanical computer [3]. As time progressed various forms of computers were gradually introduced. From electro digital computer stored program computers were developed. In these computers, instructions were stored internally and this helped to lessen the work of computer programmers. From here we moved on to magnetic tape computers which stored information as magnetized spots on magnetic tape. This new technique provided input speed of 50 to 70 times faster than that of cards and brought improved in input and storage [3].

Engineers at this stage started working on ways to improve the storage devices inside the computer. The early 1950s saw the development of the magnetic core a small item in a core storage which can be located and made ready for processing in one millionth of a second. His in turn increased the speed of data processing considerably [5]. Later on the magnetic drum storage capacity was invented, then the Random (Direct Access Storage Device popularly called DASD) was introduced in mid-1950s.

REVIEW OF RELATED LITERATURE

Many of the routine activities in today's society are performed by computer. For example when we go holiday our plane seats are often reserved by computers, the traffic in some major cities is to a degree, controlled by computers, the egg which you might have had for breakfast may have been laid (no not by a computer) by a chicken whose life history is on record on a computer file; many of the bills we pay (rates, gas, electricity, telephone, insurance etc) are calculated and printed by a computer. Why? and how? [3]. It was outlined in the introduction that there are three essential concepts that we need to examine in order to be able to think sensibly and talk intelligently about computing. What are computers? What can they do? How can we communicate with them? But first of all, what do the terms computer and computing mean? [3].

Obviously computing has something to do with reckoning or calculating but man has been using his brain to do just that for centuries. The Egyptians built the pyramids. Whoever built Sonehange left a calender which can still actually predict eclipse; the Romans design and built long straight roads, aqueducts and heating systems; early explorers navigated the globe and even radio and television were invented all without computers. What is so special about them that we need computers today? It cannot simply be because they are calculating devices. We have many forms of such devices – the abacus (still used in the far East), pocket and desk calculators, even supermarket checkout tills – all of which are cheaper and easier to use than computers. So why was the comptuer invented? [3].

Because it had to be! The pressures of World War II dictated research in many areas. The new use of night bombers submarins, and long-range guns on ships and tanks meant that armies had to fight by shooting at targets they could not see. Technology in the form of radar was developed to locate the enemy: where he was, in which direction he was moving and how fast he was traveling. It wasthen necessary to aim guns so that when the shell was fired it would reach the enemy at the point to which had moved [3]. This could not be done with any accuracy with first performing detailed mathematical calculations. Firing tables were required by the men at the front-line so that the figures were immediately available. But these figures were not in existence because the human effort involved in producing them was too great. What was needed was a machine, which could produce the tables with the required speed and accuracy [3].

Huge sums of money and brainpower were combined to produce the technology. In 1942, the Ballistic Research Laboratory of the US Army Ordinance Department began work with the Moore School of Electrical Engineering. As a result, a computer named ENIAl was able to produce the table by carrying out the huge number of calculations involved accurately and to the required precision and because it was electronic, at a speed which made it all possible [3].

The problems which early computers had to solve were mostly mathematical. Today, computers are used to forecast the weather, to operate machine, to cut shapes out of sheet mentals and even to guide spacecraft to the moon. They can set and print newspapers and books. They can be used to help in diagnosing diseases and to find out whether a hospital bed is available for a particular patient. They are used to find obscure documents in archives and elusive criminals on the run. Travel agents around the world have come to rely on them to book seats on airflights, or rooms in hotels either today or a year from now. Companies use them for counting, invoicing, stock control and payrolls [3].

The original objective for inventing the computer was to create a fast calculating machine. But in over 80% of computing today, the applications are of a non-mathematical or non-numerical nature. To define a computer merely as a calculating device is to ignore over 80% of its work, rather like someone refusing to believe that the bulk of the iceberg lies

hidden under the water. If not as a calculating device, then how are we to define a computer [3].

Before the days of electrical engineering attempts had been made to provide results to mathematical problems by mechanical means. In the early nineteenth century, Charles Babbage came close to succeeding. At that time, mathematical and statistical tables (for insurance companies and government records for example) has to be compiled by small armies of clerks. Working as they did, without the help of adding machines, even the most elaborate precaution could not eliminate human errors [3]. In 1833, Babbage began work on his Analytical Engine and it is this machine with which we are concerned. His requirements for precision engineering were impossible to achieve at that time and therefore he was unable to produce a working model of the complete and massive machine. Had he done so, it would have been the forerunner of today's electronic computer [3].

