DEVELOPING A PROJECT USING MICROSOFT ACCESS DATABASE

Case Study

Bukuma Information system

Due to your expertise and experience in system development, you have been hired to be the head of Information Technology (IT) at Bukuma Limited, a company that runs a supermarket. Your first task is to develop a computer based information system that would ensure that:

1. Stock control & monitoring is efficient and effective.
2. Customers’ orders are processed accurately within the shortest time possible and invoices sent in time.
3. Purchase orders are processed accurately in time to avoid delays in items delivery.
4. Data entry screens or forms are easy to use hence eliminating data entry errors.
5. Reports required by the management are generated within the shortest time possible.
6. Communication between the branches is efficient.
7. Company data & information is secure from unauthorized users and only certain company employees can access certain reports.
8. The overall operating cost is reduced by at least 40%.

By the end of the case study, we should have demonstrated how to:

1. Carry out the initial study.
2. Carry out fact-finding.
3. Define system hardware & software requirements.
4. Design a system using system & program flowcharts.
5. Construct a system that would allow:
   (a) Inputting of data through forms.
   (b) Updating, modification, and deletion of existing data.
   (c) Carrying out of input validation and integrity checks.
   (d) Search or filter specific records, query and retrieve specific records.
   (e) Generate various transaction reports.
   (f) Set up database security, menus and other startup options.
6. Come up with a good user manual.

Identification & definition of the problem.

The problem is to develop a computer-based transaction processing & stock control system that would:

1. Input & process data about business transactions, e.g., data about products, orders, etc.
2. Produce output in form of Invoices, pay vouchers, etc.
3. Produce a variety of reports that are to be used for managerial purposes, e.g., inventory levels, sales reports, payrolls, expenses, etc.
4. Carry out data maintenance, i.e., it should be able to update stored data.
5. Maintain the stock levels by automatically alerting the purchases department or the management when the items go below the reorder level.
6. Produce reports, e.g., summary reports showing total sales by category, monthly product sales & purchases reports.

The following project charter outlines the objectives, preliminary investigation report, and other issues that will be considered before embarking on system development:

**Project charter for Bukuma information system**

**Project name:** *Bukuma computerized information system*

**Team leader:** *Luis da silva, System analyst*

**Project objectives**

The project development team will develop new computerized information system that will support the operations of the company in order to realize the strategic vision for Bukuma products sales and delivery of customer services. It is anticipated that, the new system will provide highly integrated processes and services that will not only reach out directly to customers and suppliers but also increase internal operational efficiency.

Therefore, improving of the current system can result in the following benefits:

1. Corporate profits will improved by 10% through reduction of bouncing orders.
2. It will ensure improved customer services by efficiently managing stock levels.
3. It will improve employees’ morale due to better processing and management of operations.
4. It will improve internal decision support so that decisions are more reliable & made on time.
5. Support the competitive strategy of the business.

**Preliminary investigation**

Preliminary investigation and feasibility study of the current manual & the proposed system was done through:

1. Studying the organizational chart.
2. Quantifying work output against performance criteria.
3. Observing the behaviour of the employees.
4. Listening to external feedback from vendors, customers and suppliers.

By going through the investigative process, the team discovered the following problems with the current manual system:

1. The constantly changing products presented to the market have created many internal inefficiencies and customer services problems.
2. Increased customer base and sales through aggressive advertising may overload the current system’s ability to process transactions.
3. Unpaid orders have increased from 4% only two years ago to 12%. The current credit management system has to be improved.
4. Suppliers who have failed to deliver as per contracts have increased by 17% due to poor procurement procedures.
5. Competition from other companies threatens the survival of the company unless there is a change in management strategies.
6. Many orders are bouncing due to poor stock control. The orders that bounce are not given priority when new stock arrives.
7. The management is not exploiting the Internet as a marketing and service delivery channel.

