COMPUTERISATION IN

QUANTITY SURVEYING

~ *BY*

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APPROVAL PAGE

The text of this project work has been read and approved as meeting the requirement for the School of Science and Science Education, Department of Maths and Computer Science, Federal University of Technology Minna Nigeria for the award of Post Graduate Diploma in Computer Science.

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ABSTRACT

Computers are of vital importance to Quantity Surveyors and the reality of which has been showcased by this work on which platform a program to perform the traditional role of Quantity Surveyors has been developed. The program covers wall and roof elements of building works and runs in a Dbase IV environment for its users-friendliness.

The advantages of the program are tremendous having overcome the deficiencies often associated with manual approach to Bills of Quantities production.

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CHAPTER ONE

GENERAL INTRODUCTION

This work introduces computers, the profession of Quantity Surveyors, planning and design processes to writing a program for the primary role of Quantity Surveyors.

1.1 Introducing computers and the surveying profession.

Introducing computers, there is no doubt of the ever-increasing impact on our lives and therefore almost impossible to ignore. Almost everything are going on the computer with inescapable influence. The computer works on the basis of predetermined programmes of instructions.

The benefits of using computers may include the following:

(a) Accuracy

(b) Speed

(c) Retrieval of information

(d) Ability to handle complex problems

However, the usefulness of computers extend into many areas such as research, design, production, commerce and administration. The breakthrough of computerisation is therefore a great deal of achievement interms of better methods of performing repetitive and routine tasks more efficiently. The areas of application range from record keeping,

management information systems, information storage and retrieval, model simulation to computer-aided design.

The application of computers in Quantity Surveying provide modern techniques that are of betterment for exceptional skills which deliver results to the bottom line. Computerisation is therefore necessary for Quantity Surveyors if they are to keep abreast of modern techniques. Quantity Surveyors who rely heavily on their technical skill must now develop a stronghold of information technology skills to be able to face up to the challenges of the time because of the prediction of the next 10 years where computer technology will have completely de-skilled the technical role of the surveying profession. A lot can be learnt of the experiences of professional Quantity Surveyors engaged on PTF projects at the first inception. Infact, the brief of the project was gives out in diskettes to professionals. Quantity Surveyors relying on manual approach found this unusual simply because they lacked knowledge of modern approach. This set of not up to date professionals did not know what the diskettes given them were about; they were miserable until interpreted to them by computer consultants that the diskettes contained the technical information needed of them for the production of bills of quantities. Had they knowledge of computers then, they would have prepared their bills directly on the computers and food back to the PTF projects on e-mail which of course was expected of them. But this was

not the case! Instead, the drawings were printed out of the diskettes, their traditional role of producing bills of quantities were performed manually while only the typing aspect of the bills production was done on computers. Professionals without word processor in their offices got challenged and bought computers with the sole object of meeting up with modern operations. But again, only word processing or typing this set of purchased computers are used for. The reason being lack of enough knowledge of computers. Hence, this study provides an answer to the needs of Quantity Surveyors.

However, it is wise to include a brief account of the origin and practice of Quantity Surveying since its primary function of producing bills of Quantities is intended to be addressed of computers in this work. Practitioners of Quantity Surveying are called Quantity Surveyors and are experts of construction cost who are able to plan, check cost of project before, during and after the project and prepare bills of quantities and valuations etc.

The "Quantity Surveying as a practice came into being from the master builders trying to prepare bids for construction projects. Each builders employing a person or persons to help in calculating quantities and pricing various item or elements of the building works which finally will form the bid. As this process became more vigorous and elaborate, people started specialising in bid or tender documents for various

contractors to use in submitting their tenders. Instead of various contractors employing their own men to prepare these documents, it became more economical to use these specialists to prepare the documents for all contractors so that tenders might be submitted on equal basis. This is what gave birth to the practice of Quantity Surveying. The duty then, is to calculate various elements of works for easy pricing by estimator.

The first recorded Quantity Surveying practice came into operation around 1785 in Reading, England.

But today, through various re-engineering of the profession Quantity Surveying has moved from mere calculations of quantities to more pragmatic and pro-active ways of financial engineering of construction procurement and management process".

1.2 PROBLEM DEFINITION

The production of bills of quantities is one of the most important function of quantity surveyors. Other analytical activities of the profession start from the foregone. Therefore, this project seeks to write a program in Dbase language for the preparation of bills of quantities by Quantity Surveyors.

1.3 SINGNIFICANCE OF THE STUDY.

The study provides a frame work of concept of bills production using computers for Quantity Surveyors who still rely heavily on their

technical skills. It enables category of such surveyors to be able to appreciate and develop stronghold for computer technology in their work.

1.4   SCOPE OF STUDY

Quantity surveying through re-engineering has widen in scope of operation beyond calculations of quantities to a more pro-active ways of construction procurement and management process.

The scope of this project therefore, is limited to one of the numerous roles of the Quantity surveyor of today which is the calculation of quantities and subsequent production of bills of quantities.

1.5   DEFINITION OF TERMS

1.51   Bills of quantities

The bills of quantities is a document which describes and accurately represents the amount of labour, materials and possibly plants required in the execution of various items of works. A bill of quantities can be arranged in any of these formats

    (i)   Trade format

    (ii)   Elemental format

    (iii) Operational format

1.52   Tender document

Any of these documents required for the purpose of tendering: Article of agreement, conditions of contract, pricing notes and preambles, bills of quantities, tender drawings, tender form.

