TABLE OF CONTENTS

Sr. No.	Page Title				Page No.
1.	List Of Figures And Tables				3
2.	Introduction				5
	2.1.	Inventory			5
	2.2.	Types of inventories			6
	2.3.	Inventory control			7
	2.4.	Advantages of inventory control			8
	2.5.	Role of sales analysis in profit maximization			9
3.	Review Of Literature				10
	3.1.	Scope of the project			10
	3.2.	Prominent features of our software project			11
		3.2.1.	Bill generation		11
		3.2.2.	Accurate recording of daily sales		11
		3.2.3.	Calculation of reorder level and reorder quantity		12
		3.2.4.	ABC analysis feature for product classification		13
		3.2.5.	Effective and user friendly graphical user interface		17
	3.3.	Design and development methodology			18
		3.3.1.	Microsoft Visual Basic .NET		19
		3.3.2.	Crystal Reports		21
		3.3.3.	Microsoft SQL Server 2000		22
4.	Plan Of Work				24
	4.1.	Database Schema			25
	4.2.	Administrator's User Interface			27
		4.2.1.	Analysis		29
			4.2.1.1.	ABC Analysis	29
			4.2.1.2.	Product Comparison	31
			4.2.1.3.	Time line Analysis	35
		4.2.2.	Check Alerts		38
		4.2.3.	Client Registration		39
			4.2.3.1.	Create New User	39
			4.2.3.2.	Edit User Details	40
		4.2.4.	Product Information		41
			4.2.4.1.	Add New Product	41
			4.2.4.2.	Product Search	42
			4.2.4.3.	Product Update	44
			4.2.4.4.	Product Delete	46
		4.2.5.	Reorder Strategy		47
			4.2.5.1.	Add Supply Information	47
			4.2.5.2.	Search Supply Information	48
		4.2.6.	Vendor Information		50
			4.2.6.1.	Add New Vendor	50
			4.2.6.2.	Vendor Search	51

			4.2.6.3.	Vendor Update	53
			4.2.6.4.	Vendor Delete	54
	4.3.	Client Side User Interface			55
		4.3.1.	Billing Module		55
			4.3.1.1.	Login Screen	55
			4.3.1.2.	Billing Form	56
			4.3.1.3.	Printed Bill	57
			4.3.1.4.	Change of Password	58
5.	Testing And Results				59
6.	Conclusion				66
7.	References				67

1. LIST OF FIGURES AND TABLES:

Sr. No.	List of Figures	Page No.
1.	Bar Graph showing ABC classification example	14
2.	ABC classification example tables	15 ,16
3.	Database Schema	25
4.	Administrator's Home Form	27
5.	Menu items provided by the administrator home form	28
6.	ABC Analysis form showing product classification report	29
7.	ABC Analysis form showing analysis report	30
8.	Design and working of Product Comparison form	31
9.	Design of Comparison Report form	32
10.	Bar Graph Representation of Comparison Report	33
11.	Pie Chart Representation of Comparison Report	34
12.	Detailed Cubic View Representation of Comparison Report	34
13.	Time-line Sales Study form design	35
14.	Time-line report with daily comparison line graph	36
15.	Time-line report with sales comparison over months	37
16.	Alerts for Class 'A' and Class 'B' products	38
17.	Client Registration Form	39
18.	Message boxes in Client Registration Form	39
19.	Form for editing client details	40
20.	Message boxes shown while editing client details	40
21.	New Product Information Form	41
22.	Product Search Form	42
23.	Product Search Result Form	43
24.	Alert while updating the Product	44
25.	Message box indicating that the Update was successful	45
26.	Alert while Deleting the Product	46
27.	New Supply Information Form	47
28.	Supply Information Search Form	48
29.	Supply Information Search Result Form	49
30.	New Vendor Information Form	50
31.	Vendor Search Form	51
32.	Vendor Search Result Form	52
33.	Alert while updating the Vendor	53
34.	Alert while Deleting the Vendor	54
35.	Login Form of the Billing Module	55
36.	Billing Form	56
37.	Printed Bill	57
38.	Change of Password Form	58

Sr. No.	List of Tables	Page No.
1.	Test procedure: For valid administrator login	59
2.	Test procedure: For invalid administrator login	59
3.	Test procedure: For ABC analysis	59
4.	Test procedure: For Product comparison option selection	60
5.	Test procedure: For Time span selection in timeline comparison report	60
6.	Test procedure: For checking accuracy of comparison timeline reports	60
7.	Test procedure: For checking alerts for Class ‘A’ and ‘B’ products	61
8.	Test procedure: For valid client registration	61
9.	Test procedure: For invalid client registration	61
10.	Test procedure: For searching product	62
11.	Test procedure: For updating or deleting product	62
12.	Test procedure: For searching supply information	62
13.	Test procedure: For updating or deleting supply information	63
14.	Test procedure: For searching vendor	63
15.	Test procedure: For updating or deleting vendor	63
16.	Test procedure: For valid client login	64
17.	Test procedure: For invalid client login	64
18.	Test procedure: For bill generation item removal	64
19.	Test procedure: For bill generation item addition	65

2. INTRODUCTION

2.1. INVENTORY

Inventory can be defined in several ways as follows as given below:

- Inventory is the stock of physical items such as materials, components, work-in-progress, finished goods, etc., held at a specific location at a specific time.

- Inventory is the merchandise that is purchased and/or produced and stored for eventual sale.

- Inventory is a list of what you have. In company accounts, inventory usually refers to the value of stocks, as distinct from fixed assets. An inventory would include items which are held for sale in the ordinary course of business or which are in the process of production for the purpose of sale, or which are to be used in the production of goods or services which will be for sale.

- Inventory is a list of names, quantities and/or monitory values of all or any group of items.

- Any quantifiable item that you can handle, buy, sell, store, consume, produce, or track can be considered inventory. This covers everything from office and maintenance supplies, to raw material used for manufacturing, to semi-finished and finished goods, to fuel used to power equipment used in the business.

2.2. TYPES OF INVENTORIES

Depending up on the type of organization the inventory can be classified into two basic types. They are as follows:

1. Manufacturing Inventory:

It is the inventory maintained by a manufacturing organization.

Manufacturing Inventory consists of following three parts:

a. Raw Materials (RM) which are processed to manufacture the final product.
b. Work In Progress (WIP) which refers to the intermediate product which is obtained by processing the raw material but is not fully converted into final product.
c. Finish Goods (FG) that are the fully processed final products that are being manufactured and are ready to be dispatched.

2. Trading Inventory:

It is the inventory maintained by a trading organization with a purchase and sale business.

Trading Inventory consists of goods that are purchased from a supplier or manufacturer and sold to customers with a certain margin of profit.

In this case, the purchased goods do not undergo any further processing and are sold directly without any change of form.

The Trading Inventory is also referred as the term ‘Stock’.

2.3. INVENTORY CONTROL

The chief motive of an organization is **'Profit Maximization'**. Inventory is an essential part of an organization since it is one of the major factors that affect the profit earned by the organization. Hence controlling or managing inventory is one of the most important tasks necessary to achieve organizational goal of earning maximum profit and reducing costs and expenses.

Inventory Control is a technique of maintaining and monitoring the size of the inventory at appropriate level, so that the production and distributions take place effectively.

The main objective of inventory control is to achieve maximum efficiency in production and sales with the minimum investment in inventory.

Inventory Control is achieved by:

- Purchasing items at proper time and price, and in right quantity.
- Provision of suitable storage locations with sufficient space.
- Maintaining proper level of stocks.
- Adequate inventory identification system.
- Up-to-date and accurate record keeping.
- Appropriate requisition procedures.

2.4. ADVANTAGES OF INVENTORY CONTROL

Inventory control or management has several advantages as stated below:

1. Provides protection against fluctuations in demand and supply by monitoring the trends in demand and supply.

2. Ensures a better service to the customers by avoiding the out of stock situations by keeping a check on the minimum stock levels.

3. Helps to reduce risk of loss on account of obsolescence or deterioration of items.

4. Helps to reduce administrative work load in respect of purchasing, inspection, store-keeping, etc. thus in turn reducing manpower requirements, and consequently costs.

5. Helps to make effective utilization of working capital by avoiding its blockage in excess inventory.

6. Ensures to maintain a check against loss of materials through carelessness or pilferage.

7. Facilitates cost accounting activities.

Eliminates the possibility of duplication in ordering or in replenishing stocks by centralizing the source from where the purchase orders are issued.

2.5. ROLE OF SALES ANALYSIS IN PROFIT MAXIMIZATION

Inventory control is not all about managing stocks and ordering goods. But inventory control combined with efficient analysis tools can be truly effective as it can help us identify the trends in the demand for various products by carrying out various types of analysis.

This includes comparative study of sales as well as sales analysis concentrated on a single product.

Carrying out such analysis at regular intervals can help the shop manager to decide upon the future reordering strategies and taking some major decisions regarding purchase of goods.

3. REVIEW OF LITERATURE:

3.1. SCOPE OF THE PROJECT

APPLICATION OF INVENTORY CONTROL OR STOCK MANAGEMENT IN OUR SELECTED DOMAIN – A SUPER-MARKET

Inventory management or inventory control is a very useful technique for managing the stocks and sales records of a **Super-market** which is our selected domain of implementation for the software.

The super-market stores and sales various products which includes packed foodstuffs and drinks, milk products, glossary, decorative items, cosmetics and many other products of day to day use. It also stores some costly items like wrist watches, small electronic goods, artificial jewelry etc. Also there are some household goods like washing powders, cleaning equipments, gaskets etc. Managing all these products, sufficient stocks, sales records, also analyzing sales and reordering from time to time is a difficult job. To do it more effectively and correctly a better **inventory control** or **stock management** is required. This is provided by our software ensuring an efficient inventory control and rigorous sales analysis facility.

Our software helps to manage the daily sales records and assist in billing process as well. It also includes reordering level and reordering quantity and gives appropriate alerts, thus maintaining a safe stock.

The software also provides authorized users to perform sales analysis of various products. By providing this facility, our software will prove to be extremely useful to adjust the purchase and sales strategies leading to an increase in profit.

3.2. PROMINENT FEATURES OF OUR SOFTWARE PROJECT

- Bill generation
- Accurate recording of daily sales
- Calculation of reordering quantity and reordering level
- ABC analysis feature for product classification
- Effective and user friendly graphical user interface

3.2.1. Bill generation

This will be useful for carrying out daily transactions of the super-market.

A bill of items selected by the customer will be made and available stock count will be adjusted.

A receipt of sold items will be printed and given to the customer.

3.2.2. Accurate recording of daily sales

The software records an entry for each unit of a product sold on daily basis by maintaining a separate sales table.

The table contains the information about the number of units of a particular product sold on a given date.

Maintaining such a database enables easy analysis of past sales and studying the trends in market.

3.2.3. Calculation of reorder level and reorder quantity

The inventory level **R** in which an order is placed is called as ***reorder level***.

R = D.L

Where, **D** = demand rate in units per days/months
L = lead time in days/months

Another way calculation is,

R = (Maximum reorder period) * (Maximum usage)

The ***reorder quantity*** is the number of units of the product which must be ordered. It is denoted by **Q**.

Reorder quantity depends upon various factors like maximum capacity of inventory, reorder period etc.

Q = Maximum level of inventory – Reorder level –
(Minimum reorder period)*(Minimum usage)

When the inventory level of a particular item falls below the threshold R, the software will generate an alert message.

3.2.4. ABC analysis feature for product classification.

ABC analysis also referred to as the **Pareto analysis** is a method of classifying items, events, or activities according to their relative importance. It is also know as **Always Better Control analysis** since it provides the most optimum way of controlling inventory.

It is frequently used in inventory management where it is used to classify stock items into groups based on the total annual expenditure, or total stockholding cost of each item. It exercises discriminating control over different items of stores classified on the basis of investment involved. Organizations can concentrate more detailed attention on the high value/important items. Pareto analysis is used to arrive at this prioritization.

The first step in the analysis is to identify those criteria which make a significant level of control important for any item. Two possible factors are the usage rate for an item and its unit value.

The general ABC classification goes as follows:

A Class of items consist of only a small percentage about **5-15%** of total number of units handled by the stores but require heavy investment about **70-80%** of total inventory usage value because of their high prices or heavy requirement or both.

Paying more attention to A class items using sophisticated stock control system can give control of about 70-80% of total stock investment. Hence A Class items are controlled closely to avoid overstocking as well as shortage which may lead to a considerable loss.

These items can be ordered frequently in smaller quantities.

B Class items are relatively less important; they may be **30%** of total number of units managed by the stores. The percentage of investment required is about **15 %** of the total investment in inventory.

In case of B class items as the sum involved is moderate, the same degree of control as applied in A class items is not warranted.

The orders of the items belonging to this category can be placed after reviewing their situations periodically.

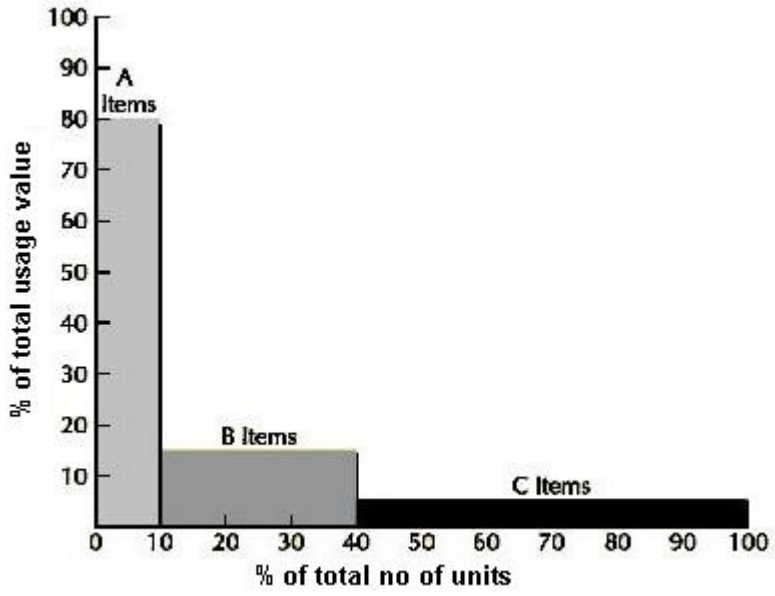

Fig. 1: Bar Graph showing ABC classification example

C Class items do not require much investment. It may be around **5-10%** of the total inventory usage value but they are nearly **50-60%** of the total number of units handled by the stores.

For C Class items there is no need of exercising constant control. Orders for C Class items can be placed after a relatively larger period of time with large quantities after ascertaining the consumption requirements.

ABC Classification example

Part	Unit Cost	Annual Usage
1	60	90
2	350	40
3	30	130
4	80	60
5	30	100
6	20	180
7	10	170
8	320	50
9	510	60
10	20	120

Fig. 2.A

From above information following parameters are calculated

Part	Value in Rs.	% of Total Value	% of Total Quantity	% Cumulative	Class
9	30,600	35.9	6.0	6.0	A
8	16,000	18.7	5.0	11.0	
2	14,000	16.4	4.0	15.0	
1	5,400	6.3	9.0	24.0	B
4	4,800	5.6	6.0	30.0	
3	3,900	4.6	10.0	40.0	
6	3,600	4.2	18.0	58.0	C
5	3,000	3.5	13.0	71.0	
10	2,400	2.8	12.0	83.0	
7	1,700	2.0	17.0	100.0	
Total	Rs.85,400				

Fig. 2.B

Finally using the ABC analysis method the items are classified as shown below

A Class	9, 8, 2	71.0	15.0
B Class	1, 4, 3	16.5	25.0
C Class	6, 5, 10, 7	12.5	60.0

Fig. 2.C

Advantages of ABC analysis

- The investment needed is minimized.
- The maintenance cost is minimized.
- Management time is saved.
- Work connected with the purchases is systematized.

3.2.5. Effective and user friendly graphical user interface

The software provides the user with an effective and easy to use graphical user interface.

It also has the feature of generating comparative sales reports in the form of pie-charts, bar graphs etc. for facilitation of the sales analysis.

3.3. DESIGN AND DEVELOPMENT METHODOLOGY

We have used Microsoft Visual Basic.Net for developing our front-end i.e. our Graphical User Interface (GUI) while our backend consist of Microsoft SQL Server.

- The Visual Basic.Net is used for programming the User Interface & coding.
- Crystal Reports for analysis report generation.
- SQL Server is used for database management.

The software has client-server architecture. In which SQL Server is running on the server and the client has Forms for making the Bill for the products purchased by the consumer.