Scope of the system
The proposed computerized system will support the following internal business functions:
1. Sales and customer order transaction processing.
2. Inventory control and procurement processing.

Recommendations for the new system
1. There is need to adopt automated data capture technology and methods, e.g., use of bar-coding as a means of capturing product stock records and sales, which is an automatic identification system currently being implemented in many modern business organizations.
2. Ensure that the order processing capacity of the unit is tripled by the end of fiscal year.
3. Reduce order response time by 50% by the end of fiscal year.
4. Provide improved marketing and promotion programs.
5. Improve any business processes, procedures and policies that have any visible impact on member satisfaction and complaints.
6. Provide improved follow-up mechanisms for orders and backorders.

Feasibility of the proposed system
1. Schedule: The system would take 9 months to develop.
2. The technology required to develop the new system is readily available in the market.
3. The system users are happy with the proposal to develop the new system.

Cost benefit analysis
(a) Costs: The entire development and operational costs can be estimated as follows:
   (i) Development - Ksh. 20,000,000
   (ii) Monthly operational costs - Ksh. 1,000,000
   (iii) Total lifetime of the new system - 5 yrs
        Total lifetime costs = 20,000,000 + (12 x 1,000,000) x 5
                           = Ksh. 80,000,000

(b) Benefits:
   (i) Profit from increased sales per month - Ksh. 100,000,000
   (ii) Savings from introduction of paperless mail - Ksh. 1,000,000
   (iii) Savings from reduced traveling costs - Ksh. 20,000,000
        Total monthly benefits = Ksh. 121,000,000
        Total lifetime benefits = (121,000,000 x 12 x 5)
                                = Ksh. 7,260,000,000

Conclusion
This report is intended to help the management to make decisions about undertaking the project. Although the development of the new system seems expensive, it will contribute positively towards corporate objectives when implemented in the future. It is cost-effective & beneficial to the company because its benefits will greatly outweigh (undo) the costs by billions of shillings throughout its operational lifetime.
Fact finding

The members of the system development team have been given the responsibility to carry out a detailed fact-finding activity through the following:

1. Documentations study.
2. Interviews.
3. Observation.
4. Questionnaires.

Documentations study

A number of manual documents were analysed. These include: Products catalogue, Invoices, Purchase orders, sales reports, etc.

Interviews

Various interviews were conducted which involved the management, employees in the company, customers and suppliers.

For each of the Interviewee, an interview guide was used.

Below is a sample interview guide used with one of the staff at Bukuma distributors.

<table>
<thead>
<tr>
<th>Interviewee name: __________________________</th>
<th>Interviewer: __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: ______________________________________</td>
<td></td>
</tr>
<tr>
<td>Time: ______________________________________</td>
<td></td>
</tr>
<tr>
<td>Place: ________________________________</td>
<td></td>
</tr>
<tr>
<td>Subject: ___________________________________</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Allocated</th>
<th>Interviewer Question or Objective</th>
<th>Interviewee Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 min</td>
<td>Objective - Open the interview.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Introduce ourselves</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Thank Mr. …… for his valuable time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>State the purpose of the interview – to obtain policies on an existing credit-checking system.</td>
<td></td>
</tr>
<tr>
<td>5 min</td>
<td>Question 1:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What conditions determine whether a customer’s order is approved for delivery?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Follow up</td>
<td></td>
</tr>
<tr>
<td>5 min</td>
<td>Question 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What are the possible actions that might be taken once these conditions have been evaluated?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Follow up</td>
<td></td>
</tr>
<tr>
<td>3 min</td>
<td>Question 3:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How are customers notified when stock is unavailable for their order?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Follow up</td>
<td></td>
</tr>
<tr>
<td>1 min</td>
<td>Question 4:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After a new order is received, approximately how long does it take to process it and put the order under shipment?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Follow up</td>
<td></td>
</tr>
</tbody>
</table>
Question 5:
Who are the individuals that perform the credit checks?
Follow up

Question 6:
May I please have permission to interview all the people who carry out credit checking?
Follow up
If so: When would be the best time to meet with each of them?