1.53 Standard Method Of Measurement Manual (Smm)

This is the main source of reference used by Quantity Surveyors which involves standardization principles it is a document which provides a uniform basis for the measurement of building works.

1.54 Management information

A system which may perform routine commercial processing functions but which is designed so that much processing will also produce information that will be presented to management including top management to assist in decision making. The implication is that the results will be produced speedily perhaps requiring real time processing, to enable management to ascertain the progress of the organization interms of satisfying its major objectives.

1.55 Real time processing

Real time is an expression used to refer to any system in which the processing of data input to the system to obtain a result occurs virtually simultaneous with the event of generating the data.

1.56 Model simulation

A representation of a system, device or process in a mathematical form as a means of solving problem of the system.

CHAPTER TWO

LITERATURE REVIEW

2.10 Standardisation of information

The syntax for the coordination of information systems by Quantity Surveyors entail a standardised structure for (a) method of measurement (b) descriptions of items (c) coordination of manual cum computerised methods of information presentation.

2.11 Methods of measurement by Quantity Surveyors

The guiding principles in measurements are laid down in the manual of standard method of measurement of building works (SMM). The general principle is that every item has three dimensions to its (length, breath, and depth). These dimensions could all be in the description wherein the unit of measurement will be number (Nr). A linear item will be an item where two of the dimensions are in the description and the remaining is in dimension. The unit of measurement of such item is the metre (m); where two are in the dimension, the other one must be in the description and the unit of measurement will be a square metre (m^2); all could be in the dimension column, the unit of measurement will be the cubic metre (m^3).

The above shall be fully illustrated later on under procedures of bills of quantities production in chapter 3.

After the calculation of quantities, the description is then framed to standard with reference to standard method of description.

2.12 Standardisation of Descriptions

The use of standard descriptions for the production of bills of quantities is achieved by arranging the constituent terms of any item description into graded structure with reference to the SMM. The following will illustrate the principle involved upon analysis of their graded structures.

Description 1:

"PLAIN INSITU CONCRETE (1:2:4/40mm AGGREGATE) FOUNDATIONS NOT EXCEEDING 150mm THICK IN TRENCHES"

Description 2:

"BRICKWORK IN COMMON BRICKS IN CEMENT MORTAR (1:3) REDUCED TO ONE BRICK THICK IN PROJECTIONS"

The graded structure of any items description consists of a number of "levels" each of which contains alternative words or phrases. The description "levels" are referenced below.

Level 1 – The main section heading (usually follows the SMM)

Level 2 – Subsidiary division within the main heading

Level 3 – Specification of materials and workmanship

Level 4 – Identification of work involved

Level 5 – Variables such as size and colour.

A number of phrases contained in each level of a description are interchangeable provided within the same level except at level 1 where such interchangeability is not allowed.

Level 1: Classifies description accordingly to the main section of the SMM such as:

(i)   Demolitions and Alterations

(ii)   Excavation and Earthworks

(iii)   Piling

(iv)   Concrete work

(v)   Brickwork and Blockwork

(vi)   Underpinning

(vii)   Rubble walling

(viii)   Masonry

(ix)   Asphalt works

(x)   Roofing

(xi)   Carpentry

(xii)   Joinery

(xiii)   Structural steel works

(xiv)   Metalwork

(xv)   Plumbing and Eng. Installations

(xvi)   Electrical installations

(xvii)   Plasterwork

(xviii)   Glazing

(xix) Painting and decorating

(xx) Drainage

(xxi) Fencing

From the foregoing level of classification, the following will apply:

Description 1 – CONCRETE WORK

Description 2 – BRICKWORK AND BLOCKWORK

Level 2: This second level classifies description into the subsection of the main section such as in

(a) Concrete work:

(i) Plain insitu concrete

(ii) Reinforced insitu concrete

(iii) Labour on concrete of any description.

(iv) Reinforcement

(v) Formwork to plain insitu concrete

(vi) Formwork to reinforced concrete

(vii) Precast concrete

(viii) Sundaries

(b) Brick and Blockwork thus:

(i) Brickwork

(ii) Brick face work

(iii) Brick work but entirely of facing bricks

(iv) Blockwork

(v) Damp proof courses

(a)   For concrete work such as

   (i)   Mass filling

   (ii)   Foundation

   (iii)   Ground beam

   (iv)   Machine bases

   (v)   Beds

(b)   For brickwork such items as

   (i)   Reduced to one brick thick

   (ii)   Brick on edge

   (iii)   Half brick thick

   (iv)   One brick thick

From the foregoing, the following will apply:

Description 1 – "foundation in trenches"

Description 2 – "reduced to one brick thick"

Level 5: This level identifies the variables involved such as size, colour, and weight.

(a)   For "concrete work" such items as over 300mm thick not exceeding 150mm thick.

(b)   For "brick work" such items as walls, skin of hollow walls, projection.