PROCEDURES

The research design chosen for the study is a combination of an ex-post facto survey in which the researcher does not have control of independent variables affecting comptuer application to materials management because they have already occurred and so they cannot be manipulated by the researcher and the use of computer programming. If it were possible for the researcher to manipulate the explanatory variables affecting the computer application in the institute the proper research design to use would be an experimental research design, rather than a survey.

The elements of the survey research design are:

(a) There is a decreased willingness of subjects to respond to survey probes;
(b) Most surveys are 'one shot' as different from what holds in the panel type in which repeated measures are taken on the same sample;
(c) As an outcome of (b) above, the ability for collecting data with which to test the causal relationship of variables is limited;
(d) In terms of total expenditure, the survey is an extremely costly research strategy due to big administrative and or personnel costs especially when the interviewers have to make repeat trips when some subjects are not on sear; and
(e) The standardized and structured answer formats of many survey measures such as questionnaire and structured interview schedules may compel the subject to accept statements they do not fully accept [6].

SAMPLING

One of the decisions that a researcher must take in carrying out an empirical study be interviewed. To do this the researcher uses the techniques of sampling. Fundamentally, sampling is the choice of a subject of the population or universe in such a way that the past is representative of the whole so that judgment about the whole are made on the platform of the part [7]. The purpose of sampling is to get primary data on the part of population or universe so that at a future point in time inferences can be made about the universe based on the data from the sample. In this reseachproject, the universe is the totality of the staffs in the materials management department of an institute in Nigeria. In this reseach project, the sample of 50 respondents is got from the list of the staff. The list of the staff in materials management department is got from Personnel Department of the Institute. The lottery method of simple random sampling is used to pick 50 staff.

DESCRIPTION OF DATA PRESENTATION AND ANALYSIS TOOLS

The data is presented by the use of tables. Anyiwe (1994) gives the following merits of a table over a prose of information:

(1) a table ensures an easy location of the required figures;
(2) comparisons are easily made by means of a table than a prose information;
(3) patterns or trends within the figures which cannot be visualized in prose information can be clearly shown by a table;
(4) a table is more concise than a prose information where a lot of words are used.

The answer to the Yes or No questions is to be analyzed to means of percentages. Percentages, which convert the ratios of two sets of data to a common base of 100, facilitate comparisons. Percentages also remove the misleading nature of absolute figures in which 3 over is greater than 5 over 10 as the former gives 60% while the later gives 50%. The data from the questions in which the respondents are given alternative answer to pick are to be analyzed using cross-tabulation. A computer program on FORTRAN is to be drawn to handle the Wilson's model.

DATA PRESENTATION, PROGRAMMING AND ANALYSIS

In this last section, the research methods and procedures have been handled. In this section, the data presentation, computer programming and analysis are to be handled. The data presentation is to be done by the use of tables. Computer programming is a process, which results in the development of a computer program, the set of detailed instructions which outlines the data processing activities to be performed by a computer. It is an important step in the analysis, design and implementation of the computer based materials management application [8].

By analysis is meant the process of noting relationships and aggregating the similar attributes of a particular variable and also the process of splitting a unit into its constituent components [9]. The research agrees with the contention of [10] that the factual information from the data is to be used as a basis for reasoning calculation and discussion [11]. It is also to be used as a basis for coming up with the summary findings, conclusion and recommendations to be done in the next section. It was found that all 50 respondents making 100% of them said that they applied the computer to the materials management function.

CROSS-TABULATED ANALYSIS

Table 1: The analysis of the objectives of the inventory control applications

Objectives	Frequencies	Proportion
To provide high quality services	17	0.34
To minimize the amount invested	20	0.40
To provide management information	13	0.26
Total	50	1.00

Table 2: The outputs of the inventory control application

The outputs	Frequencies	Proportion
Inventory control listings	10	0.20
Field orders	06	0.12
Back orders	05	0.12
Miscellaneous transaction data	04	0.08
Out of stock	02	0.04
Re-order level	03	0.06
Economic order quantity	09	0.18

Inventory control reports	11	0.22
Total	50	1.00

Source: From the questionnaires administered.