Objective – Conclude the interview:
- Thank Mr. …… for his cooperation and assure him that he will be receiving a copy of what transpired during the interview.

Questionnaires
In my preliminary investigation of the business operations, I decided to prepare some questionnaires that would help me seek some classified information without the respondent feeling threatened.

Below is an extract of one of the questionnaires used.

BUKUMA DISTRIBUTORS INFORMATION SYSTEM

Date: ………………………..

Introduction:
The IT department is in the process of developing a new information system. Please, take a few minutes to fill in this questionnaire and return it to the IT office before ………… (date)

1. How often do customer orders bounce due to lack of enough stock?
   - Very often   - Often   - Not often   - Not at all

2. After receiving an order, how long does it take to process it from reception to date of shipping?
   - I hour   - Several hours   - One day   - Many days

Fact finding summary & Recommendation report
A Fact-finding report gives a more detailed analysis of the existing system and proposals for improving or overhauling it altogether.
The following is a layout outline of the report.
System design phase
The design phase can be broken into two:
1. Preliminary design.
2. Detailed design.

Preliminary design
Preliminary design describes the functional capabilities of the proposed information system.
One of the tools that can be used at this stage to design the system is the System flowchart.
1). System flowchart

The system flowchart shows a general overview of the functionality of the computerised system.

The proposed system required for Bukuma distributors should be able to achieve the following:

1. Input & process customer orders which may be in form of electronic messaging, post or personal visit.
2. Produce output inform of reports that are used for managerial purposes, e.g., summary reports showing total sales by category, purchase reports, inventory levels, pay vouchers, sales reports & invoices.
3. Carry out data maintenance, i.e., it should be able to update stored data.

Bukuma distributors sales order processing system flowchart
Detailed design

After designing the system flowchart, it is possible to design the detailed designs for the various system functionalities. These include:

1. Output design.
2. Input design.
3. Files and data stores design.
4. Hardware & software requirements.

Output design

This is the design of both screen and printed output.

The output requirements for Bukuma system include: *Invoices, payment vouchers, and sales reports.*

*Invoices*

An *invoice* is produced after delivery of goods to a customer.

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**BUKUMA DISTRIBUTORS LTD**

*Industrial Area, Funzi Road Box 30307, Nairobi-Kenya*

*Phone: 257 – 020655147  Fax: 0206551418*

**Invoice**

**Bill To:**

<table>
<thead>
<tr>
<th>Company name</th>
<th>Postal code</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Contact name</th>
<th>Sent via</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Destination city</th>
<th>Date due</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Country</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Order number</th>
<th>Customer name</th>
<th>Order date</th>
<th>Required date</th>
<th>Date shipped</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product name</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Discount</th>
<th>Amount</th>
</tr>
</thead>
</table>

|                      |          |            |          |        |
|                      | Subtotal |            |          |        |
|                      | Freight cost |          |          |        |
|                      | Total     |            |          |        |

**Sales report**

*Sales report* gives a summary of sales made within a period of time such as weekly, monthly or annually.

Below is a sample sales report design.

---

**BUKUMA DISTRIBUTORS LTD**

Product sales for the year ___________

Category name _______________________

<table>
<thead>
<tr>
<th>Order ID</th>
<th>Customer name</th>
<th>Product</th>
<th>Amount</th>
</tr>
</thead>
</table>

|                          |          |         |        |
|                          | Total sales |         |        |
Payment voucher

A payment voucher is used to authorise payments to the suppliers.