From the fore going, the following will apply:

Description 1- "not exceeding 150mm thick"

Description 2- "projections"

The entire level of description when integrated will give a full blown description which is given thus:

Description 1

CONCRETE WORK

PLAIN INSITU CONCRETE

NORMAL MIX 1:2:4/40MM AGGREGATE

Foundation in trenches

not exceeding 150mm thick.

Description 2.

BRICK WORK AND BLOCK WORK

BRICK WORK

COMMON BRICK IN CEMENT MORTAR (1:3)

Reduce to one brick thick.

Projections.

This standard of description illustrated above are based on the standard method of measurements and description of building work: The main source of reference by quantity surveyor being a document that provides a uniform basis fro the measurement of building work.

An example for a building format for the concrete work described above is given below:

(vi)   Sundaries

From level 2 classification, the following will apply thus:

Description 1 – PLAIN INSITU CONCRETE

Description 2 – BRICKWORK

Level 3: The third level of classification is concerned with the variations of materials and workmanship. For example, the materials and workmanship clauses as follows.

(a)   Concrete work covers such factors

    (i)   type of concrete such as normal, sulphate-resisting water-repellant, lightweight or insulating

    (ii)   Concrete mix such as 1:12, 1:3:6, 1:2:4

    (iii)   Size of aggregate such as 40, 20, 10mm.

(b)   Brickwork covers factors such as

    (i)   Common bricks, calcium silicate bricks, engineering bricks

    (ii)   Type of mortar, such as cement lime, cement

    (iii)   Mortar mix, such as 1:2:9, 1:1:6, 1:3

From the foregoing level 3, the following will apply:

Description 1 – NORMAL CONCRETE MIX 1:2:4/40mm AGGREGATE

Description 2 – COMMON BRICKS IN CEMENT MORTAR (1:3)

Level 4: This level identifies the work involved in the remaining portion of a description.

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No	Description	Unit	Qty	Rate	₦	k
	PLAIN INSITU CONCRETE					
	Concrete (1:2:4/40mm aggregate)					
1	Foundations not exceeding 150mm thick in trenches	M3				
2	Ditto exceeding 150mm but not exceeding 300mm thick do.	M3				
3	Ditto exceeding 300mm thick –do	M3				
4	Beds 125mm thick	M3				
5	Ditto 150mm thick.	M3				

The above is of a traditional bill format.

Notice please that when certain portion of a description repeat the content of a proceeding description, the traditional method of drafting such items is to use "ditto" or "do" to indicate the repetitive contents at the beginning and end respectively. But in the standard bill format, the content are so structured that the use of "ditto" or "do" becomes needless, see the format of a standard description bill below for clarity.

No	Description	Unit	Qty	Rate	N	K
	CONCRETE WORK					
	PLAIN INSITU CONCRETE					
	NORMAL MIX 1:2:4/40MM AGGREGATE					
	Foundation in trenches					
1	Not exceeding 150mm thick	M3				

2	exceeding 150mm but not exceeding 300mm thick.	M3			
		M3			
3	Exceeding 300mm thick Bed	M3			
	Beds	M3			
4	125mm thick				
5	150mm thick				

Above is a standard description bill format.

The advantage of the standard description include:

(1) The quality of the written communications is improved by the consistency of the standard terminology.

(2) The process of drafting and interpreting description are simplified.

(3) Comparism of work/item price and record becomes simple as in tender examination procedure.

(4) The advantages of having the work described in the same terms.

A library of standard description are adopted as a basis for computer systems. One method for this in the form of a program written to contain a library of all the possible items occurring in bills of quantities with such items having unique coded reference for storage in memory.

A library of description could be

(i)   Standard library

(ii)   Multiple library

In a standard library each item in the standard clause library represents a full description and therefore facilitate the use of numeric coding.

A multiple library can be of skeleton or articulated library; A library of skeleton description has the sub-library of words and phrases can be used to fill the gaps of the skeleton description; the articulated phrase library is composed of standard phrases that are so drafted to be interchangeable and interconnected. Each phrase is given coded reference and a description is built up by amalgamation of the coded references in a predetermined order.

2.13 The Code Structure For Standard Description.

The code structure is a key to data coordination and information retrieval. It is of unique identity with same references throughout the whole of the project document.

The object of code usage include the following:

(i)   Compressing information

(ii)   Increasing accuracy of transmission and interpretation.

(iii)   Enabling a variety of types of manipulation to be performed

Nevertheless, the following code types are used for manual or computer manipulations.

(a) Mnemonics codes

(b) Numeric and Alphabetic codes

(c) Binary code

While the advantage of using Mnemonic code is it's characteristics of being easily remembered, the numeric code enhances speed with less training because of it's position in the keyboard where as the alphabetic code has the advantage of being easily distinguished by humans than particular sequence of numbers, the binary code is suitable for information requiring a yes or no answer.

Illustrating the application of coding, the following with appropriate key will apply for instances.

(2-)   SUPER STRUCTURE

(20)   SITE SUPER STRUCTURE

(21)   External walls

(22)   Internal walls

(23)   Floors

Above shows coding of location or the building element of a description

E- concrete construction

F- Brick construction

Above provides some coding of construction using symbol A / Z

e-natural stone

f-formed [precast] concrete etc.

g-clay in general

Above again provides a further classification to indicate the resources [labour and materials] of the item. This is further amplified as follows

g- clay in general

g1. adobe; cobe, pise, [rammed] earth, moler earth e.t.c]

g2.fired clay

g3. faience clay (glazed fire clay, ceramics, terracotta etc).