The data (product info.) collected from client is transferred to SQL Server database. This data is processed on server and proper output (billing information) is given to the respective client. Every effort is made to make the software a User-friendly Application.

3.3.1. VISUAL BASIC.NET

Why Visual Basic.Net?

Visual Basic .NET, the next generation of Visual Basic, is designed to be the easiest and most productive tool for creating .NET applications, including Windows applications, Web Services, and Web applications.

All the User Interfaces of our project are developed using Visual Basic .NET. Visual Basic .NET uses fewer & less complex constructs (like pointers). Visual Basic .NET employs Windows environment for the User Interface. Visual Basic .NET uses common dialog boxes so that users can access the typical features they expect in a Windows application.

Visual Basic .NET programs are easier to maintain .If any part of the software is to be altered in the near future, then it can be done easily due to the use of Visual Basic .NET.

Varied Database Technology can be incorporated into Visual Basic .NET programs. It possible to provide external ActiveX controls.

Developing GUI(Graphical User Interface) in Visual Basic .NET is very easy because it makes many aspects of programming as simple as dragging graphic objects(like buttons, text box, etc) onto screen using a mouse.

Features of Visual Basic .NET

- Full support for Object Oriented Programming.
- Structured Error handling capabilities.
- Access to .NET Framework.
- Powerful unified Integrated Development Environment (IDE).
- Inherent support for XML & Web Services.
- Better windows applications with Windows Forms.
- New Console capabilities of VB.NET.
- Immense power of tools & controls (including Server Controls).
- Interoperability with other .NET complied languages.
- Better database programming approach with ADO.NET.
- Simplified Deployment of Windows applications.
- Enhanced security for the Windows Applications
- Improved versioning support.

(These are some of the major features of Visual Basic.NET; there are additional features also.)

3.3.2. Crystal Reports

Crystal Reports for Visual Studio .NET provides a comprehensive reporting solution for .NET developers that is thoroughly integrated with both the Visual Studio .NET IDE and the .NET Framework. It integrates seamlessly with the Visual Studio .NET Server Explorer, toolbox, and design environment. It has a rich programming model and flexible options for customizing and deploying reports.

Crystal reports can be used effectively for tasks such as generating Acrobat (PDF) documents from your reports, building reports on parameterized SQL Server stored procedures, and passing reports using the current user's database security credentials.

Crystal reports can be used effectively to generate accurate bar graphs, text reports, pie charts and many other types of graphical reports such as area graphs and 3-dimensional graphs.

3.3.3. SQL SERVER 2000

Why SQL SERVER 2000?

Microsoft SQL Server 2000 is a complete database and analysis solution for rapidly delivering the next generation of scalable Windows and Web applications. SQL Server 2000 is a key component in supporting e-commerce, line-of-business, and data warehousing applications, while offering the scalability necessary to support growing, dynamic environments.

The SQL Server manages the entire database part of our project. We are using SQL Server in our project instead of Oracle because it is cheaper than Oracle and gives all the features required for our project.

SQL Server 2000 includes rich support for Extensible Markup Language (XML) and other Internet language formats; performance and availability features to ensure uptime; and advanced management and tuning functionality to automate routine tasks and lower the total cost of ownership.

SQL Server can handle many request at a time, hence many clients can Query the SQL Server simultaneously.

Features of SQL Server 2000

- User-defined functions and Stored procedures.
- Indexed views.
- Distributed partitioned views.
- New datatypes and User Defined Datatypes.
- Cascading Referential Integrity(RI) constraints.
- Multiple SQL Server instances.
- XML support.
- Log shipping.
- SQL Server 2000 includes several components that improve the capability to build data warehouses that effectively support decision support processing needs.
- Support for .NET platform.
- Online backup.
- INSTEAD OF and AFTER triggers.

4. PLAN OF WORK:

The software is divided into three parts:

- Database
- Administrator’s User Interface
- Client Side User Interface

4.1. DATABASE SCHEMA:

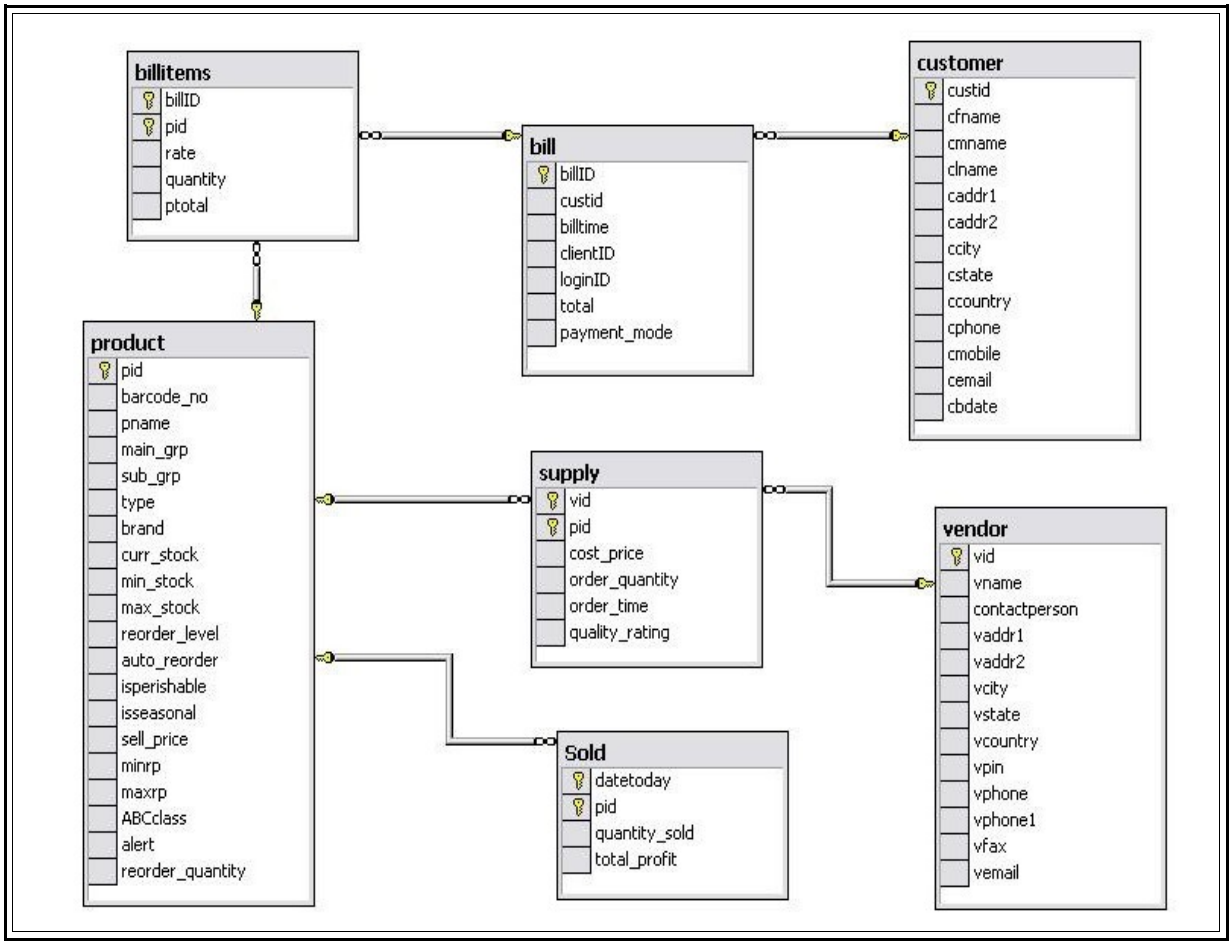

Fig. 3: Database Schema

Above figure gives the schematic representation of the project database.
It shows various data tables which represent various entities and their relationships. The tables along with their attributes are explained as follows:

1. **Product:** It stores the general information about each product in the inventory. Each entry is uniquely identified by the primary key **pid**. *Product names* and *brand* names are stored. Also, for better retrieval and for facilitation of analysis process the products are classified at several stages into *main group*, *sub group* and *type*. This table also stores valuable attributes like *reorder level, reorder quantity*, stock related attributes, *maximum reorder period* and *minimum reorder period* etc. which are essential for exercising inventory control. Product

table also records information about the nature of product such as perishable, seasonal etc.

2. **Vendor:** It is used to store the general information about the various vendors that supply products to the inventory. Each entry is uniquely identified by the primary key **vid.** It includes attributes like Vendor name, contact person etc. along with a composite attribute address consisting of several simple attributes that can be used as criteria to search a vendor from the table.

3. **Supply:** This table represents the relationship between the tables ***Product*** and ***Vendor***. Each tuple is uniquely identified by the union of foreign keys **pid** and **vid.** It stores important attributes namely, cost price, order quantity, order time and quality rating.

4. **Sold:** It is the data table which records daily sales for every product and serves as a basis for sales analysis. Each entry represents the number of units of a particular product sold on a particular date. Its primary key consists of **pid** and a date attribute named **datetoday.**

5. **Customer:** This table is used to record customer details. Primary key is **custid**.

6. **Bill:** It is used to store the basic data about a bill entity. Primary key is **billID**.

7. **Bill Items:** It is the relationship table between main tables Bill and Product. Primary key is formed by union of **billID** and **pid.** This table stores the number of units of a particular product sold within a particular bill. It also stores the custid to identify the customer.

4.2. ADMINISTRATOR'S USER INTERFACE:

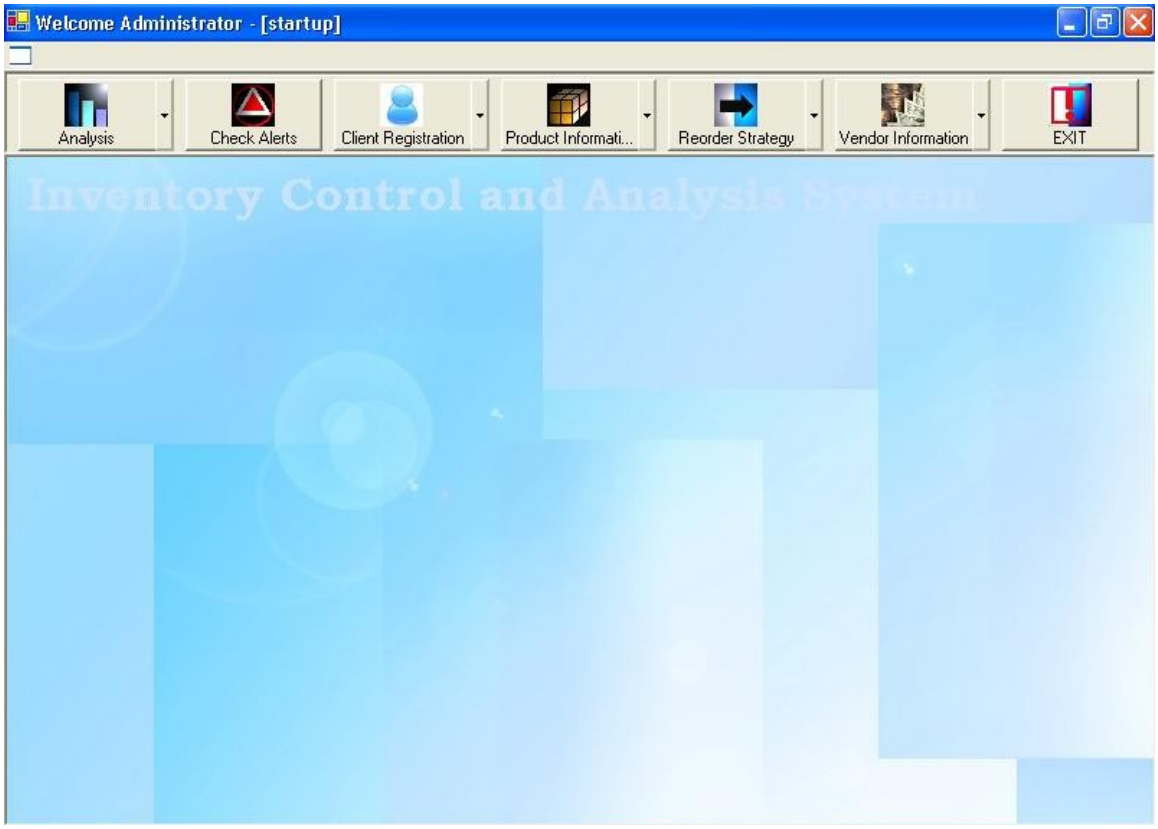

Fig. 4: Administrator's Home Form

When the administrator enters the valid username and password in the login form he will be directed to the form called 'Welcome Administrator'.

The layout of this form is as shown in the figure and consists of a toolbar having dropdown buttons, each having a menu consisting of menu items directing to the respective forms as shown in the figure below.

This form is a MDI Container and exploits Multiple Document Interface property provided by VB.net.

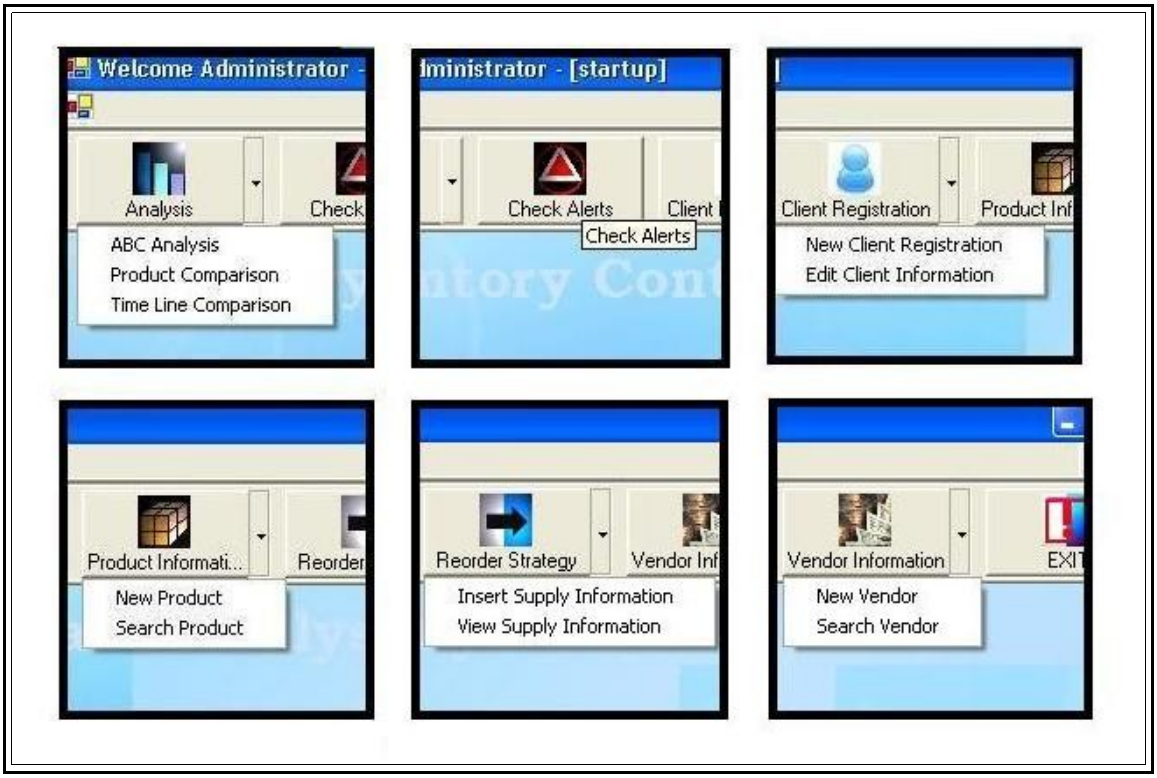

Fig. 5: Menu items provided by the administrator home form

4.2.1. Analysis:

4.2.1.1. ABC Analysis:

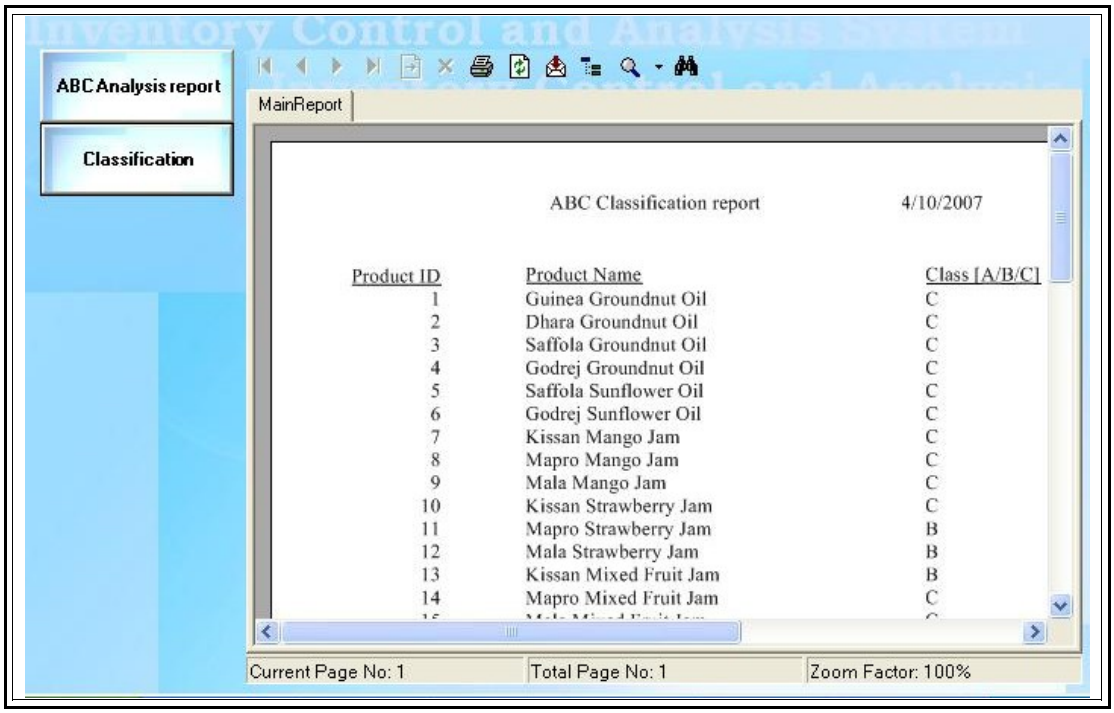

Fig. 6: ABC Analysis form showing product classification report

The design of form **'abc'** consists of a crystal report viewer and two push buttons.