BUKUMA DISTRIBUTORS LTD
Industrial Area, Funzi Road Box 30307, Nairobi-Kenya
Phone: 257 – 020655147 Fax: 02065551418

Voucher

Payment To:

<table>
<thead>
<tr>
<th>Supplier name</th>
<th>Postal address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact title</td>
<td>Region</td>
</tr>
<tr>
<td>City</td>
<td>Sent via</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Purchase ID</th>
<th>Supplier name</th>
<th>Date ordered</th>
<th>Date required</th>
<th>Date received</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Quantity delivered</th>
<th>Purchase price</th>
<th>Purchase discount</th>
<th>Amount</th>
</tr>
</thead>
</table>

Subtotal
Freight cost
Total

Input design

User interfaces in form of data entry forms or screens should be designed.

The forms for data entry should be clearly captioned, easy to use, attractive and consistent. Some of the forms needed for Bukuma system are: invoice processing entry form, products entry form, customer entry form, pay voucher processing entry form, suppliers entry form, and transporters entry form.

Products entry form

It should allow the user to enter or view products. It has the following controls:

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Quantity per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name</td>
<td>Selling Price</td>
</tr>
<tr>
<td>Supplier</td>
<td>Purchase Price</td>
</tr>
<tr>
<td>Category</td>
<td>Unit in stock</td>
</tr>
</tbody>
</table>

Customers entry form

This is a columnar form with the following controls:

<table>
<thead>
<tr>
<th>Customer ID</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company name</td>
<td>Region</td>
</tr>
<tr>
<td>Contact name</td>
<td>City</td>
</tr>
<tr>
<td>Contact title</td>
<td>Country</td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
</tbody>
</table>

Invoice processing entry form

This is a compound form used to enter customer details in the main form and the items purchased in the products subform:
Pay voucher processing entry form

This is a compound form that allows the user to enter supplier’s details in the main form and the items delivered in the products subform.

<table>
<thead>
<tr>
<th>Company name</th>
<th>Purchase Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Title</td>
<td>Freight charges</td>
</tr>
<tr>
<td>Telephone</td>
<td>Date ordered</td>
</tr>
<tr>
<td>Country</td>
<td>Date received</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product name</th>
<th>Unit price</th>
<th>Quantity</th>
<th>Discount</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suppliers entry form

It has two tabs; a company information tab & a Contact information tab.

Company Info tab
Supplier ID
Company name
Contact name
Contact title

Contact Info tab
Address
Country
City
Region
Postal code
Telephone
Fax

Transporters entry form

Entry form for companies offering transport services to Bukuma may have the following controls:
Freight Number
Company Name
Postal Address
Physical Address
Vessel Name
Phone
Files and data stores design

There are two methods of data storage in a computer: Flat files and databases.

In Bukuma Distributors Information System, the database system is used. This will ensure that, the following objectives are achieved:

1. There is sharing of data among the users of the system.
2. The data maintained is accurate & consistent.
3. Data is made available for current & future applications.
4. Easy access of data by the users.

Designing tables/file structures

This allows the system analyst to produce the data structure that will be used to store the data elements in the system. In our system, we will use records to store data elements of the various entities.

Before designing a file or a table structure, the following points but be considered:

1. The type of files to be constructed, i.e., is it a master, a transaction or a report file?
2. Method of data access in the file, i.e., it is random, sequential, or indexed sequential?
3. The size of the files & the storage media to be used.

Below are some of the file structures that will be designed for the Bukuma information system:

<table>
<thead>
<tr>
<th>Table/file structures</th>
<th>Elements</th>
</tr>
</thead>
</table>
| Inventory             | - Inventory number (PK)  
                          - Inventory name  
                          - Description |
| Products              | - Product number (PK)  
                          - Quantity per unit  
                          - Quantity in stock  
                          - Product name  
                          - Unit price  
                          - Purchase price |
| Customers             | - Customer number (PK)  
                          - Company name  
                          - Contact name  
                          - Contact title  
                          - Address  
                          - City  
                          - Country |
| Supplier              | - Supplier number (PK)  
                          - Company name  
                          - Contact name  
                          - Contact title  
                          - Physical address |
| Purchase orders       | - Purchase number (PK)  
                          - Product purchased  
                          - Quantity purchased |
| Sales orders          | - Order number (PK)  
                          - Customer name  
                          - Order date  
                          - Required date  
                          - Product ordered  
                          - Quantity  
                          - Unit price  
                          - Discount |
| Transporter           | - Transporter number (PK)  
                          - Company name  
                          - Physical address  
                          - Postal address  
                          - Phone |