A specific identity can be given to a general code thus;

g2. 1010- clay common bricks to Bs3921 part2 special quality

g2 .1020 –clay hollow blocks to BS 3912 part 2.chapter1 keyed for plaster

g.1030 – multi-coloured red rustic facing brick

There fore in a notation like [21] fg2 .1010

'[21]' will mean a location [external walls]

'f' will mean a construction [brick construction]

'g2' . will mean a material [fired clay]

'1010' will mean the specific identity of the material [clay common brick to BS 3921 part 2 special quality]

The above notation [21] Fig. 2. 1010 therefore signifies work in EXTERNAL WALLS OF BRICK CONSTRUCTION WITH CLAY COMMON BRICKS TO BS 3921 PART 2 SPECIAL QUALITY .

A further set of codes may be necessary to identity the particular job, block, storey, room, feature, trade, and activity as follows;

'CO 64' for the job contract

'A1' for Admin block [senate building]

B1 for school of science and science and science education.

B2 for school of postgraduate studies (theatre)

B3 for school of engineering

Above identities might apply for the construction of Federal University of Technology Minna. From the same above, if an item is part of a block housing the school of science and science education, the block code B1 will apply.

Below are identities in relation to storey or floor level of the block:

00   Basement

01   Ground floor

02   First floor

03   Second floor

04   Third floor

05   Fourth floor

If the item is on the ground floor, the reference is '01'.

Below will identity for item in relation to any subdivisions of any storey:

A0   General

A1   Admin Section

A2   Research section

If an item is applicable to a whole floor and not section of a floor, the reference is 'A0'.

Room code could be this:

300 General

301 Room 1 on the third floor

302 Room 2 on the third floor

303 Room 3 on the third floor.

Feature code would identify certain constructional parts such as wall or beams. For the purpose of illustration, assume the reference 'IP4' to be for an items of infill panels.

Trade code would identify the skill or trade required to execute the item. For the purpose of illustration, take this to be 'G01'.

Activity code would identify the activity to which the item belongs. Take this to be '036' for illustrative purpose.

Adding to the foregoing reference of the notation C064A101A0 303 IP4 G01 036, the complete code would appear thus:

(21) fg 2. 1010 C064 A1 01 A0 303 IP4 G01 036.

This complete code then signifies an item in activity number 36 involving work in external walls of brick construction forming an infill panel (1P4) of clay common bricks BS3921 part 2 special quality. The work is located at room number 303 on the ground floor of senate building of F.U.T Minna.

However, note that the nature of documents produced determine the type of code for computer use. The type of document used are:

(i)   Input documents

(ii) On-file document

(iii) Output documents

The input document are intermediate between the user and computer and are used as data input. The look-up time of referring to the code key should be minimal.

The on-file document consists of coded information stored on computer media that are intermediate between input and output. Such devices are magnetic tape, discs and drum.

The output document are product of the computer.

CHAPTER THREE

3.0 SYSTEM DESIGN

The manual preparation of the bills of quantities by quantity suveyor and the computer approach to bills of quantities preparation are items for discussion here in this chapter. However, the problem of manual approach is not left out being a basis for the computer approach.

3.1.0 MANUAL APPROACH

Bills of quantities used to be widely prepared manually.

The procedures include:

(1) Taking off quantities

(2) Checking waste calculations

(3) Squaring and casting out dimensions

(4) Checking squared and cast quantities

(5) Billing

(6) Edit bills

(7) Provide edited bills

Taking off Quantities:

Taking off quantities means picking of dimensions i.e. length, breath and depth from the architect or engineers reference drawing and then the subsequent booking of the dimensions in accordance with the standard of the profession of quantity surveyor on a specially ruled sheet called dimension sheet such as given below.

Typical dimension sheet.

The dimensions are booked in column 2, multiplied in 1 and the work item described in column 4.

Checking waste calculation:

The checking of waste calculation simply refers to the editing of all the arithmetics and multiplications carried out on the dimension sheet. The purpose of this checking is to see that errors in calculation are corrected.

Squaring and casting:

Squaring refers to the multiplication of the booked dimensions to arrive at quantities but casting is the summation of common quantities to establish that quantities for bill.

Checking squared and cast quantities:

After squaring and casting the quantities involved are properly checked. For instance, it is ensured that the unit of item squared and cast are what are required.

Billing:

The act of giving descriptions for each items of work to the relevant quantities and unit is referred to as billing. The process of billing could be based on the text of an old bill or on the manual of standard method of measurement of building work. The use of manual of standard method of measurement is best with users who know how to use it otherwise an old bill is quicker to use. With old bill items not relevant are striked out while appropriate quantities and units allocated to relevant descriptions of the old bill.

Edit billing:

The act of reading over what has been billed to ensure that no error of spelling, misplaced unit etc. do not find their way in the final text of the bill of quantities is called bill editing. The word editing explains it all.

Bills are verified or no error lest there is one. However editing could be the checking of the draft bill for error correction or could be the altering of the content of the bill to suite requirement.