The working mainly consists of two parts. Firstly, when the administrator wants to recalculate the classes for the products he clicks on 'Classification' button to get the new ABC classification calculated using the data from the sales record database. This report is loaded in the crystal report viewer as shown in above figure. This report gives the product ID, name and respective class of every product.

Secondly, the ABC analysis report document can be loaded in the report viewer by clicking on ‘ABC analysis report’ button. This helps in studying the sales value distribution of A, B and C classes, which follows the Pareto rule.

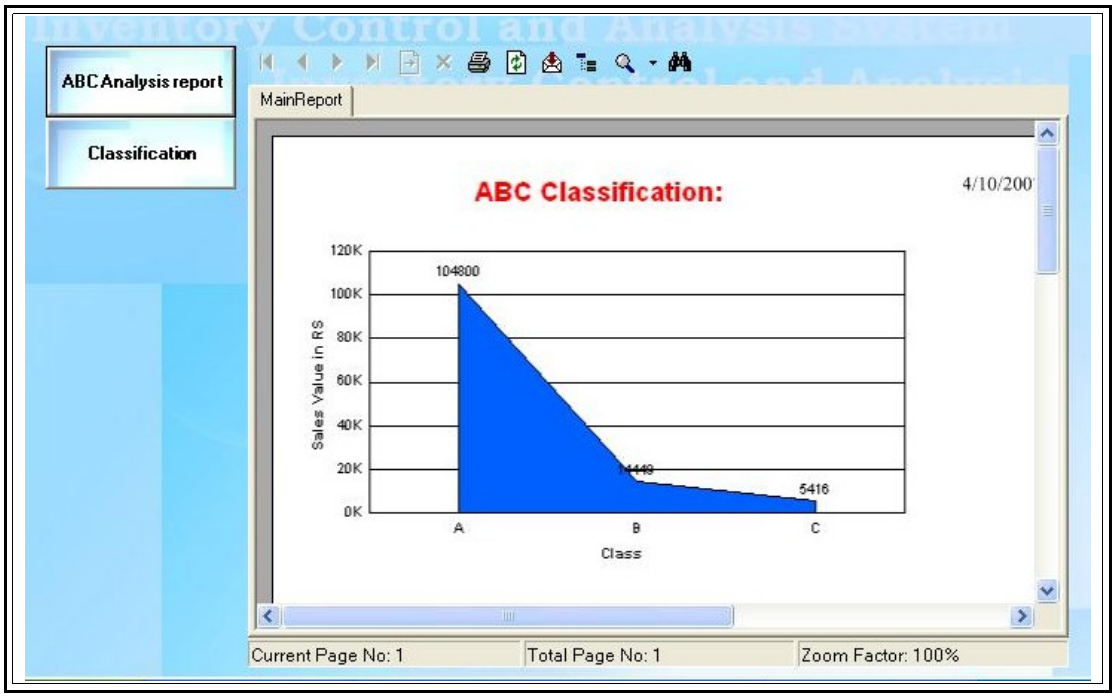

Fig. 7: ABC Analysis form showing analysis report

Area graph is used to display the sales value distribution effectively. This is shown in above figure where the graph shows the sales value distribution by means of the area shown by blue color.

4.2.1.2. Product Comparison:

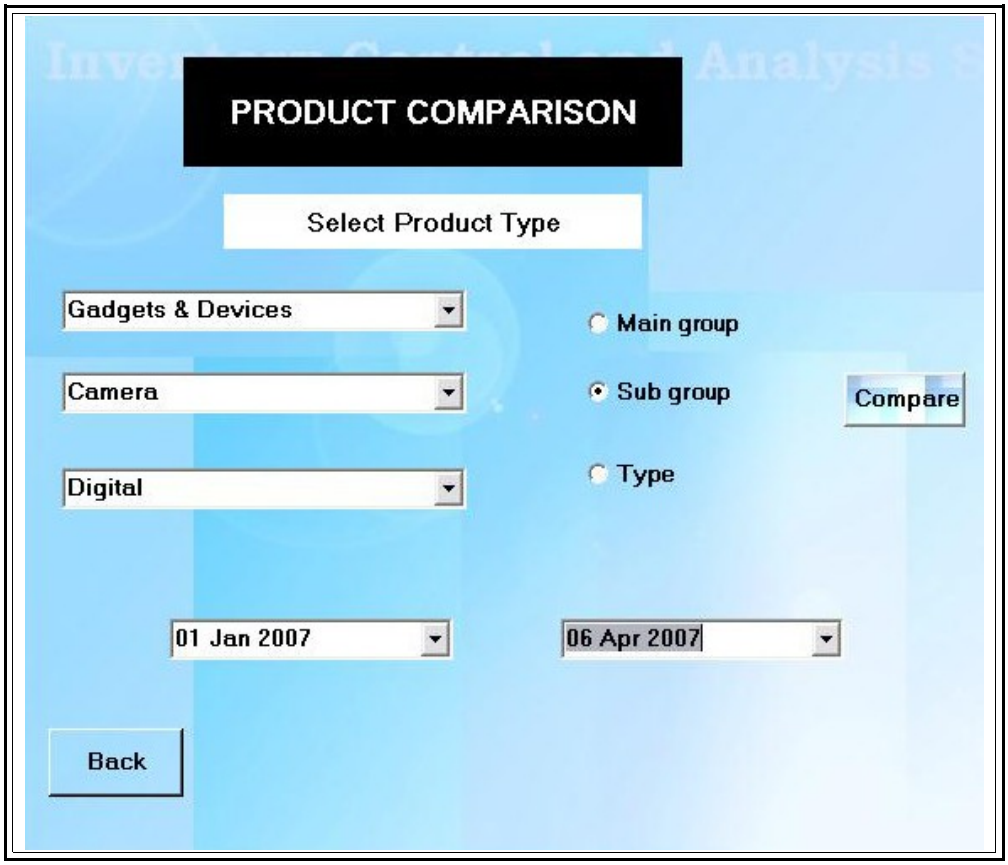

Fig. 8: Product Comparison form design and working

The form 'Product **Comparison'** allows the user to select products categorically to compare the sales within a specified period of time.

A product category such as a ***main group***, a ***sub group*** or a ***type*** is selected using the 3 combo-boxes which provide the user with appropriate values from the database for selection.

Similar combo-boxes are used to select the span of comparison by getting the start and end date from the user.

When the user makes the necessary selections and clicks on 'Compare' button, the application shows the **'Comparison Report'** form as shown in the figure below.

The comparison report form basically includes a Crystal Report Viewer component and a flat toolbar to select the type of report document.

Crystal Report Viewer allows the user to view the report document that is loaded. It also provides the facilities such as search, export, zoom etc. When the form is loaded the crystal report viewer is loaded with the textual report as shown in the figure below.

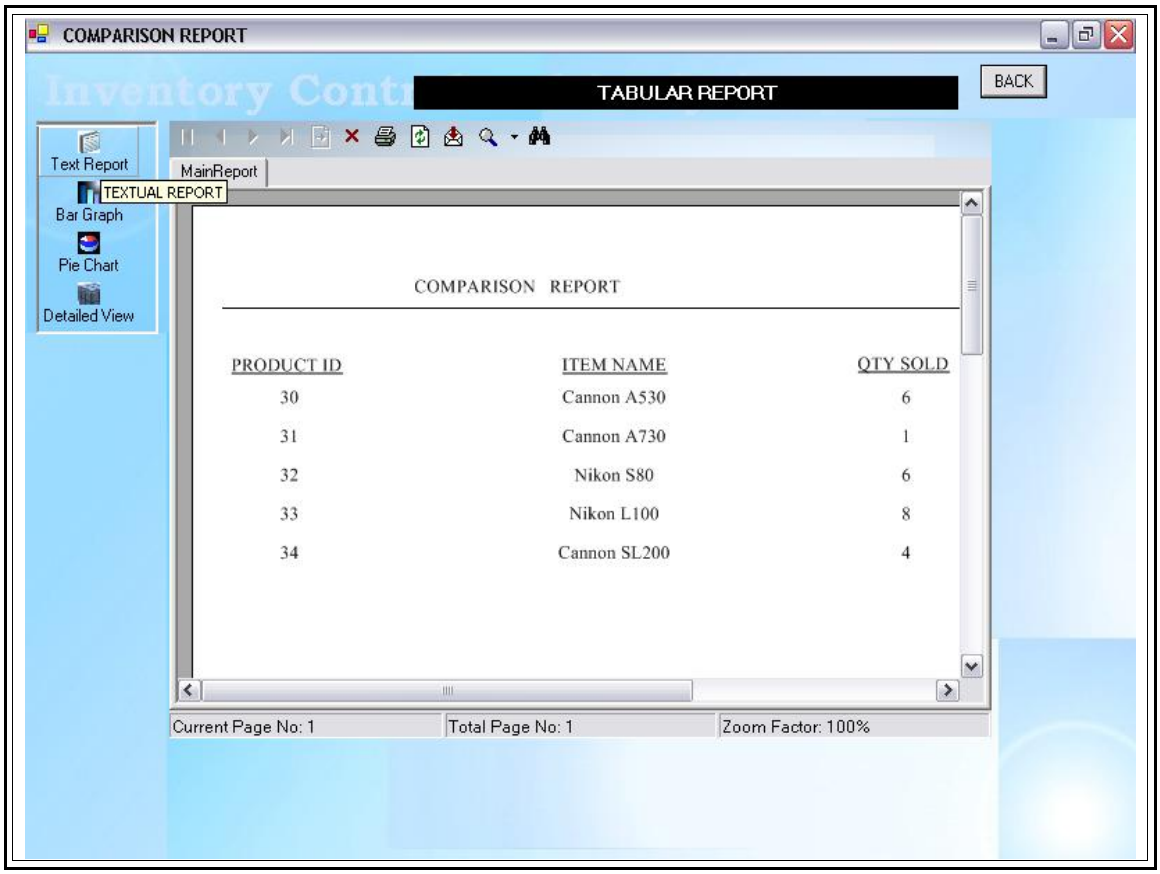

Fig. 9: Design of Comparison Report form

Using the buttons provided on the toolbar the user can select the type of report he wants to view. It may be a text report, a bar graph representation, a pie chart view or a detailed 3D view displaying the quantity sold of a particular product on a particular day. Following figures show the various types of the reports available.

These reports are generated using the Crystal reports which are provided with the Visual Studio.NET which facilitates generation of reports using the database or the ADO.net datasets used as a project data.