Entity relationship (E-R) diagrams

Some of the entities that may be used in constructing Bukuma distributors Information system are categories, products, customers, employees, orders suppliers, transporters and purchase orders.

Below is an E-R diagram for customers and the products ordered.
Interpretation:
One customer may place several orders, but each individual order can be placed by only one customer (One-to-Many relationship).
Each order placed by a customer may contain many products (or, many products can be contained in one order).

Hardware and software requirements

After studying the detailed system design specifications and recommendations, the management of Bukuma decided to settle for a computer-based system.
Therefore, the hardware & software specialists in the development team visited various suppliers in major towns and brought quotations and price lists for most of the required hardware & software resources.
The table below gives a summary of the hardware requirements for Bukuma Distributors information system.

<table>
<thead>
<tr>
<th>Hardware facility</th>
<th>Example</th>
<th>Estimated cost (Ksh.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computer</td>
<td>IBM desktop computer</td>
<td>Documents collected from various suppliers’ quotations</td>
</tr>
<tr>
<td>2. Storage media</td>
<td>Optical disks, magnetic disks</td>
<td></td>
</tr>
<tr>
<td>3. POS terminal equipments</td>
<td>Wand reader, magnetic card reader, bar-code printer</td>
<td></td>
</tr>
<tr>
<td>4. Printers</td>
<td>Laser printer, Dot-matrix printer</td>
<td></td>
</tr>
<tr>
<td>5. Scanner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table below gives a summary of the software requirements for Bukuma Distributors information system.

<table>
<thead>
<tr>
<th>Software</th>
<th>Example</th>
<th>Estimated cost (Ksh.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GUI-based Operating system</td>
<td>Ms-Windows 9x, 2000, Me, Xp; Mac OS9, etc</td>
<td>Documents collected from various suppliers’ quotations</td>
</tr>
<tr>
<td>3. Antivirus software</td>
<td>Norton Antivirus, MacAfee, AVG antivirus</td>
<td></td>
</tr>
</tbody>
</table>

Constructing Bukuma information system

Design database tables that are related to each other via Primary & foreign keys.

<table>
<thead>
<tr>
<th>Table</th>
<th>Primary/foreign key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory</td>
<td>- Inventory ID, …</td>
</tr>
<tr>
<td>Products</td>
<td>- Product number (PK), Sales ID (FK), Inventory ID (FK), …</td>
</tr>
<tr>
<td>Customers</td>
<td>- Customer number (PK), Company name, …</td>
</tr>
<tr>
<td>Supplier</td>
<td>- Supplier ID (PK), Company name (FK), …</td>
</tr>
<tr>
<td>Purchase orders</td>
<td>- Purchase number (PK), Inventory ID (FK), Supplier ID (FK), …</td>
</tr>
<tr>
<td>Sales orders</td>
<td>- Sales ID (PK), Customer name (FK), …</td>
</tr>
<tr>
<td>Transporter</td>
<td>- Transporter number (PK), Supplier ID (FK), …</td>
</tr>
</tbody>
</table>
Setting up integrity constraints

After setting up the database, integrity constraints such as **Lookup fields & data integrity constraints** need to be set up in the database to enhance accuracy.

### Creating a lookup field

A **Lookup field** displays a list of acceptable values that may be entered into a field. This prevents entry of wrong data in a field.

**NB:** All foreign keys should be lookup fields.

**To create a lookup field:**

1. Open the table in **Design view**.
2. Select **Lookup wizard** in the **Data Type** column of the desired fields.
3. Complete the prompts in the lookup wizard.