Producing the bill:

The draft bill edited is typed out after all necessary correction of it. The new typed copy is also edited. If no error or nothing to correct, it is finally approved for use.

The editing of a bill is a worrisome one; the number of retyping for reason of error or alteration is a serious problem which could be addressed adequately by computers. Another area which could also be taken care of is the number of paper wasted during taking off, squaring and casting as before described.

3.20. COMPUTER APPROACH IN THE APPROPRIATION OF BILL QAUNTITIES

This would be discussed under the following:

0.010 Billing using standard description and code

0.020 Processing by computer.

.030 Print soft copy

.040 Edit copy

.050 Print out bill of quantities

.060 Code length and time of coding

Computerized Billing:

Billing as with computer is based on a library of standard description. The library is an organized description kept in a file. From the file the description of choice are selected and assembled.

The system of billing using computer also allows one the opportunity of creating one own description besides that of the library. For instance, certain phrases or descriptions required of an item of description may not appear at the standard library of description. These non-standard descriptions are called 'rogue items'. Spaces are kept between codes at all levels of description to allow for such possibility so that rogue description and standard description can be combined when coding of any of such description calling for rogue description.

A library of rogue description with related code reference can be prepared to act as extension of the standard library of description and both libraries read together. As an example, assume that the following item is required in a bill of quantities.

M^2 red rustic facing brick from supabrick co. In cement morter (1:3); one brick thick; whether struck pointing both sides; walls; Flemish bond.

The rogue is a level three articulated phrase which is red rustic facing brick from supabrick co. in cement moter. (1:3)

A rogue library is compiled by preparing rogue description sheet containing all relevant information.

Assuming the above description is an item in a rogue library and given the coding: G51, the description will appear as follows given GO

G6 G51 GA6.A G600

Level	Code	Description
1	GO	Brick work and Block work
2	GG	Brick work entirely of facing
3	G51	sand faced facing brick from supa brick Co. in cement morter (1:3)
4	GA6A	One brick thick; weather struck pointing both sides
5	G600	Walls, Flemish bond.

The asteric indicates the position of the rogue in description code.

The description at level 1,2,4,5 will be obtained from standard library of description while other level from rogue library.

The level which the rogue occupies in the description must not always be level 3 but could be level 1,2,4 or 5.

On completion of a description selection, such complete description is alloted a quantity value with appropriate unit of measurement. Item of complete description not given values of quantity are those of lump sum or prime cost.

The quantity value so mentioned is come by from the processing of the computer when appropriate dimensions inputed into the system are converted correctly which possibility is the result of the set of program given the system to work.

Computer Processing:

The preparing of a description with appropriate quantity and unit of measurement is a function of the image file created by the computer on a magnetic tape or disc after reading input data on to a file holding device. Storage with magnetic disc makes reference to description in the library easier.

The text of the bill items are built up the computer by reference to the code of the standard library of description or master library file. The code is examined and the appropriate library item selected.

Print soft copy and edit

Soft copy is the visually displayed output on the screen. The purpose of a soft copy is that of editing and correction. For this reason scrutiny is made of every record to ensure that possible errors that could have found there ways to the soft copy are corrected.

As in editing, alteration can be made on the content of the bill of quantities besides error correction.

A record may be corrected by insertion of appropriate one to super cede the original in which case the new item is coded exactly the same way as the original.

Print out bills of quantities:

After correction and or alteration of the content of the bill of quantities from the soft copy, the final copy of the soft copy is then rolled out in the printer.

'Print out' is a general term for the output from a printer; printed pages of the bills of quantities produced by a printer is an example of print out.

However, the bill of quantities printed out of the bill image file may be shown below as sample.

Code	No.	Description	Qty	Unit	Rate	Amount
DO		EXCAVATION AND EARTH WORKS				
DO1		Excavating				
X						
DO2 7	1	average 150mm deep, depositing in soil heap average 100.00m from excavation, on site	23	m^2		
DO2 7	2	average 200mm deep, deposition in permanent soil heaps average 100.00 from	23	m^2		

		excavation, on site.		
DE		Excavation		
D10		Excavation		
D10		Surface of reduced level		
G				
D10	2	average 150mm deep		
P				
D11		Trenches starting from reduced		
E		level		
D11		not exceeding 1.5m deep	5	m^3
7				
D20		Disposal		
D23		Surplus excavated materials		
X				
D20	5	back filling	20	m^3
4				
D24	6	spreading on site average		
G		100mm from excavation	17	m^3
D30		Surface treatment		
D32		Surfaces of ground		
1		leveling, compacting	23	m^2

3.30 CONSTRAINT:

Constraint with computer billing is in area of timing and length of coding. A technique known as short coding ofcourse has come to the aid of user of computer. Discussion on short coding is offered next.

Length of code and lengthy time for coding (Solution)

A technique known as short coding can be developed to solve the problem of lengthy code. The technique of short coding makes use of an existing job file that has been updated with bill reference during the production of a bill of quantities.

The content of the short code library will be a library code, variables for these items as set up for previous bills processed by computer. Each item is allocated a short code reference, which is translated by the computer into a full description code via the short code library. A full description is therefore generated from a shorter form of coding. For instance, the short code reference for 102MM x 150MM precast reinforced concrete lintel with one 12MM bar may be '0709' (item number), assuming the content of the code library are based on the job file for bill of quantities. Short code references are created by the numerical sequence established in the short code library.