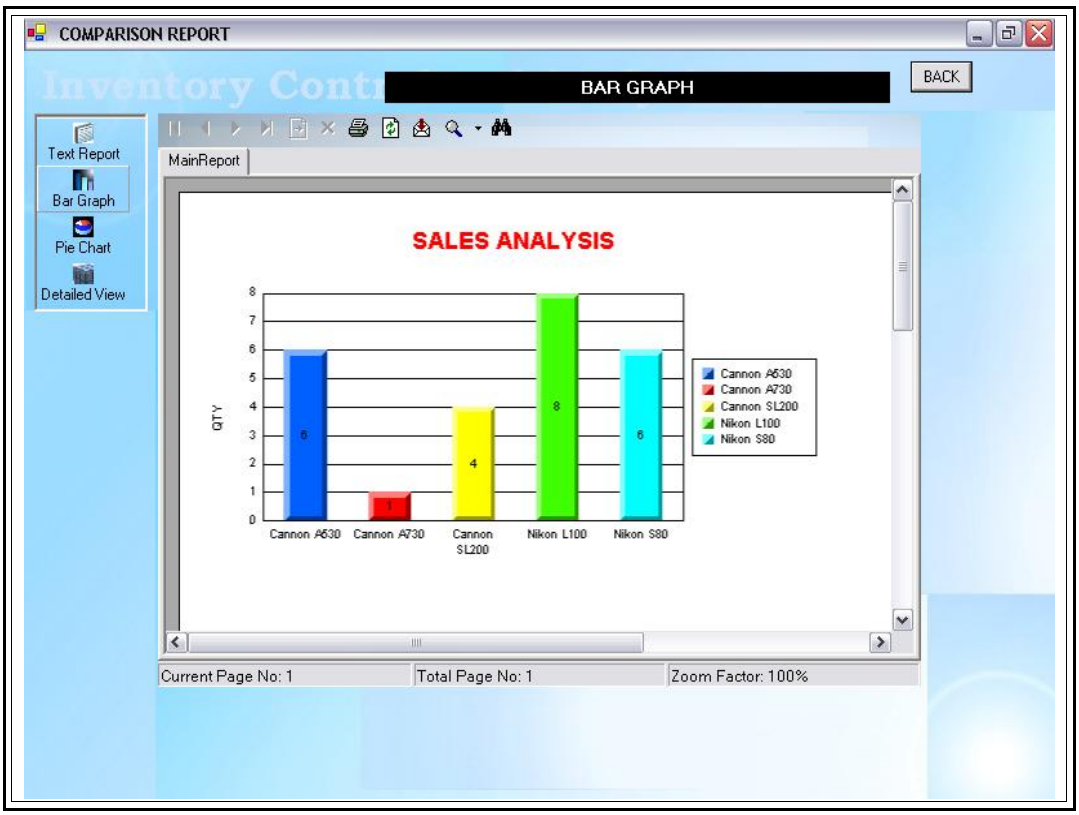

Fig. 10: Bar Graph Representation of Comparison Report

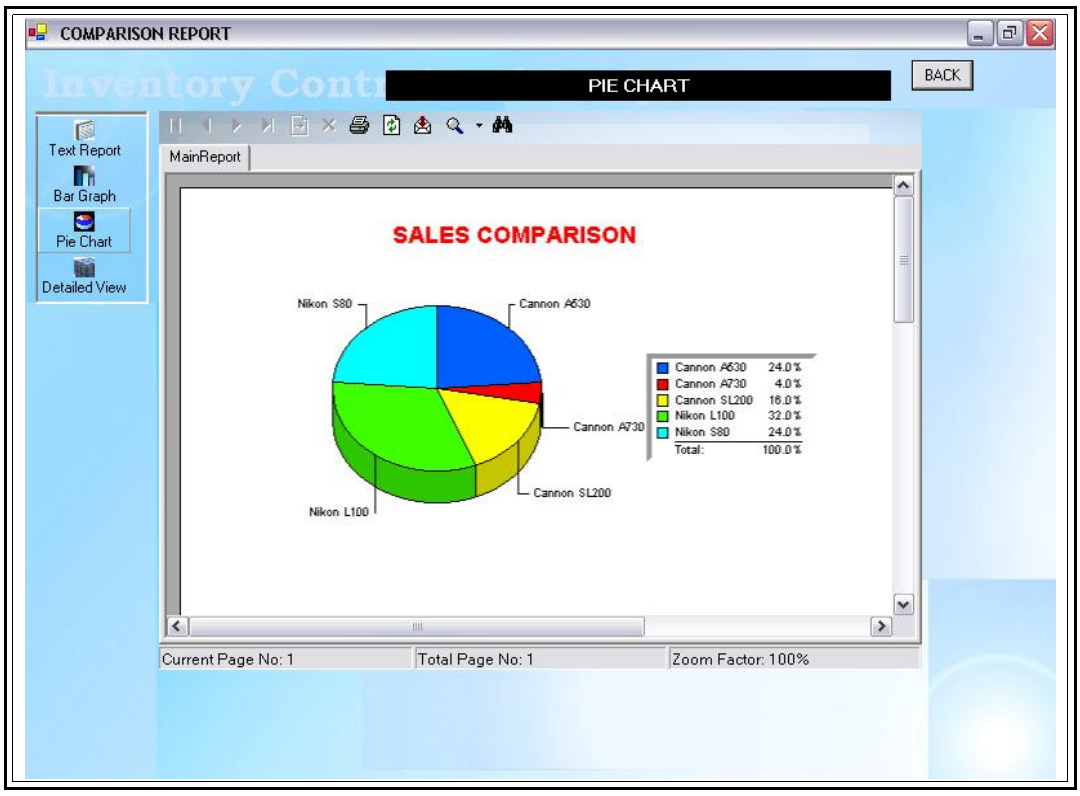

Fig. 11: Pie Chart Representation of Comparison Report

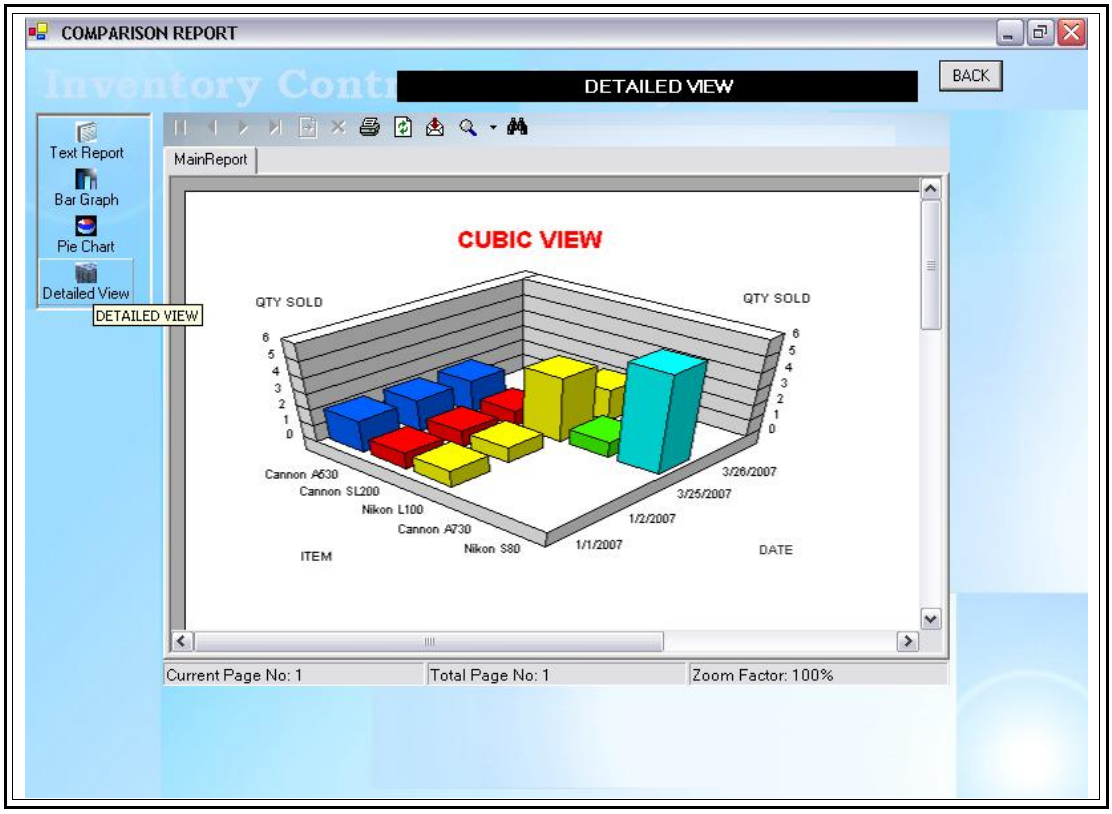

Fig. 12: Detailed Cubic View Representation of Comparison Report

These reports can be stored by exporting them into a non modifiable file formats such as a ‘pdf’ file.

4.2.1.3. Time Line Analysis:

This feature is provided to study the trends in the sales of a particular product over a period of time.

To start with, the user is shown the form in the figure below.

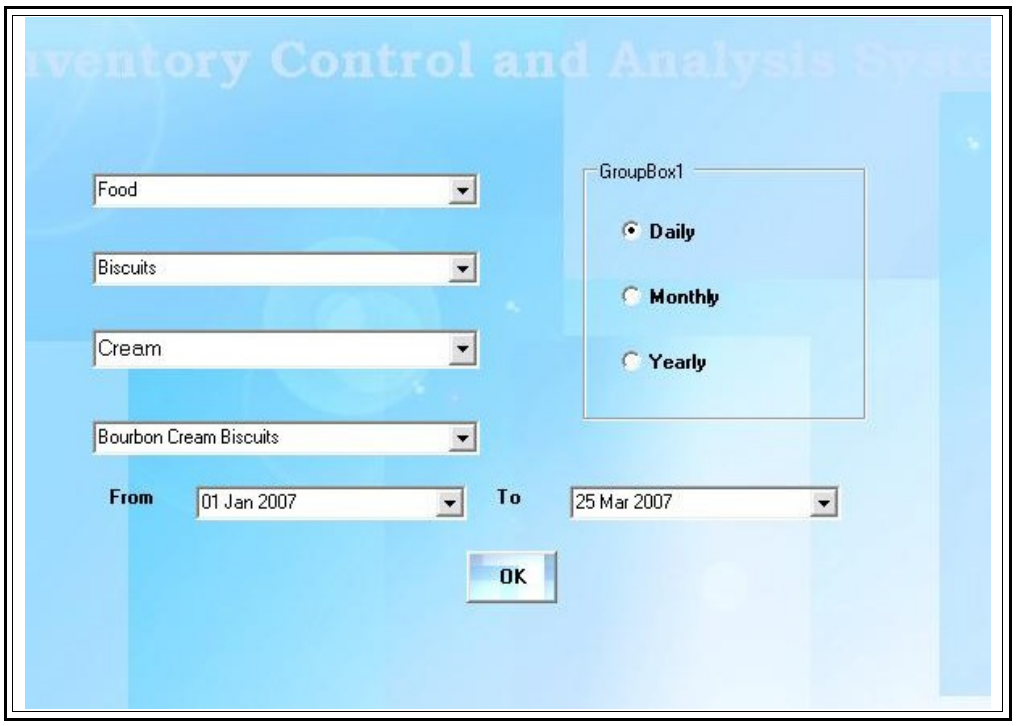

Fig. 13: Time-line Sales Study form design

The form has 4 combo-boxes for facilitating the user to select the product for which he wants to analyze the sales.

Secondly, the user is also asked to select the time period to be considered. A group of radio buttons is used to get a choice among daily, monthly and yearly sales comparison. When ‘OK’ button is clicked the queries are fired at the sales database and the reports are generated using their results.

The reports are displayed in the next form named ‘Time line report’. It has a Crystal Report Viewer in which the report document is loaded. The following

figures show the generated reports in the form of a daily sales line graph and a monthly report.

Fig. 14: Time-line report with daily comparison line graph

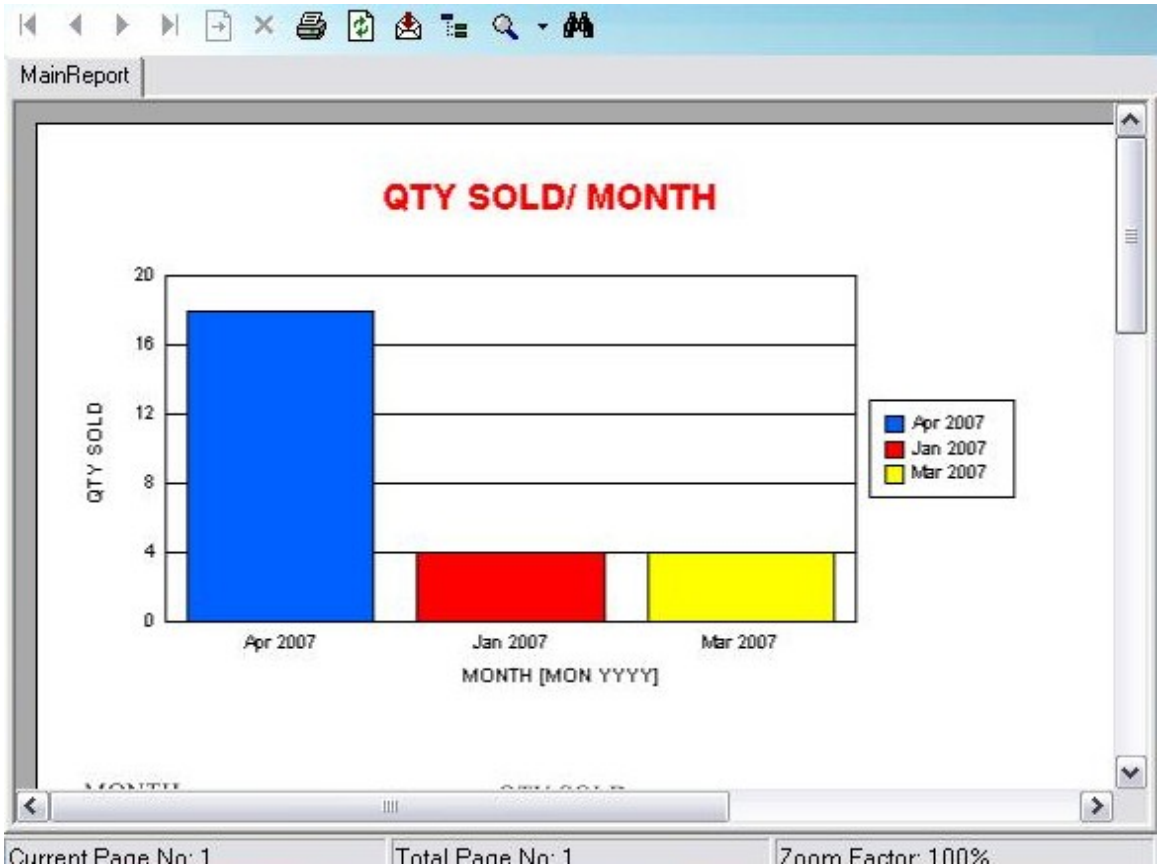

Fig. 15: Time-line report with sales comparison over months

4.2.2. Check Alerts:

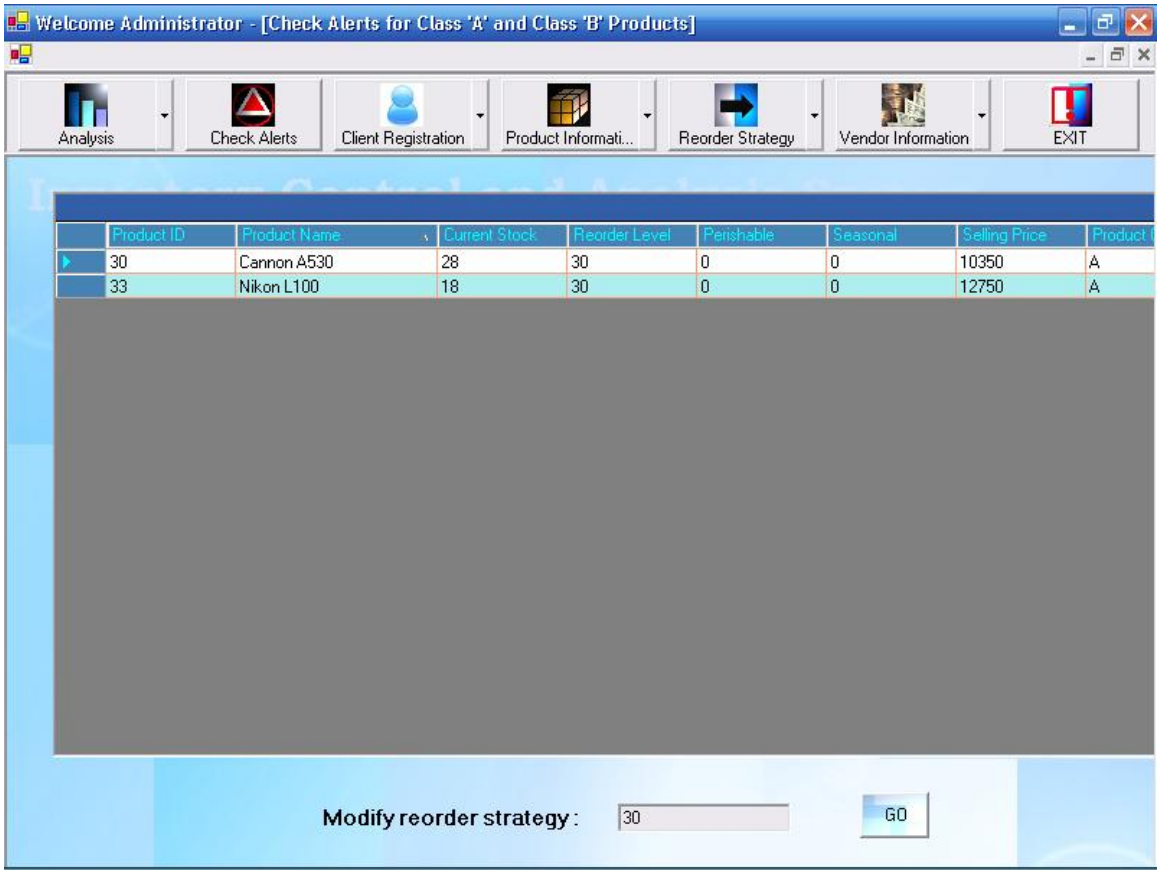

Fig. 16: Alerts for Class 'A' and Class 'B' products

Administrator can check for the alerts regarding Class 'A' and Class 'B' products whose current stock has gone below their currently assigned reorder level. These alerts are fired by a trigger at the back-end which continuously monitors the current stock of all the products. Alerts for Class 'C' products are not given since these products can be dealt with automatically by the software and do not need intervention of the administrator.

Administrator can modify reorder strategy for such products, if desired. When administrator selects a product from the alert grid, he/she is redirected to the supply information form where he/she can modify the reorder strategy of that particular product with respect to various vendors.

4.2.3. Client Registration:

4.2.3.1. Create New User:

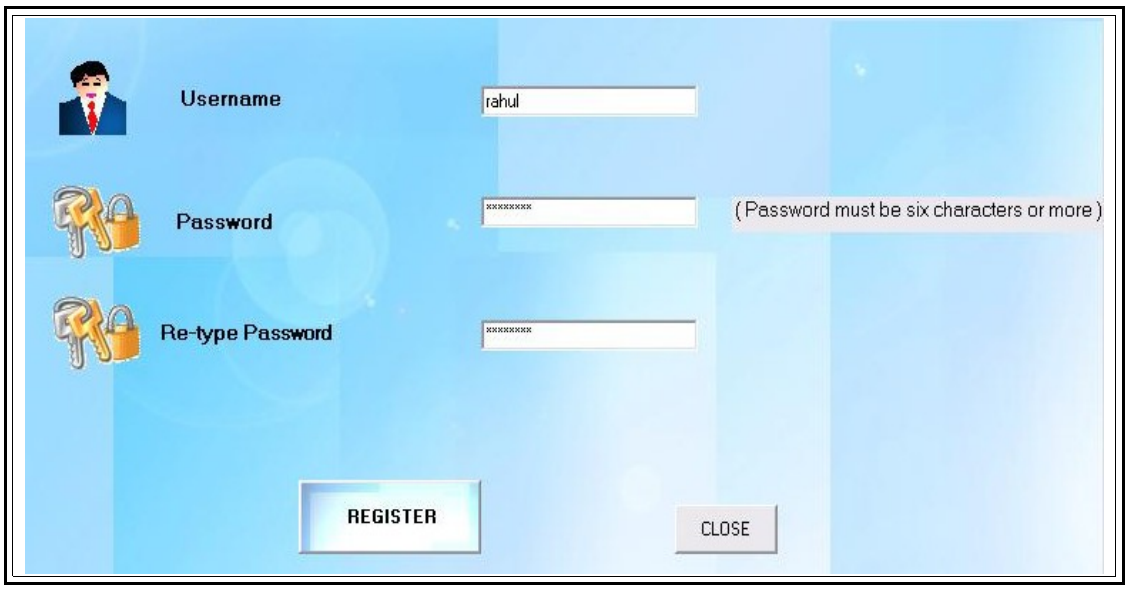

Fig. 17: Client Registration Form

In client registration form, there are 3 textboxes for entering username, password and confirming the typed password. After validating the entered text, a message box is displayed to confirm the registration activity.