   When the table is displayed in datasheet form (data entry mode), select an item from the drop-down list.

### Data integrity constraints

These are rules that govern the entering, changing & deleting of data and records in a database.

The following are types of integrity constraints:

(a) Entity integrity constraint.
(b) Referential integrity.
(c) Domain integrity.

#### Entity integrity

These are rules that govern the composition of a primary key.

A primary key:

- Cannot contain a null value. A **null value** is an empty space in a field that has no data.
- Must be unique.
- Does not allow duplicates.

#### Referential integrity

**Referential integrity** governs the nature of records in One-to-Many relationships between tables in a database.

E.g., all foreign keys in the child table must have a matching record in the parent table.
Referential integrity is implemented in 2 ways:

1. **Restricted database** – a restricted database will delete or update a parent record if there are no matching child records.
   A parent record is the one that has the primary key of the relationship, while a child record is the one that has the foreign key of the relationship in the second table.

2. **Cascaded database** – a cascaded database will delete or update/change all matching child records when the parent record is deleted or updated.

**Note.** To set referential integrity, display the *Edit Relationships* dialog box.

**Domain integrity**

In databases, the term **domain** is used to refer to the acceptable range of values an attribute can have. This ensures that no field takes on a value outside the range of valid values.

*For example:*

In the Purchase Orders table, the date of items received is always less than or equal to the current date.

This should be shown in the *Validation Rule* property box as: \(<=\text{Now}()\).* Now () is a function that returns the current date.

In the *Validation Text* box, you can type; *Date Received must not be in future.*

**Constructing data entry and user-interface forms**

Forms are mainly created to reduce data entry errors.

Forms can be grouped into 2 main categories namely; **primary forms** and **advanced forms**.

(a) **Primary forms**

These are forms primarily used to enter data into underlying tables.

They include; customers, categories, employees, products, suppliers, transport & employees details forms.

(b) **Advanced forms**

These are more complex forms that are based on underlying queries & unbound controls.

They provide the user with easy access to and manipulation of data in the underlying tables & other database objects.

**Creating the primary forms**

The main factors to be considered in creating primary forms are:

1. The general form properties, e.g., record source (i.e., the underlying table).
2. Control properties for each of the objects.
3. Command buttons and their underlying event procedures and codes.

**Customers form**

This is a columnar form that draws its data from the customers table.

The form has command buttons *Add Customers, Search, Close* and *Delete*. These buttons are brought to life by their underlying *event procedures*. The codes are generated using the command button wizard that automatically starts when you draw a command button on the form.

**Products form**

This is a single columnar form. The text box controls are populated with data from the Products table.
To operate the form, three command buttons have been used; *New Record*, *Close*, & *Delete*.

**Suppliers form**

The form is designed using the *Tab* tool from the toolbox. The form is populated with data from the Suppliers table.

The form has command buttons for adding a new record, closing a form, searching a record, deleting a record. In addition, it has an *Open Products Form* button, brought to life by the *OpenForm* wizard.

**Transporter form**

It is a single columnar form populated with data from the Transporter table.

The 3 command buttons are: *Add New*, *Delete* and *Close*.

**User-Interface forms**

These are forms that enable the user to access, manipulate, display, and print other forms and reports.

In Bukuma system, the *Main switchboard* is used.

**Creating reports**

Reports are used to present information to system users.

The main features to be highlighted in creation of reports are:

1. General properties of the report, e.g., data source.
2. Control properties, grouping, and event procedures.
3. The report in design view.
4. Layout of the report needed.

**Testing the system**

Individual system modules were tested using test data and found to work accurately and properly.

Sample test data and error messages that were encountered due to invalid data entry are given in the Appendix of this project report.

**Implementing the system**

*System implementation* involves putting the new system into use.