Example, assume the item required is

8MM 102MM x 150mm precast reinforced concrete lintel

...................................one 12MM bar

The description code therefore could read

"S800 + 0709"

where 'S' = the nature of input

800 = quantity value of the description

+ = arithmetic value

0709 = the short code

Using an existing work description held on a file is another way out.

CHAPTER FOUR

IMPLEMENTATION

Introduction.

The emphasis here is to discuss the basis for the language for the sample program of the project.

4.1 Choice of Programming

Arriving at a suitable language, certain characteristics were used. These characteristics include among others:

1. The efficiency of the compiler

2. The ease of coding with the language

3. The availability of sub-routine

4. The type of processing to be executed

5. The familiarity of the language.

The "applications" of database management systems bear the above advantage. However, one of the packages of database management systems: dbase iv happens to be well equipped with two other modes besides program modes.

A. Assistant mode

The assistant mode provides an easy to use menu-driven interface that enables one to issue a command without an in-depth understanding of Dbase.

B. Command mode

Command mode require user of Dbase to have some understanding of Dbase because instructions are entered at the dot prompt and does not display help menu for most commands.

C. Program mode

The program mode allows one to store instructions in a program file and execute all of them by issuing one command.

The Dbase application enables speed of implementation to be achieved. Therefore, the program which has been developed to illustrate the production of bills of quantities have been enhanced by this advantage together with the use of a standard library of a bill held up on a file.

A library of a bill is a record composed of accumulated data description of a bill of quantities.

It follows that a program of database management system is one that enables one to record, organise, sort, rearrange, select, summarise, extract, report on and otherwise manage vast amount of data. This infact favours the Quantity Surveyor for the kind of processing associated with the surveying profession.

The data of a bill of quantities are kept in files and within each file is a collection of related data. The data are organised into rows and columns with each row making up a record. A column is known as a

field and its heading is referred to as field name. In a bill of quantities file for instance, the fields are usually folio, code, item description, quantity, unit, rate and amount.

The content of the field determines the field type. The usual field type are numeric, characters, logical, memo and date.

A numeric field contains numbers that can be the result of calculation.

A character field contain text, such as description.

A logical field contains a logical value "true or false" for decision making.

A memo field contains long strings of text

A date field contains a date value that can be added or subtracted from other date values for calculation of periods.

One other strong reason for considering Dbase iv for the program development is the field type produced by the database management system management as already given above.

CHAPTER FIVE

DOCUMENTATION AND CONCLUSION

The subject here will the scope and depth of the program including conclusion.

5.1 Documentation

The library of the descriptions and sample program developed has been limited to the following measurement of:

A. Wall

B. Roof

It does not include

(i)   Sub-structure

(ii)   Plaster work

(iii) Painting and Decorating

(iv)   Mechanical and engineering installation

(v)   Electrical installation

However, the documentation will be discussed under the following:

System installation

Customization

Using the system

System installation:

The process of installations of computer does not include the installation of the equipment alone but the development of all resources necessary for the processing centre as a whole including the program.

The implementation includes choosing the relevant hardware and applications to making the systems operational.

The introduction of the program which have been developed would include the installation of Extra Hardware facilities where necessary. For instance there is need to expand the storage capacity of the computer system to accommodate volumes of storage required to hold.

(A). The executive or compiler

(B). Programs necessary for the operations

(C). Raw data requiring processing

(D). Space for processing data

Sufficient memory storage however can be achieved by supplementing with auxiliary storage in the form of peripheral file-holding devices which may be used for recording the result of processing.

Customization:

Customizing is the modification of a standard hardware or software product to meet the needs of a specific user. On this background, the program has been written to produce quantities to two places of decimal.

Where special description not provided is identified it is

possible to add description of your own.

The language processor for use with the program is that of Dbase and therefore the developed program is runned on the Dbase environment.

Anybody trained on it can use the program.

Using the system

(i) Conversational format and system message.

The main menu shows option of choice. If any option is chosen e.g. view library of description, then the library of standard description is displayed.

(ii) New input entries

The addition of new descriptions follows the same pattern as the initiation control.

(iii) Amendment to program facilities

Amendment can be carried out carefully from the program and specification for reason of ease to make changes on the modules of the program structure.

5.2 CONCLUSION

The preparation of bills of quantities appears to be the principal use the Quantity Surveyor makes out of the computer which basic principle is to take advantage of the ability of the computer to store large amount of information with rapid retrieval facility. As it is, standard descriptions of construction works are stored and appropriate quantities are generated from the computer against such record levels of each descriptions of the image file resulting in the production of a complete Bill of Quantities.

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Chandor, A. (1970) Dictionary of Computers. Great Britain, pengium Book.

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Robert, A (1979) Principles of data processing. United State, John Wiley and sons. Inc.