Once, administrator confirms it, a message box is displayed to indicate that new user has been registered successfully. Now, the sales person can logon at the client side using the new username and password and access the billing module.

Fig. 18: Message Boxes in Client Registration Form

4.2.3.2. Edit User Details:

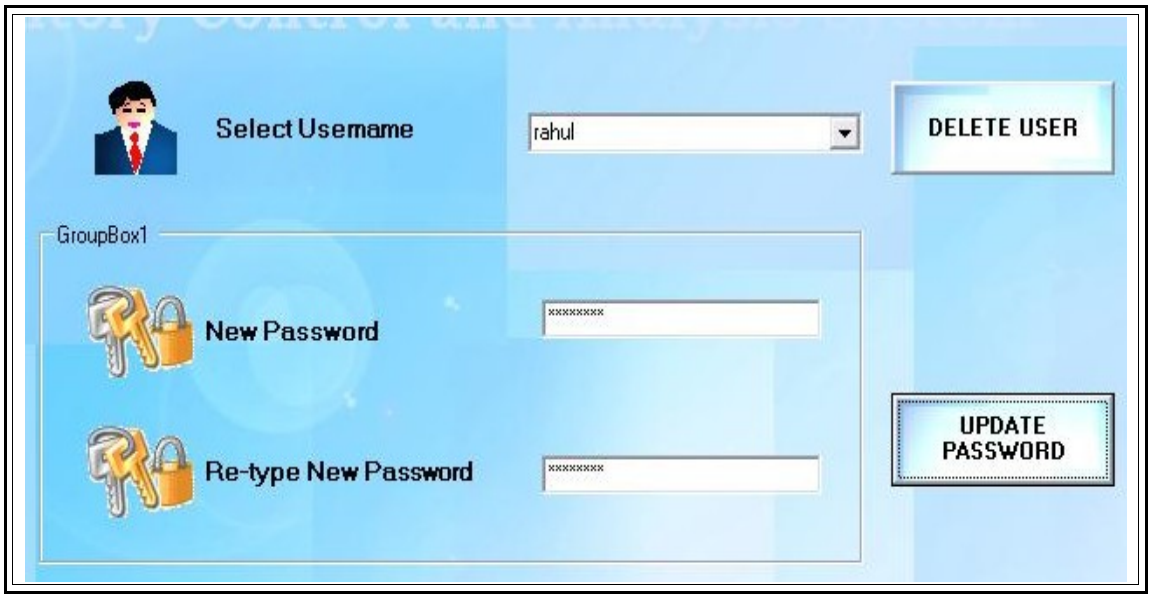

Fig. 19: Form for editing client details

Administrator has authority to edit client login details. Administrator can permanently delete a particular client user account, so that, henceforth, a sales person cannot logon at the client side using that username and corresponding password.

Administrator can also change password for a particular client user account, without deleting that account. This may be the case when the sales person requests administrator to change his password if he/she has lost or forgotten his/her current password.

Fig. 20: Message Boxes shown while editing client details

4.2.4. Product Information:

4.2.4.1 Add a New Product:

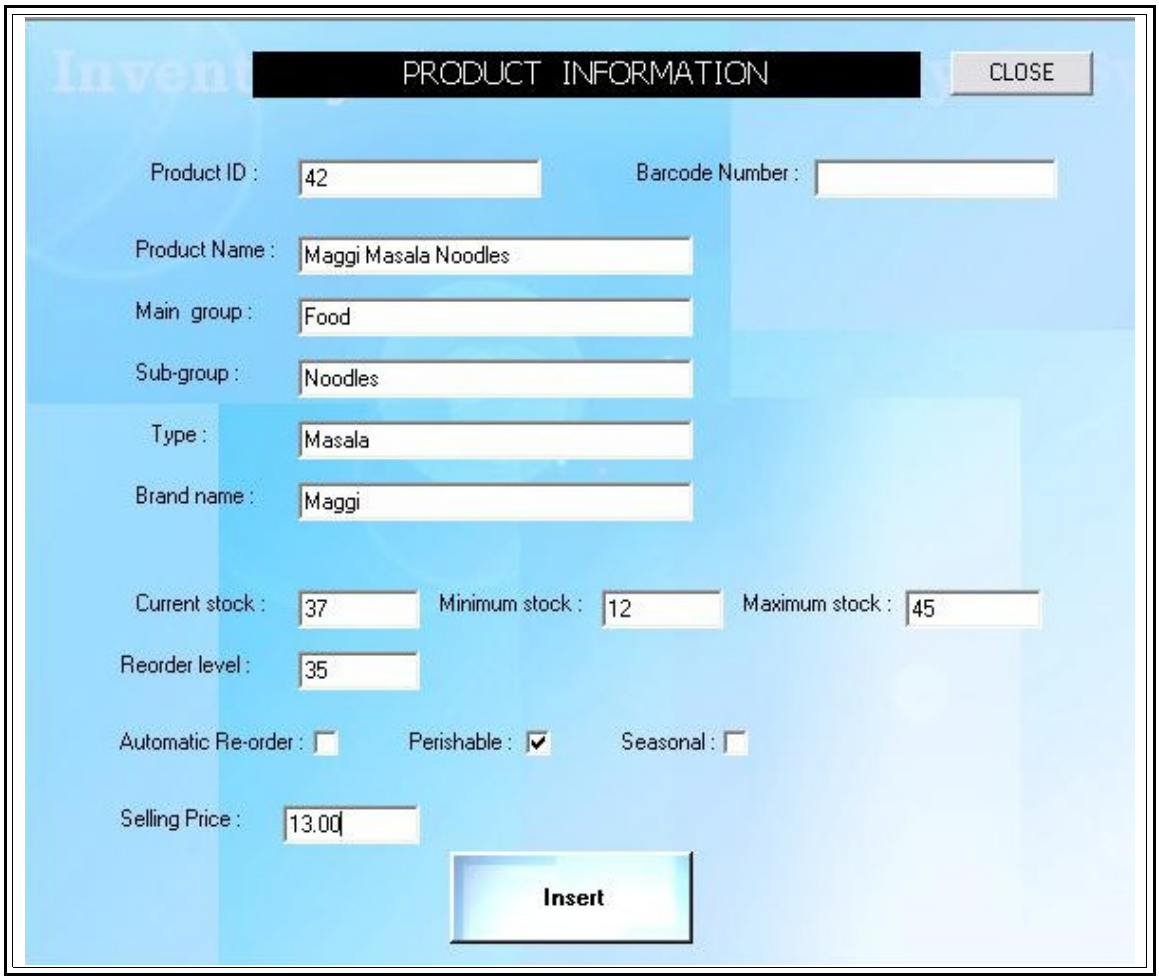

Fig. 21: New Product Information Form

The New Product Information Form contains many textboxes which are used to enter the information of the product in the database. The first textbox is of Product-ID which is unique for every product. A textbox for Barcode Number is also kept which can be used if there is a Barcode reader. The product is classified under Main group, Sub-group, type, and brand name. There are fields for Current Stock, Minimum Stock, Maximum Stock, Reorder level, and Selling Price. Also there are checkboxes to indicate whether automatic re-order is possible and whether the product is perishable or/and seasonal.

4.2.4.2. Product Search:

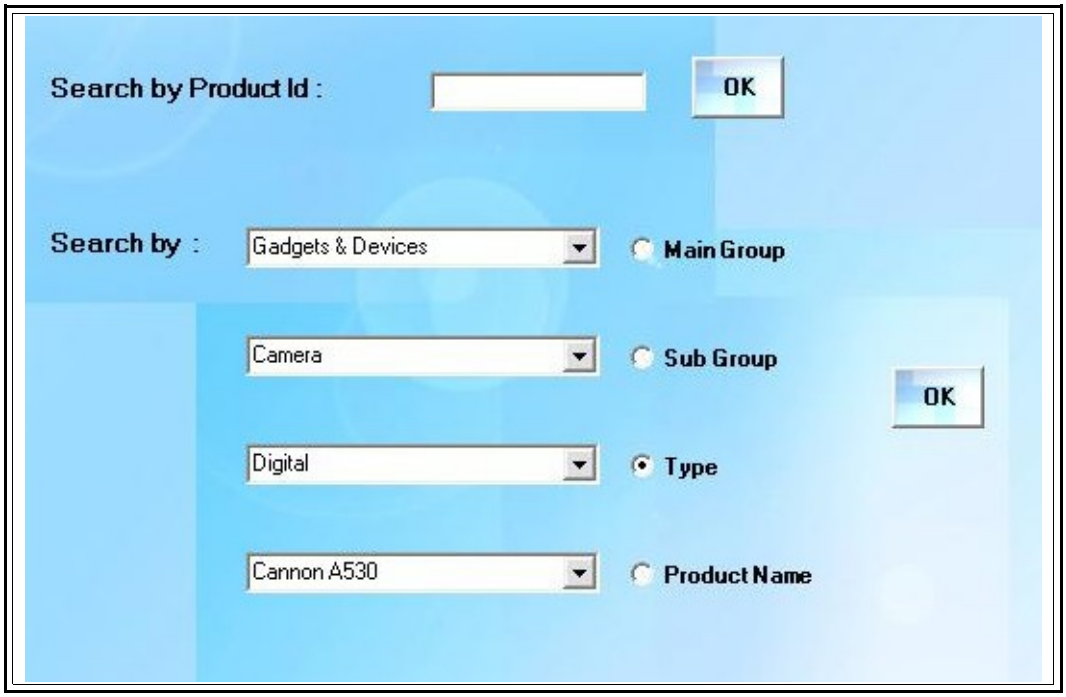

Fig. 22: Product Search Form

The Product can be searched in many different ways. The Product can be searched using its Product ID, Main Group, Sub Group, Type or Product Name in a hierarchical manner. The user has to press 'OK' button to see the results of the Search.

Example of a Search : When the user selects the 'Gadgets & Devices' from the Main Group then all the Sub Groups under that Main Group are shown in the list-box of the Sub Group. If we select the Sub Group 'Camera' then we will see two elements viz. Digital, Plasma in the 'Type' list-box. If we select Type of the Camera as 'Digital' then we will see all the Cameras which are of type Digital (one of them is Cannon A530 as shown above).Now the user can search by main Group or by Sub Group or Type or Product Name by selecting the adjacent radio-button.

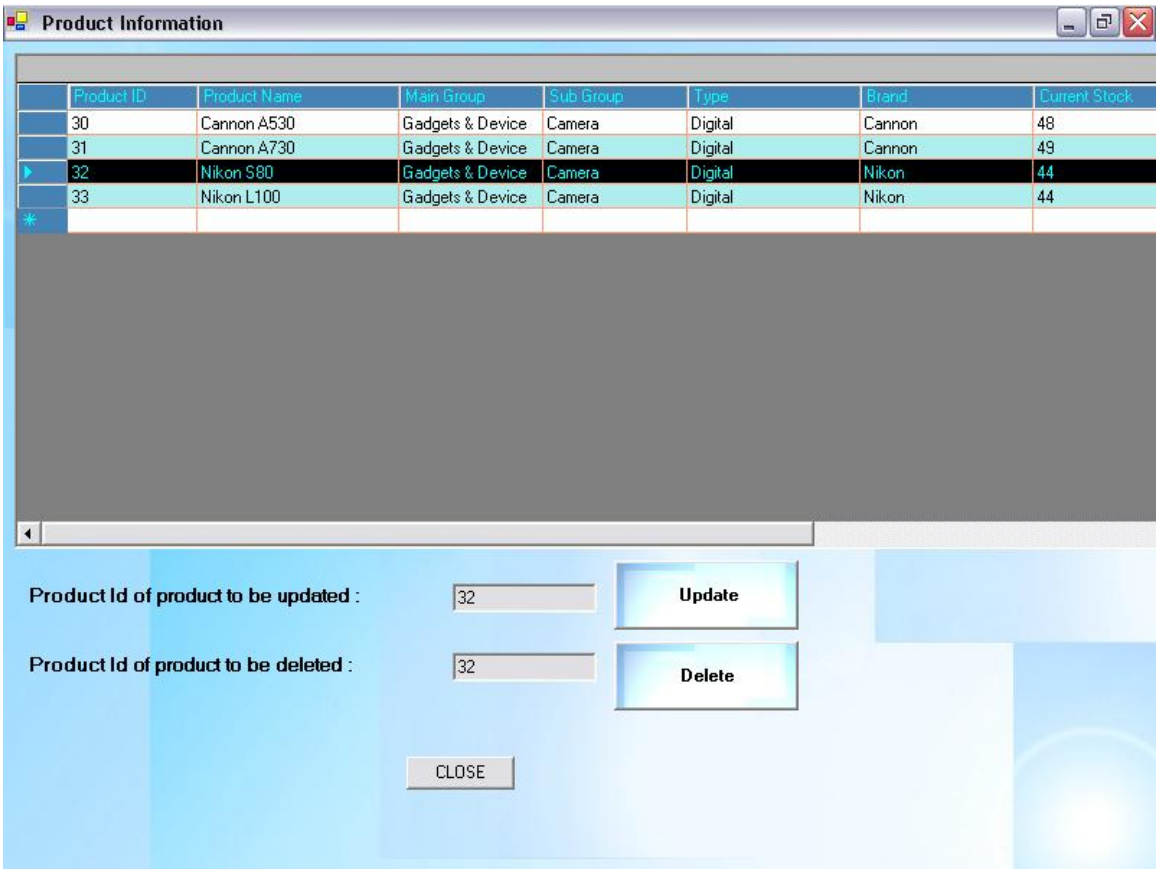

Fig. 23: Product Search Result Form

The Product Search Result Form displays the information about the product(s) which are searched from the previous form. The entire search result is shown in a Data Grid which contains Product ID, Product Name, etc. There are two buttons ‘Update’ and ‘Delete’ which are used to update and delete the information of the Product from the database. The textboxes present adjacent to the update and delete buttons show the Product ID of the product to be updated or deleted respectively.

4.2.4.3. Product Update:

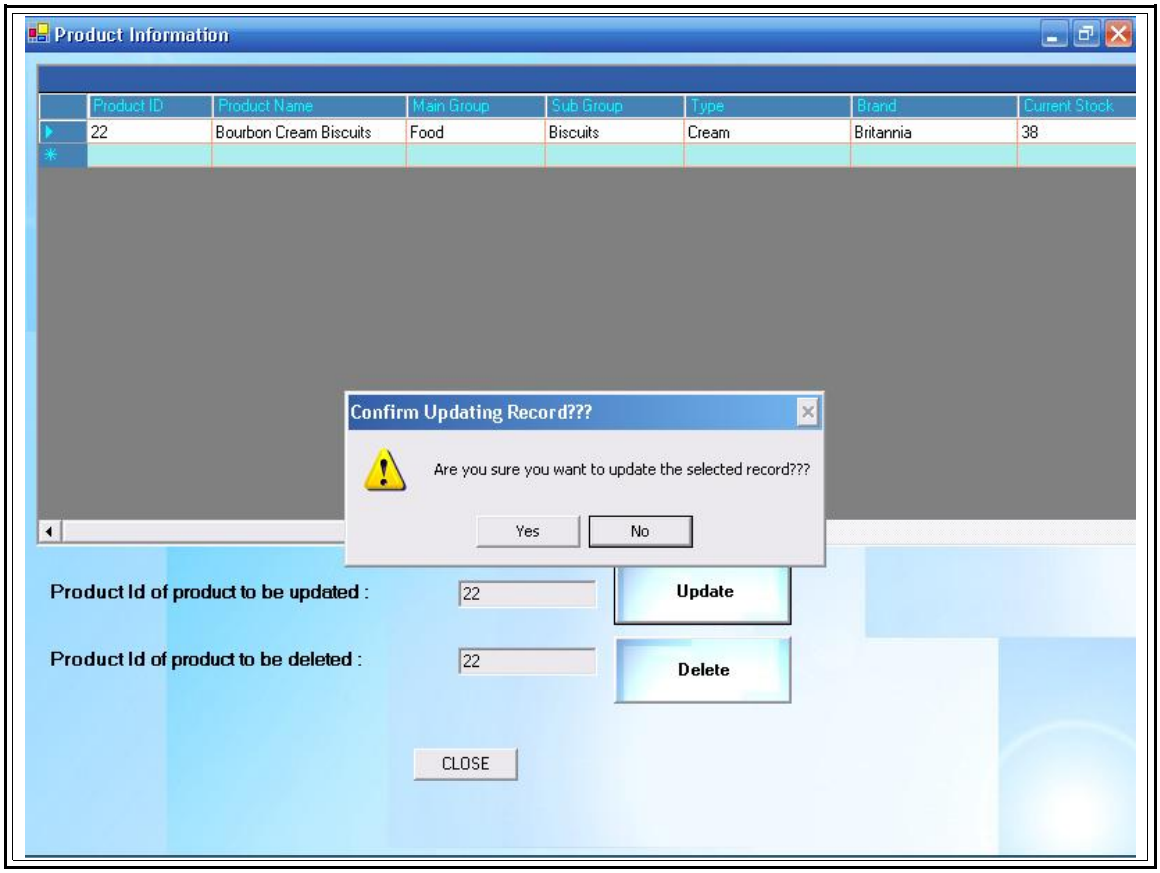

Fig. 24: Alert while updating the Product

When the user has updated a data field of a product and then he presses the ‘Update’ button to save the changes. An alert message is shown to the user to confirm the update. If the user does not want to save the changes then he can select the ‘No’ button or else press ‘Yes’.