The tasks carried out during the implementation stage are:

1. System management: - This involves installation, resource and staff allocation.
2. Staff training: - it is done without interfering with the business operations.
3. Security control and contingency planning: - in case the system breaks down.
4. Changing over from the old to the new system using the most appropriate method.

**Evaluation report**

Once the system has been installed, and is running, the programming team must evaluate the system to ensure that it is working as expected.

The Evaluation report for Bukuma information system shows that, the following issues have been addressed:

1. Out of stock problems have been addressed satisfactorily.
2. Stock transfer between warehouses is running smoothly.
3. Store managers, Accounts clerks, and order processing managers feel that they are in full control of the system.
The programming team has promised to address the minor emergent problems encountered during the system maintenance phase.

**Recommendation and conclusion**
The new system received recommendation from all sectors of the organization after the first month of operation.

**User Manual**
Below is a sample user manual aimed at helping the users of Bukuma information system.

**Introduction**
Bukuma information system is a computerized information system that enables users to process business transactions more efficiently and accurately.

The system can help you prepare most of the documents that would otherwise take a lot of time to prepare manually. Some of the documents include: Invoices, Pay vouchers, Sales reports, Profit and Loss accounts, and many more.

**Loading the system**
To load the system:
1. Click the Start button, point to Programs, then click Bukuma System. A Log on dialog box is displayed.
2. Enter your User name and Password, and then click OK.

The System main menu appears.

**Menu descriptions**
Within the Main menu, there are submenus that help the user to choose on the specific tasks to process. These submenus are grouped into two:
1. Details processing submenus.
2. Viewing transaction reports.

You activate a submenu by clicking on its button.

**Description of the submenu items.**

a) **Customers submenu**
   Once you click the Customers button, you will get the following items:
   1. Customer entry and editing form.
   2. Customer orders and invoice processing.
   3. Preview and print invoices.
   4. Preview and print a list of Bukuma customers.

b) **Suppliers**
   This button displays the suppliers submenu with the options.
   1. Entering new records, editing the supplier details and products supplied.
   2. Processing purchase details for items below reorder level.
   3. Preview and print a list of Bukuma suppliers.

**Viewing transaction report submenus.**

a) **Sales reports**
   Clicking this button displays the sales dialog box from which you can select the report to preview or print.

b) **Purchase reports**
   Click this button to preview purchases made for each purchase order.
Exiting from the program
To exit the program, simply click the Exit button located at the bottom of the main menu.

Troubleshooting data entry related errors
Any invalid or erroneous data you enter will result to error messages being displayed on the screen. Some of the error messages that you may encounter are:

*Error message:* The changes you requested to the table were not successful because they would create duplicate values in the index, primary key or relationship.
*Description:* You are trying to enter the same item twice.
*Solution:* Avoid double entry.

*Error message:* The field Product ID cannot contain a null value because the required property in the field is set to true.
*Description:* You are trying to proceed to another record or field yet you have not selected the product name of the record.
*Solution:* Select the product before proceeding to the next record.

*Error message:* The value you entered isn’t valid for this field.
*Description:* You are trying to enter an invalid data type in the field, e.g., you are entering text in a numeric field or an invalid date such as 46/32/2007.
*Solution:* Enter the correct data type.

Project appendix
Below is a sample appendix of the project report.

Test data used in Bukuma information system
Although a variety of test data was used to test each operation of the system, I have provided only one test data table to prove that the system is properly functioning.

Products table

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soda</td>
<td>Beverages</td>
</tr>
<tr>
<td>3</td>
<td>Omo</td>
<td>Washing powder for washing</td>
</tr>
<tr>
<td>4</td>
<td>Maize flour</td>
<td>For Ugali</td>
</tr>
<tr>
<td>5</td>
<td>Milk</td>
<td>Dairy product</td>
</tr>
</tbody>
</table>

www.arena.co.ke  0713779527
Bibliography

Below is a list of books and reference materials used in developing Bukuma information system.