APPENDIX (FLOWCHART)
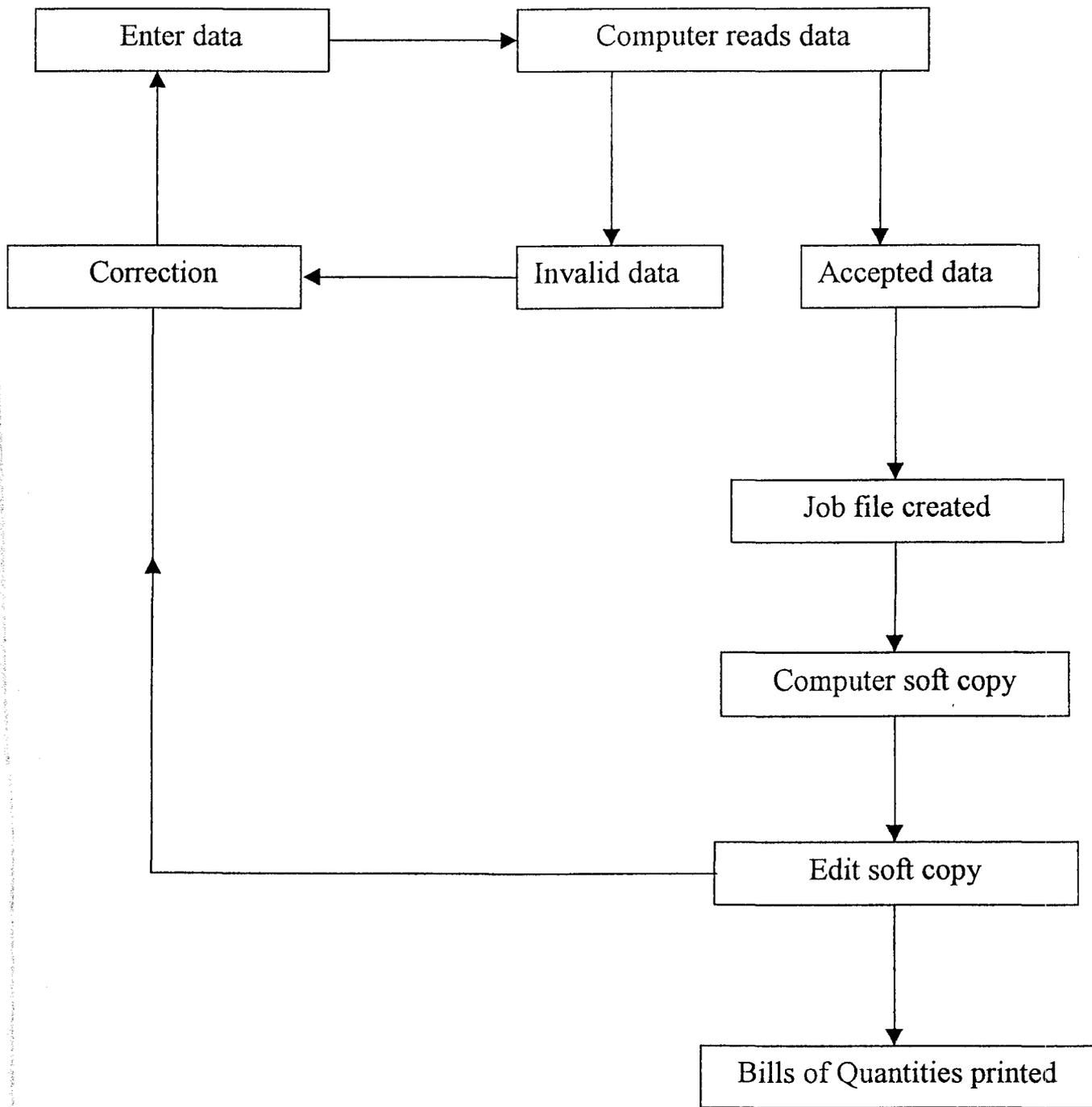
Fig. Procedure for the preparation of bills of quantities.

PROGRAM TO PREPARE BILL OF QUANTITY
==

```
+-------------------------------------------------------+
|  +-------------------------------------------------+  |
|  |              CONTROL PANEL                      |  |
|  | =============================================== |  |
|  |                                                 |  |
|  |  A.     View Library ...............ctr+m       |  |
|  |                                                 |  |
|  |  B.     Perform Calculation ...........         |  |
|  |           Wall    ....................          |  |
|  |           Roof    ....................          |  |
|  |                                                 |  |
|  |                                                 |  |
|  | =============================================== |  |
|  |         Close all Open files .......ctr+m       |  |
|  |                                                 |  |
|  |         Exit window ............... ctr+s       |  |
|  |                                                 |  |
|  +-------------------------------------------------+  |
+-------------------------------------------------------+
```

0

```
Enter: Length Of Wall:          10.00

Enter: Breadth Of Wall:          4.00

Enter: Height Of Wall:           3.00

Enter : Length Of Door:          2.10

Enter : Breadth Of Door:         0.80
```

```
    Quantity of wall =          82.32  Sq.m
                                =========
```