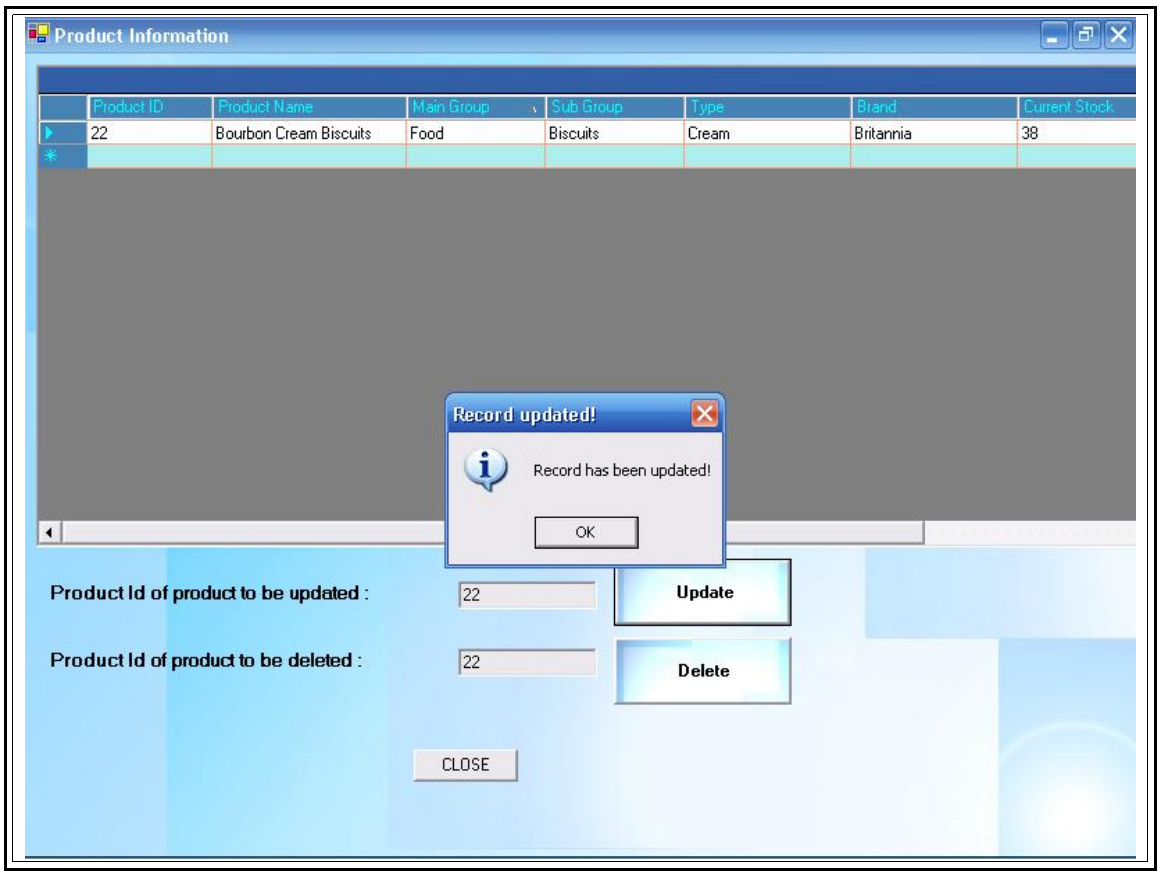

Fig. 25: Message box indicating that the Update was successful

After pressing the 'Yes' button, the software makes the changes for the respective Product in the database. After that a message box is shown which says that the Update was successful.

4.2.4.4. Product Delete:

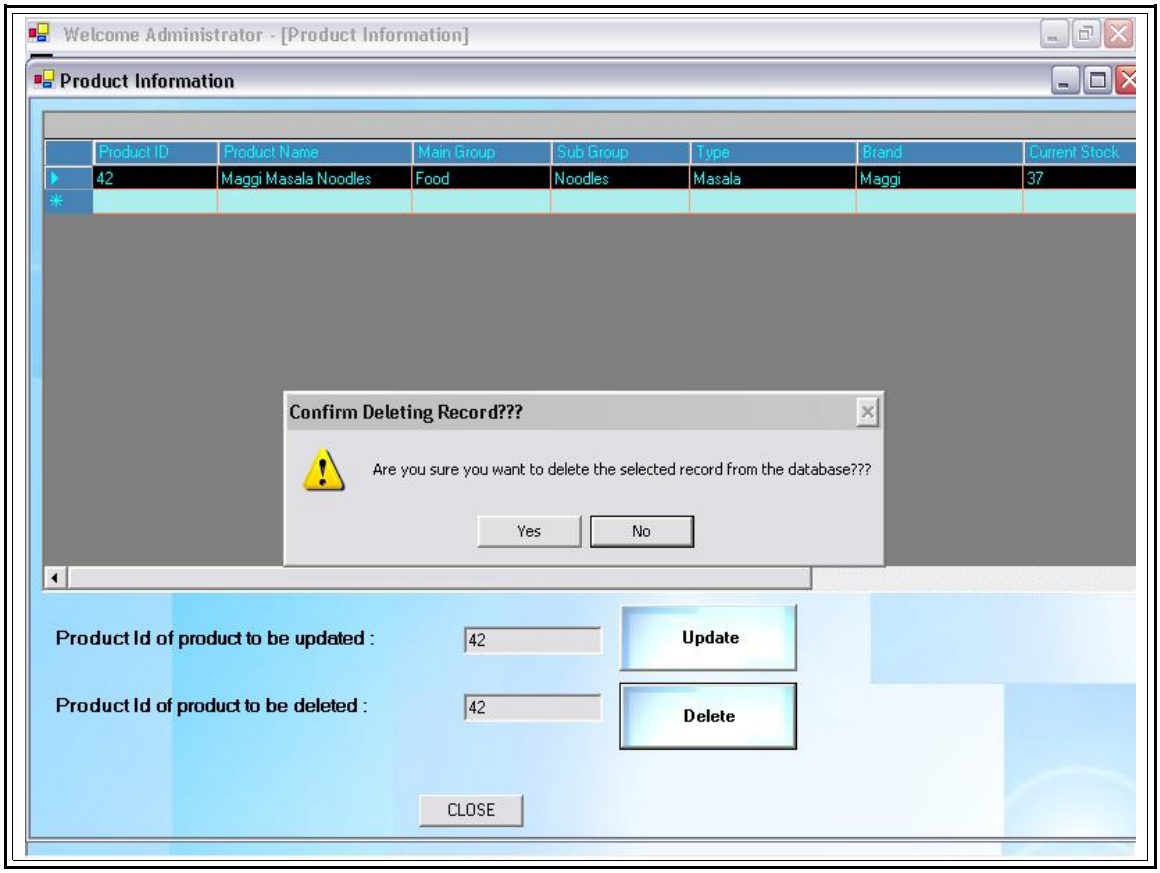

Fig. 26: Alert while Deleting the Product

When the administrator wants to delete a particular product's information from the database, he/she can delete that product by selecting that particular product and pressing the 'Delete' button, and then an alert message is shown to him/her. If the administrator doesn't want to delete the product, then he can select the 'No' button or else press 'Yes' and then the selected product will be deleted.

After pressing the 'Yes' button the software deletes the respective product from the database. After that a message box is shown which says that the product was successfully deleted.

4.2.5. Reorder Strategy:

4.2.5.1. Add Supply Information:

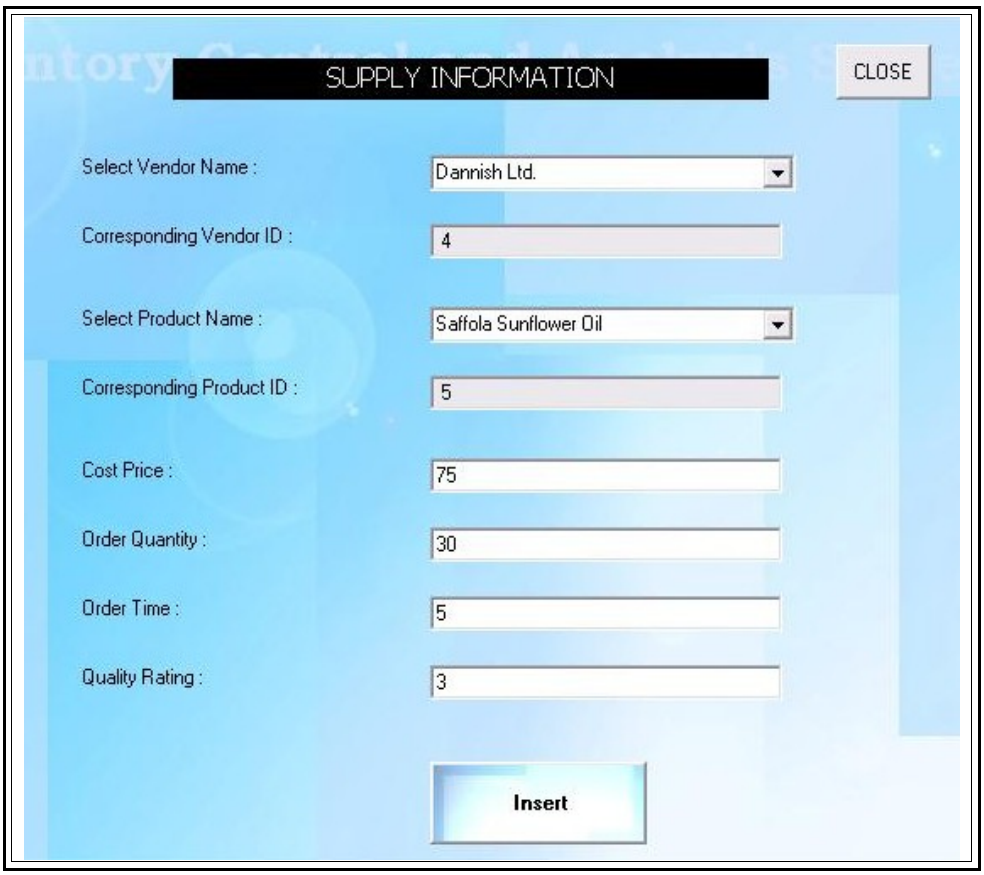

Fig. 27: New Supply Information Form

The Supply Information Form contains many textboxes which are used to enter the information in the database about which product is supplied by which vendor.

There are two combo-boxes which allow the administrator to select vendor name and product name from the available list. The vendor ID and product ID of that vendor and product respectively are automatically displayed in the textboxes. Then, the administrator can fill in the appropriate supply information, namely, cost price, order quantity and time, and the quality rating of the product supplied by that vendor.

4.2.5.2. Search Supply Information:

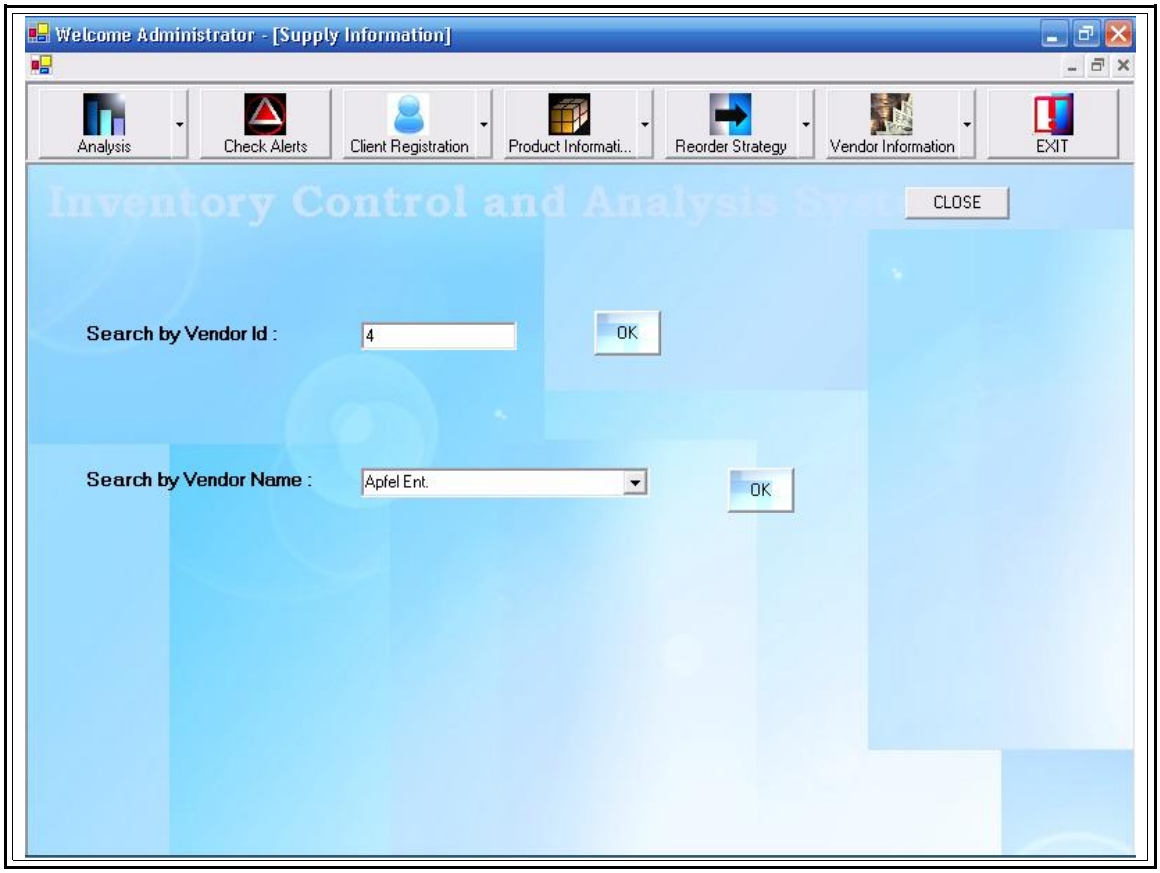

Fig. 28: Supply Information Search Form

The existing supply information can be searched in two different ways. The supply information can be searched for a particular vendor either by entering its vendor ID or by selecting the vendor name from the combo-box as shown in figure above. The user has to press 'OK' button to see the results of the Search.