Table 3: The analysis of the inputs of their inventory control system

Objectives	Frequencies	Proportion
Accepted orders	20	0.40
Transaction date	10	0.20
Stock receipt notices	15	0.30
Miscellaneous inventory	05	0.10
Transactions	50	1.00

Source: From the questionnaires administered.

From Table 3 above, it is shown that the inputs are accepted orders, transaction data, stock receipt notices and miscellaneous inventory transactions. They have frequencies of 20, 10, 15 and 5 out of 50 respectively.

Table 4: The analysis of the type of data processing system

Type of data processing system	Frequencies	Proportion
Manual	10	0.20
Electro mechanical	15	0.30
Electronic	25	0.50
Total	50	1.00

Source: From the questionnaires administered.

From Table 4 above, it is shown that the types of data processing system are manual, electo-mechanical and electronic with frequencies of 10, 15 and 25 out of 50 respectively giving proportions of 0.20, 0.30 and 0.50 respectively.

Table 5: The analysis of the types of file

Types	Frequencies	Proportion
Inventory master file	26	0.52
Back order file update	24	0.48
Total	50	1.00

Source: From the questionnaire administered.

From Table 5 above, it is shown that the types of file are inventory master file and back order file update with frequencies of 26 and 24 out of 50 giving proportions of the total of 0.52 and 0.48 respectively.

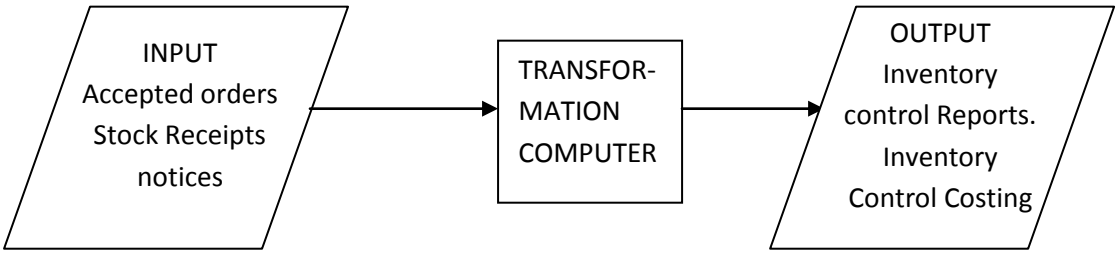

Figure 1: The general systems diagram of the inventory control application
Source: Adapted by the Researcher

From Figure 1 above, it is shown that the input are the accepted orders and the stock receipt notes, the transform is the computer and inventory control listings. From Figure 1 above, it is shown that at the point of minimum cost, the inventory holding cost is equal to the inventory ordering cost.

By equating them the economic order quantity is given as the FORTRAM Program of the E.O.Q model.

```
READ Co,    Ch,    Q.
INTER       D,
READ X,     Co,    Ch,    D.
Q      =    SORT[(2*D*Co)/Ch]
PRINT X, Q
END
```

Source: Adapted by the Researcher.

The data for the order cost, the holding cost and the quantity are read and E.O.Q is calculated as $\sqrt{\frac{2CoD}{Ch}}$ and the E.O.Q is printed.

It was found that 10% of the respondents said that the computer is applied to the materials management function and to the inventory control function in the Institute. It was found that the inputs of the inventory control system were accepted orders, stock, receipt notices, transaction data and miscellaneous inventory transaction in that descending order of magnitude. It was found that the database consisted of the use of inventory master file and back order file output. It was recommended that the administrators of the institute should continue to use computers for their inventory control to make for timeliness of operations.

Results

In this Research paper all the given objectives were achieved and this was done by ensuring that the six research questions were fully answered. The findings that 50 out of the 50 respondents said that they applied the compputer to their materials management and inventory control functions had the implication that it was possible to research on the computer application to materials management in the institution and this placed the research topic in context. The findings that accepted order was the inputs of the orders have to be properly documented to avoid having wrong inputs into the inventory control computerised system. The finding tha the constituent of the data base with the higher magnitude was the inventory master file had the implication that their file should be kept carefully for an effective data base management.

The findings that the type of data processing system mostly in use was the electronic data processing system had the implication that the system would have such advantages as speed, reliability, accuracy, mass storage, precision, security and indefatigability. The finding tha the output of the inventory control system with highest magnitude was inventory control report implied that the materials management managers in the Institute would have timely reports for their management meetings.

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