Enter: Length Of Roof: 12.00

Enter: Height Of Roof: 2.00

Enter : Width Of Building: 4.00

Quantity of roof =   82.28 Sq.m
                       =============

```
Henry\:>do pgNo
 Press any key to continue ..........
Henry\:>do pg
 Press any key to continue ..........
Henry\:>goto 3
FILE: Record No        3
Henry\:>repl quantity with 82.28,unit with 'Sq.m'
      1 record replaced
Henry\:>do pg
 Press any key to continue ..........
Henry\:>goto 8
FILE: Record No        8
Henry\:>repl quantity with 82.32,unit with 'Sq.m'
      1 record replaced
Henry\:>do pg
 Press any key to continue ..........
Henry\:>assist
     14 records added
 Press any key to continue ..........
Henry\:>assist
     14 records added
Henry\:>do pg
 Press any key to continue ..........
Henry\:>assist
     14 records added
Henry\:>do pg
```

ESCRIPTN	QUANTITY	UNIT	RATE	AMOUNT
OOF:	0.00		0.00	0.00
oofing:	0.00		0.00	0.00
orrugated longspan roofing sheet	82.28	Sq.m	0.00	0.00
	0.00		0.00	0.00
ALL	0.00		0.00	0.00
====	0.00		0.00	0.00
andcrete hollow block	0.00		0.00	0.00
50mm wall	82.32	Sq.m	0.00	0.00
	0.00		0.00	0.00
	0.00		0.00	0.00
	0.00		0.00	0.00
	0.00		0.00	0.00
	0.00		0.00	0.00
	0.00		0.00	0.00

View and edit fields

```
Structure for database: C:\OJFME\FILE.DBF
Number of data records:         14
Date of last update   : 09/02/00
Field   Field Name   Type        Width     Dec      Index
    1   DESCRIPTN    Character     110                  N
    2   QUANTITY     Numeric         6       2          N
    3   UNIT         Character       5                  N
    4   RATE         Numeric         7       2          N
    5   AMOUNT       Numeric         9       2          N
** Total **                        138
```

```
set status off
set scoreboard off
set bell off
set color to w+/b
clear
@ 3,20 say ' PROGRAM TO PREPARE BILL OF QUANTITY' COLOR R+/B
@ 4,15 SAY '===========================================' 

set border to double
define popup ass from 5,15 to 21,60
 define bar 1 of ass prompt '              CONTROL PANEL ' SKIP
 DEFINE BAR 2 OF ASS PROMPT
'===========================================' SKIP
 define bar 4 of ass prompt '  A.    View Library
...............ctr+m'
 define bar 6 of ass prompt '  B.    Perform Calculation
.............. '
 define bar 7 of ass prompt '              Wall
...................... '
 define bar 8 of ass prompt '              Roof
...................... '
 define bar 11 of ass prompt
'===========================================' skip
 define bar 12 of ass prompt '        Close all Open files
.......ctr+m'
 define bar 14 of ass prompt '        Exit window .............
ctr+s'
 on selection popup ass do qty2
 activate popup ass


      procedure qty2

        do case
          case bar () = 4
          clear
          browse
          @ 24,5
          wait ' Press any key to continue ...........'
        case bar () = 6
            *clear
            *DO calc
        case bar () = 7
           clear
           do pet
        case bar () = 8
         clear
```

```
       do det
       case bar () = 12
       use
       case bar () = 14    ..
       clear
       cancel
    endcase
@ 3,20 say ' PROGRAM TO PREPARE BILL OF QUANTITY' COLOR R+/B
@ 4,15 SAY '==========================================='
       RETURN



       * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

       procedure det
       store 0 to LRF,HRF,BWL
       clear
       @ 5,2 say 'Enter: Length Of Roof:'
       @ 5,30 get  LRF pict '999999.99'
       @ 7,2 SAY 'Enter: Height Of Roof:'
       @ 7,30 get HRF pict '999999.99'
       @ 9,2 say 'Enter : Width Of Building:'
       @ 9,30 get BWL pict '999999.99'
         read
          store sqrt(((BWL*BWL)/4)+ (HRF*HRF)) to qty
          store  (qty + 0.6) to BRF1
          store (LRF*BRF1*2) to Qty5
       clear
       @ 5,8 say 'Quantity of roof ='
       @ 5,28 SAY QTY5
       @ 6,30 say '============'
       @ 24,2
        WAIT 'Press any key to continue.......'
        clear
    return                  ..
    * * * * * * * * * * * * * * * * * * * * * * * * ! * * * * * * * * * * * * * * * * * * * *
       procedure pet         && Procedure calculating wall.
       store 0 to LWL,BWL,HWL,LDR,BDR
       clear
       @ 5,2 say 'Enter: Length Of Wall:'
       @ 5,30 get LWL pict '999999.99'
       @ 7,2 say 'Enter: Breadth Of Wall:'
       @ 7,30 get BWL pict '999999.99'
       @ 9,2 SAY 'Enter: Height Of Wall:'
       @ 9,30 get HWL pict '999999.99'
       @ 11,2 say 'Enter : Length Of Door:'
       @ 11,30 get LDR pict '999999.99'
       @ 13,2 say 'Enter : Breadth Of Door:'
       @ 13,30 get BDR pict '999999.99'
         read
```

```
        store   (2*(LWL+BWL)*HWL)-(LDR*BDR)  to qty7
     clear
     @ 5,8 say 'Quantity of wall ='
     @ 5,27 SAY QTY7
     @ 6,33 say '=========='
     @ 24,2
      WAIT 'Press any key to continue.......'
      clear
return
*********************************************

set status on
set bell on
set scoreboard on
```