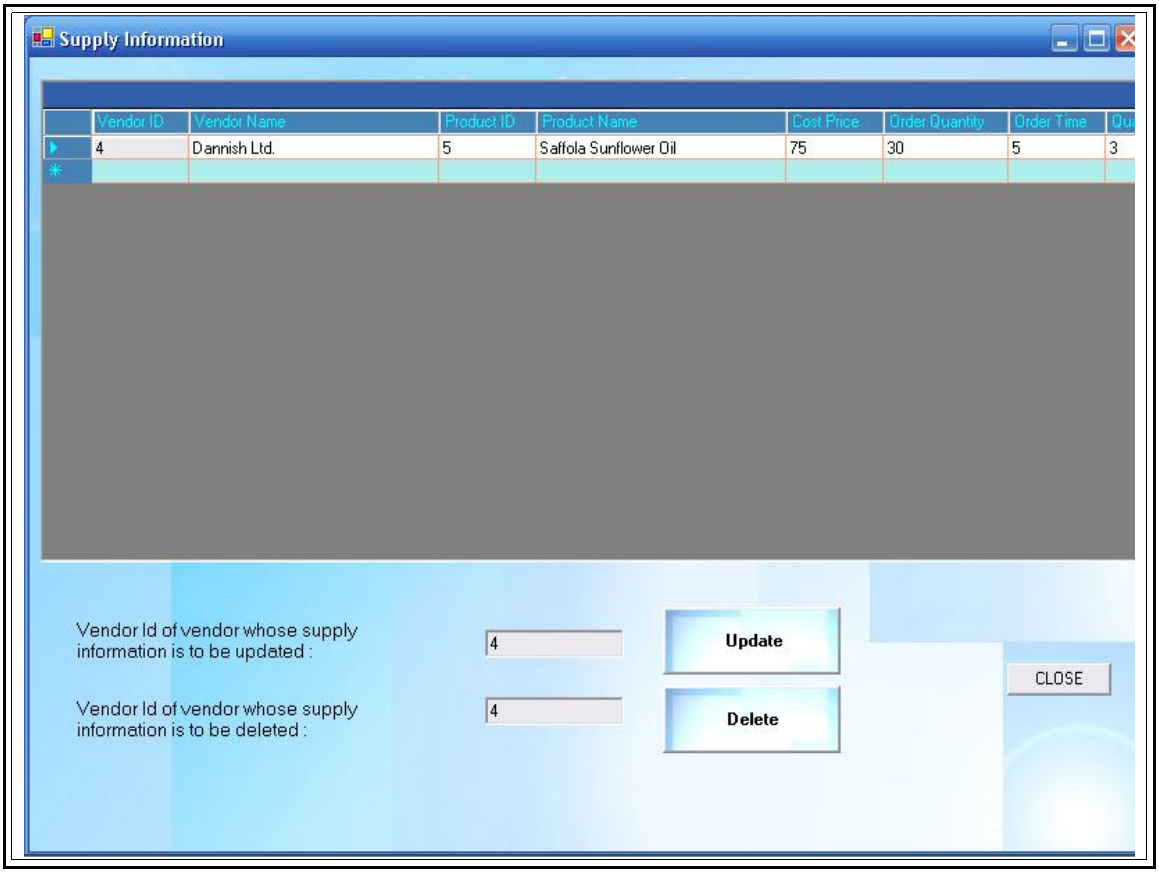

Fig. 29: Supply Information Search Result Form

The supply information search result form displays the supply information about the product(s) which are supplied by the searched vendor. The entire search result is shown in a Data Grid which contains Vendor ID, Vendor Name, Product ID, Product Name, Order Quantity, Time, etc. There are two buttons ‘Update’ and ‘Delete’ which are used to update and delete the supply information of a particular product supplied by the searched vendor from the database. The textboxes present adjacent to the update and delete buttons show the Vendor ID of the searched vendor to be updated or deleted respectively.

4.2.6. Vendor Information:

4.2.6.1. Add a New Vendor:

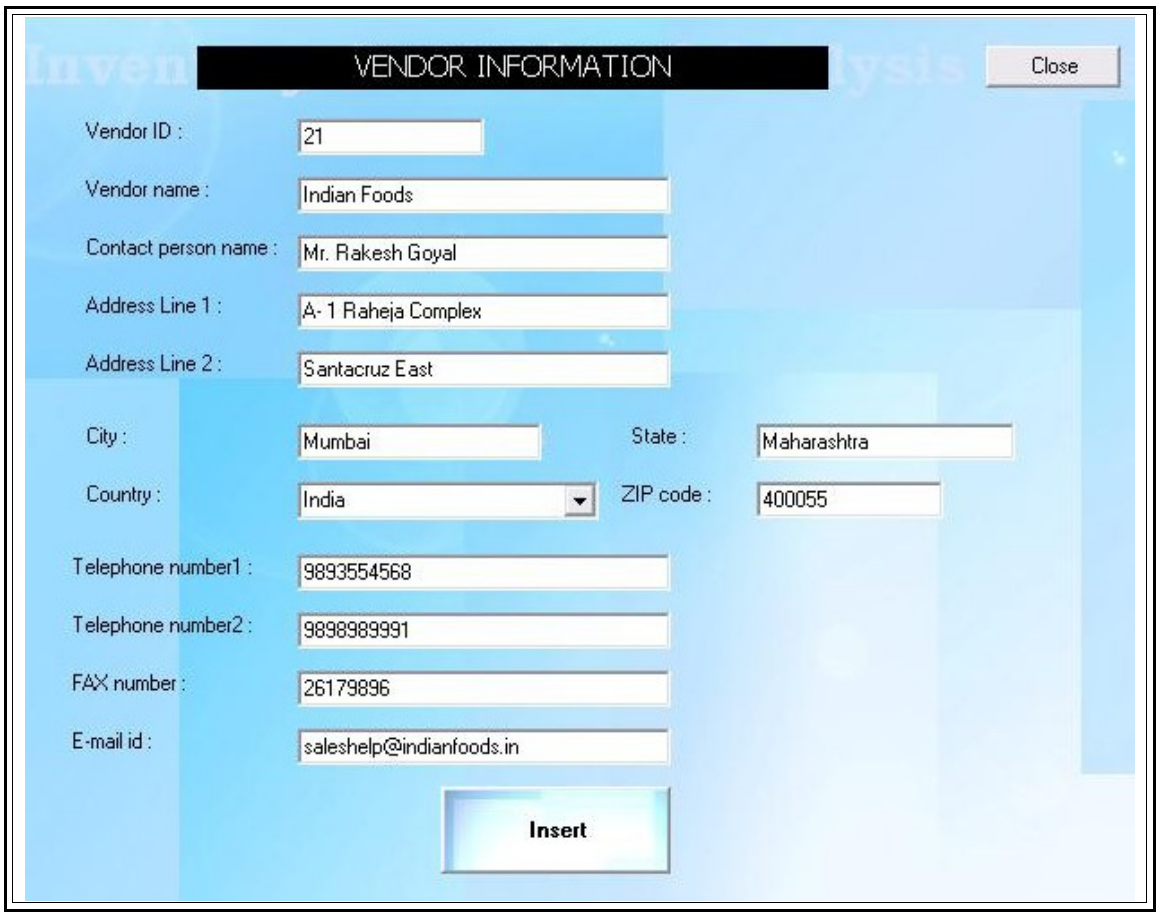

Fig. 30: New Vendor Information Form

The Vendor Information Form contains many textboxes which are used to enter the information of the vendor in the database. The first textbox is of Vendor-ID which is unique for every vendor. There are fields for Vendor Company's name, Contact person's name, address, telephone numbers, FAX number and e-mail ID of the vendor's company. When the administrator clicks on the 'Insert' button and confirms it, the new vendor's information is stored in the database.

4.2.6.2. Vendor Search:

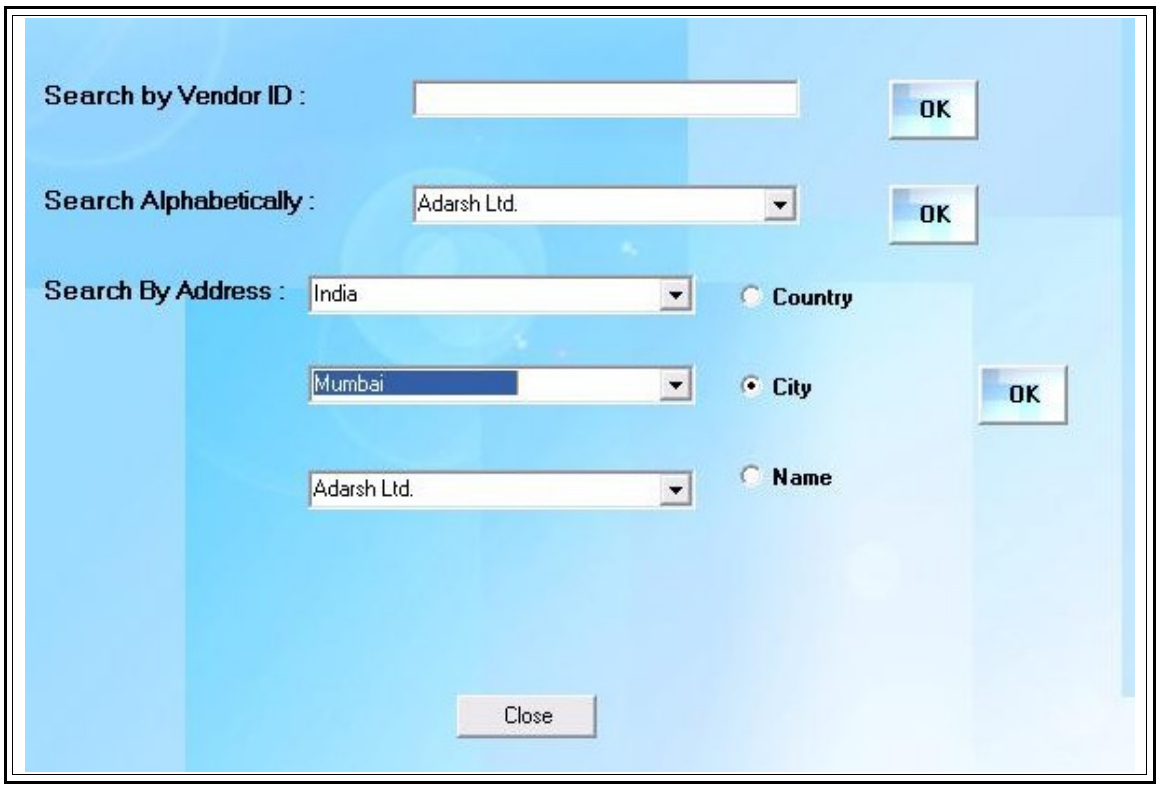

Fig. 31: Vendor Search Form

The Vendor information can be searched in many different ways. The Vendor can be searched using its Vendor ID, Vendor Name (Alphabetically), Country and City and Name in a hierarchical manner. The user has to press 'OK' button to see the results of the Search.

Example of a Search: When the user selects 'India' from the Country, then all the cities under that Country are shown in the list-box of the City. If we select the City 'Mumbai' then we will see all vendors from Mumbai region in the 'Name' list-box. Now the user can search by Country or by City or Vendor Name by selecting the adjacent radio-button.

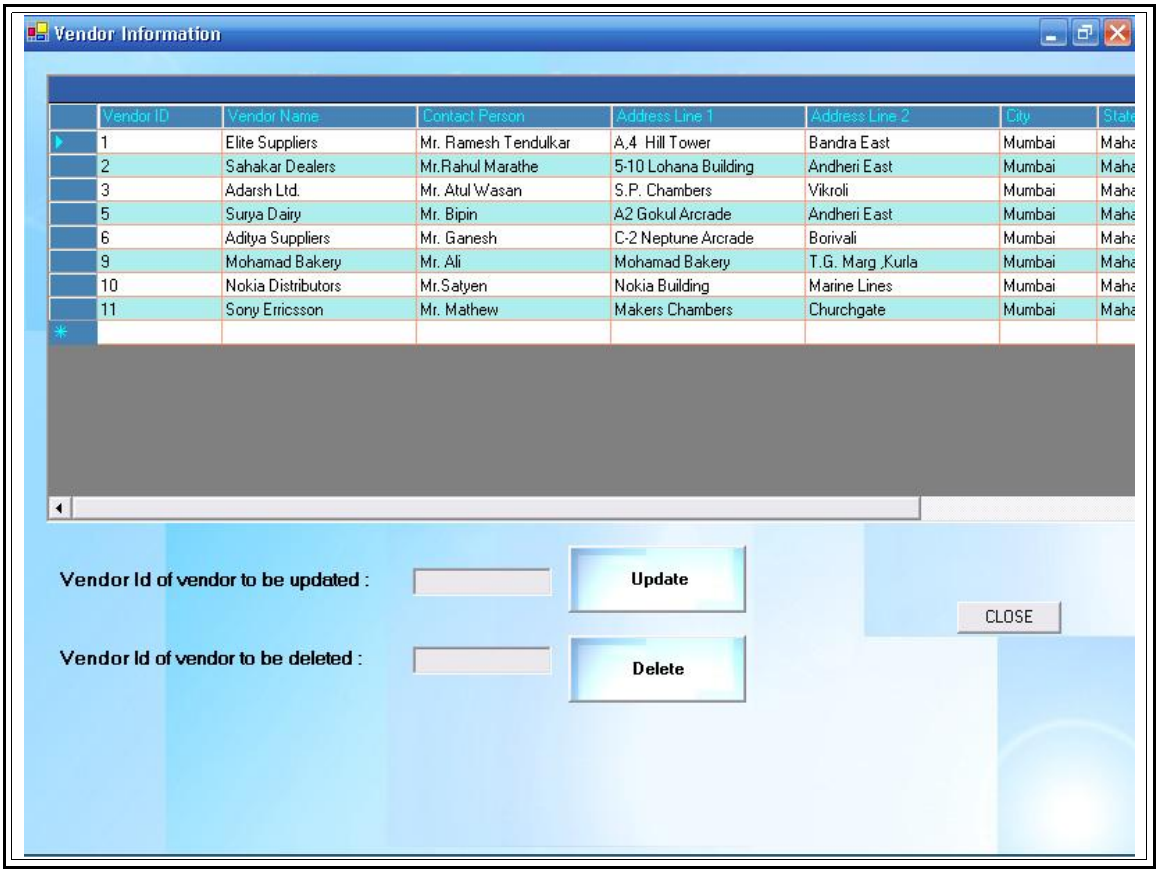

Fig. 32: Vendor Search Result Form

The Vendor Search Result Form displays the information about the vendor(s) which are searched from the previous form. The entire search result is shown in a Data Grid which contains Vendor ID, Vendor Name, etc. There are two buttons ‘Update’ and ‘Delete’ which are used to update and delete the information of the Vendor from the database. The textboxes present adjacent to the update and delete buttons show the Vendor ID of the vendor to be updated or deleted respectively.

4.2.6.3. Vendor Update:

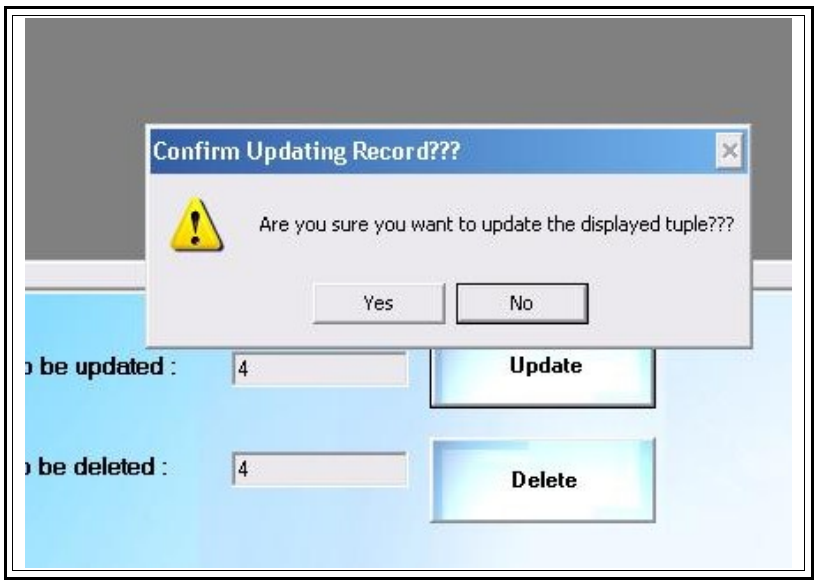

Fig. 33: Alert while updating the Vendor

When the user has updated a data field of a vendor and then he presses the 'Update' button to save the changes, an alert message is shown to the user to confirm the update. If the user does not want to save the changes then he can select the 'No' button or else press 'Yes'.

After pressing the 'Yes' button, the software makes the changes for the respective Vendor in the database. After that a message box is shown which says that the Update was successful.

4.2.6.4. **Vendor Delete:**

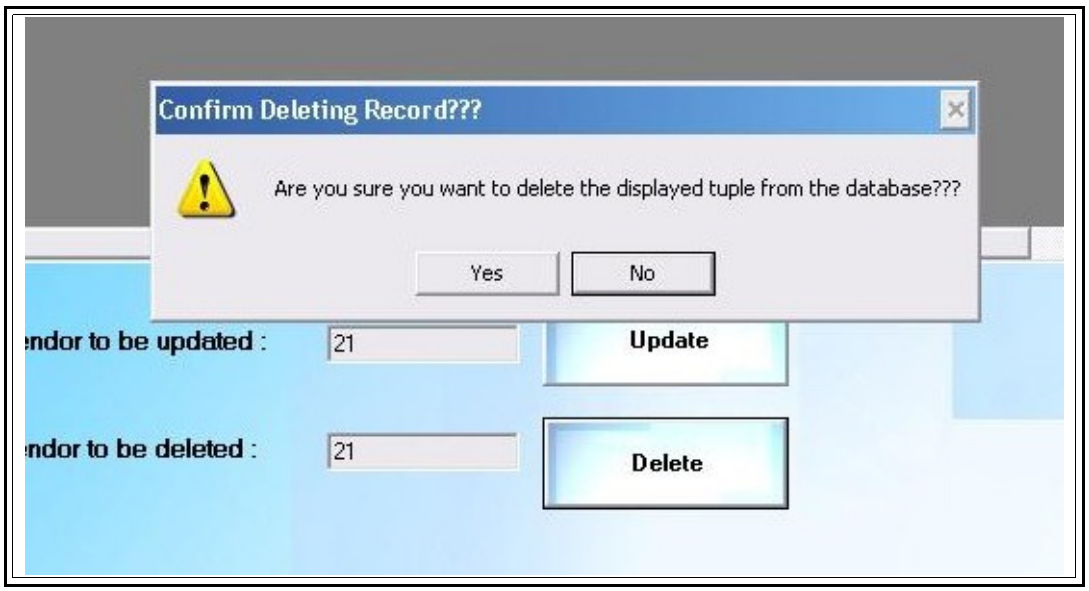

Fig. 34: Alert while Deleting the Vendor

When the administrator wants to delete a particular vendor's information from the database, he/she can delete that vendor by selecting that particular vendor and pressing the 'Delete' button, and then an alert message is shown to him/her. If the administrator doesn't want to delete the vendor, then he can select the 'No' button or else press 'Yes' and then the selected vendor will be deleted.

After pressing the 'Yes' button the software deletes the respective vendor from the database. After that a message box is shown which says that the vendor was successfully deleted.

4.3. CLIENT SIDE USER INTERFACE:

4.3.1. BILLING MODULE:

4.3.1.1. Login Screen:

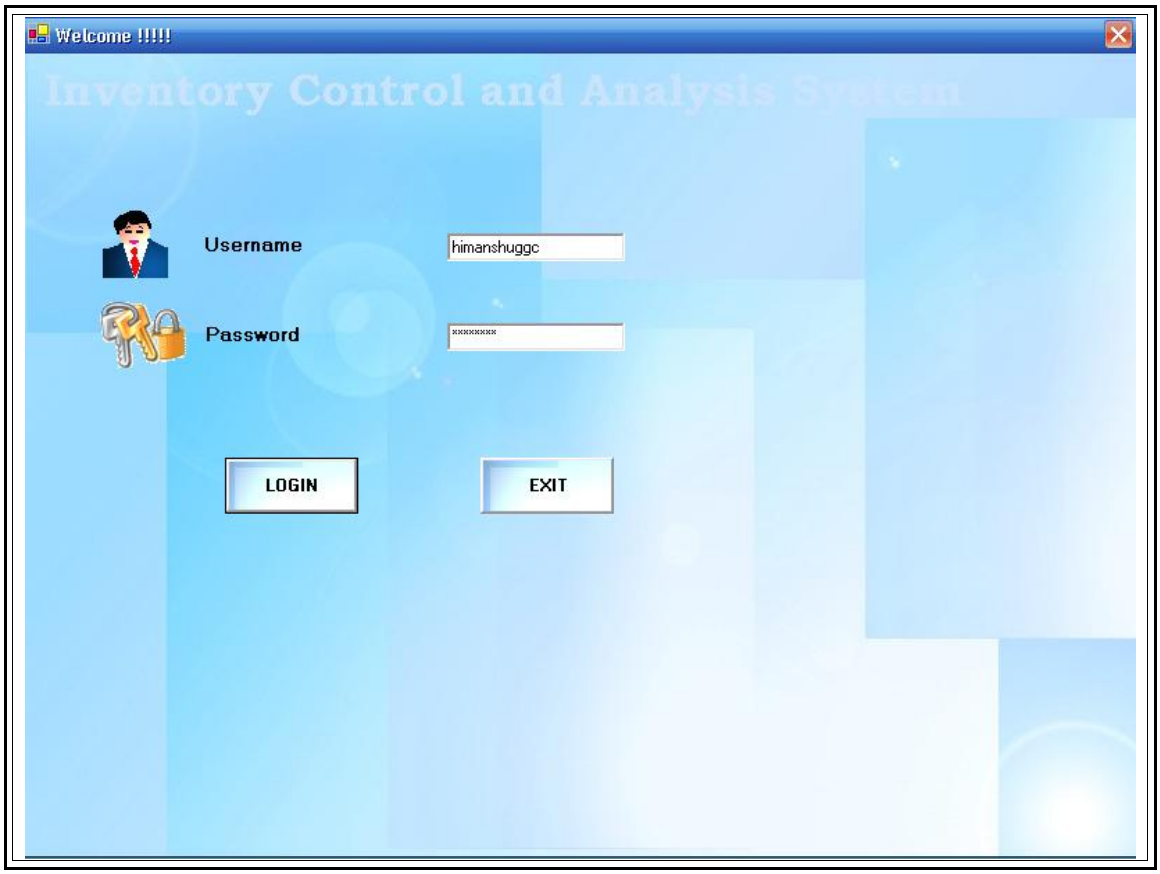

Fig. 35: Login Form of the Billing Module

The above form contains two text boxes for entering Username and Password. The sales person has to enter his appropriate Username and Password. The sales person will not be logged-in unless he specifies correct Username and password.

After the sales person enters his Username and Password he has to press the 'LOGIN' Button in order to login. His/her Username and Password are compared with the Username and Password present in the 'userlogin' Table of the database. If both the fields match then the user is authenticated and the Billing form opens.

4.3.1.2. Billing Form:

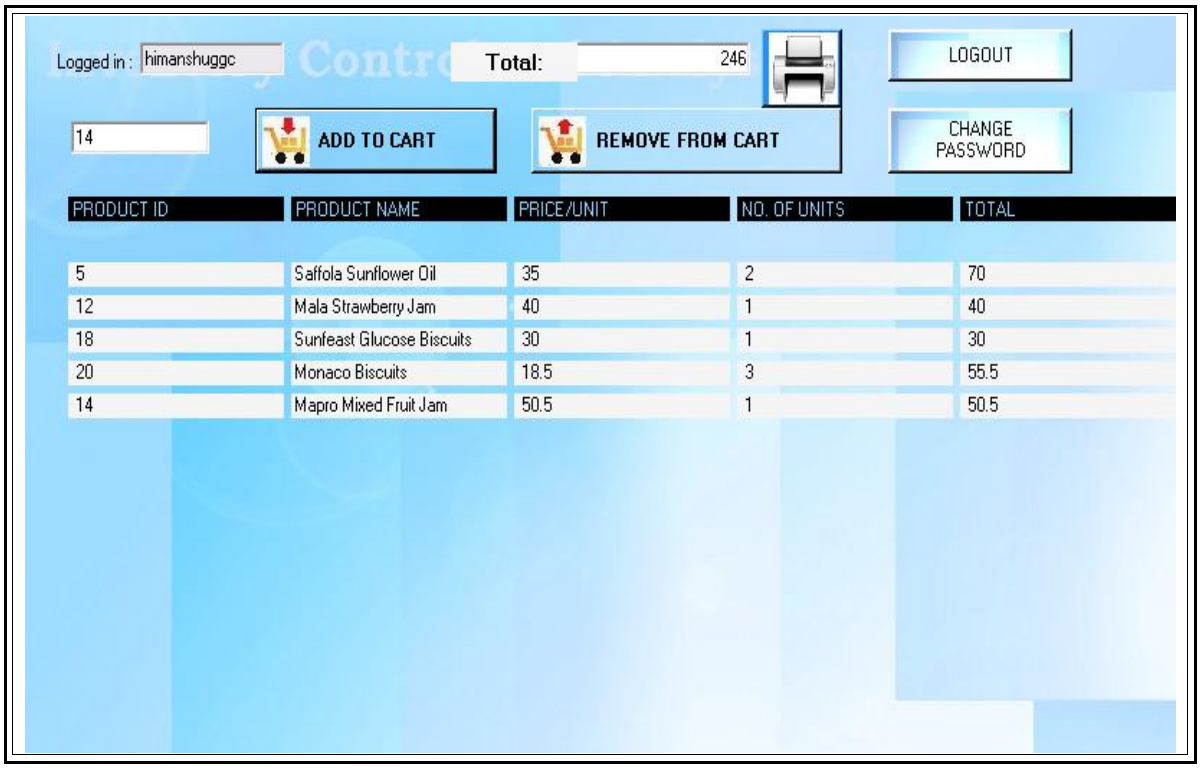

Fig. 36: Billing Form

The Billing Form contains a textbox (top-left) that shows the username of the user who is logged-in. The textbox besides the Label field 'Total' shows the total price of the goods purchased by the customer. There is a textbox next to the button 'ADD TO CART'. In that textbox we have to enter the Product ID (PID) of the product purchased by the consumer. When the sales person enters the PID in that textbox and presses the 'ADD TO CART' button that product is added in the bill. The bill shows the details of following fields: Product ID, Product Name, Price per Unit, Number of Units and Total Price for the product purchased. The 'REMOVE FROM CART' button is used to remove a particular product from the bill.

When the bill is made the sales person should press the 'PRINTER' icon to print the bill. The sales person can change his password by clicking the 'CHANGE PASSWORD' button. The sales person can logout by pressing the 'LOGOUT' button.

4.3.1.3. Printed Bill

ISSUED AT:4/9/2007 1:02:13 AM

*****GOODS BAZAAR*****

Product ID	Product Name	Rate	Qty.	Total
5	Saffola Sunflower Oil	35	2	70
12	Mala Strawberry Jam	40	1	40
18	Sunfeast Glucose Biscuits	30	1	30
20	Monaco Biscuits	18.5	3	55.5
14	Mapro Mixed Fruit Jam	50.5	1	50.5

TOTAL AMOUNT:= Rs: 246 only

Fig. 37: Printed Bill

The bill is printed when the sales person clicks the 'PRINTER' icon. The printed bill contains the Date and time of purchase, Name of the supermarket, Product ID, Product Name, Rate per Unit, Quantity (Number of units) and Total (for each product). It also shows Total Amount to be paid by the customer.

4.3.1.4. Change of Password:

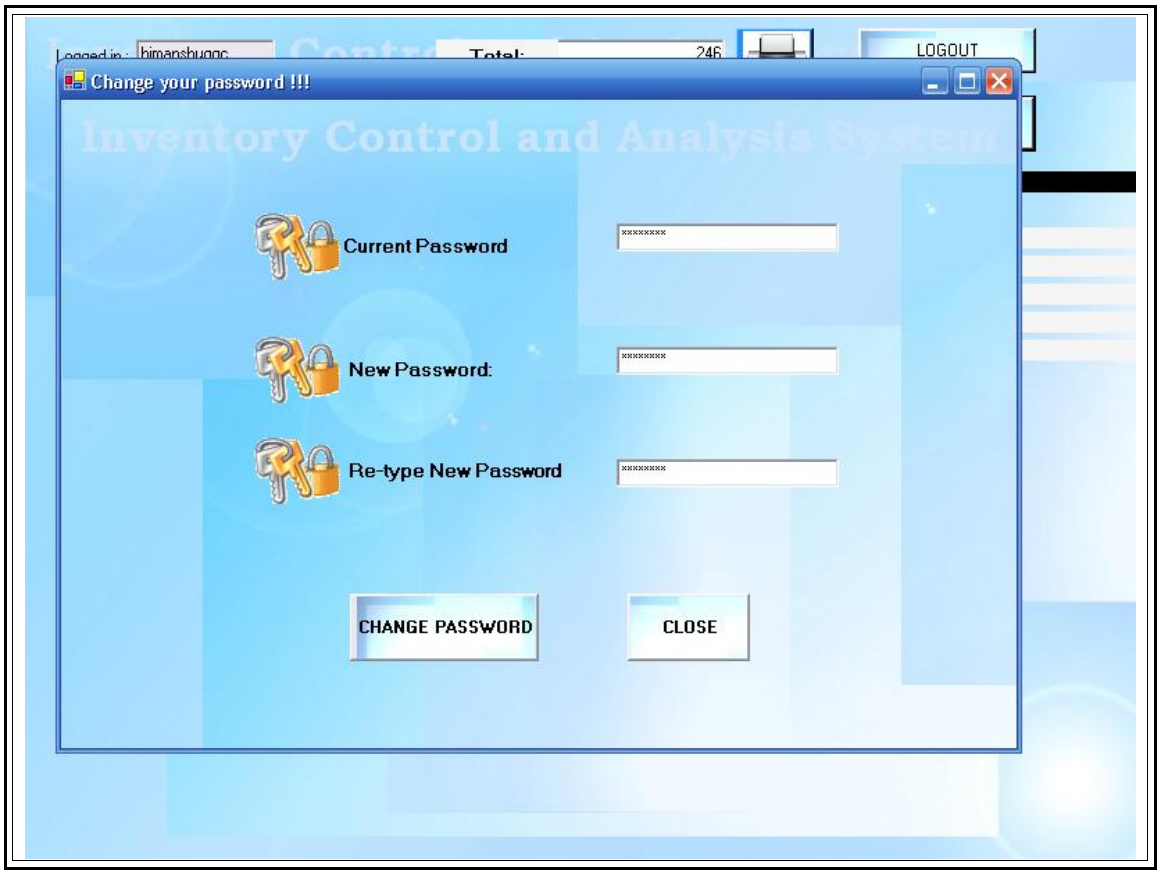

Fig. 38: Change of Password Form

The sales person can change his Password by clicking the 'CHANGE PASSWORD' button on the billing form. After clicking that button the above form pops up and there are three textbox fields viz. current password, new password, re-type new password. The sales person has to fill these textboxes in order to change his password and then click the 'CHANGE PASSWORD' button on this form.

5. TESTING AND RESULTS:

Test procedure: For valid administrator login

Test Case	Admin login with valid user name and password
Input	Valid admin user name and password (Password must be six characters or more)
Expected Output	System redirects to administrator's home page
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For invalid administrator login

Test Case	Admin login with invalid user name and password
Input	Invalid admin user name and password
Expected Output	System generates an error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For ABC analysis

Test Case	ABC analysis and classification
Input	Data sample from a theoretical example
Expected Output	System performs classification in the same way as that of the theoretical method
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For Product comparison option selection

Test Case	User leaves a mandatory selection blank
Input	Button is clicked without selecting an option (carried out for all controls like radio boxes and drop down list boxes)
Expected Output	System pops up a message indicating that a necessary selection is not made
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For Time span selection in timeline comparison report

Test Case	User leaves a mandatory field blank.
Input	Button is clicked without selecting an option (carried out for all controls like radio boxes and drop down list boxes)
Expected Output	System pops up a message indicating that a necessary selection is not made
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For checking accuracy of comparison timeline reports

Test Case	Comparison reports generate inaccurate data
Input	Sample database is attached to the database
Expected Output	Report should be generated showing calculated results from the sample data
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For checking alerts for Class ‘A’ and ‘B’ products

Test Case	Blank product ID field
Input	Clicking ‘Modify reorder strategy’ button when no product ID is selected

Expected Output	System pops up a message indicating that the product ID field is blank
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For valid client registration

Test Case	Client registration with valid user name and password
Input	Valid user name and password (Password must be six characters or more)
Expected Output	System registers the new client
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For invalid client registration

Test Case	Client registration with invalid user name and password
Input	Invalid user name and password
Expected Output	System generates an error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For searching product

Test Case	Invalid search option or blank search field
Input	1. Search by product ID when product ID field is blank 2. Search by main group, subgroup, type or product name when appropriate option is not selected
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For updating or deleting product

Test Case	No row available or blank product ID
Input	Clicking ‘Update’ or ‘Delete’ button when no row is available or product ID field is blank
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For searching supply information

Test Case	Blank search field
Input	Search by vendor ID when vendor ID field is blank
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For updating or deleting supply information

Test Case	No row available or blank vendor ID
Input	Clicking ‘Update’ or ‘Delete’ button when no row is available or vendor ID field is blank
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For searching vendor

Test Case	Invalid search option or blank search field
Input	1. Search by vendor ID when vendor ID field is blank 2. Search by country, city or vendor name when appropriate option is not selected
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For updating or deleting vendor

Test Case	No row available or blank vendor ID
Input	Clicking ‘Update’ or ‘Delete’ button when no row is available or vendor ID field is blank
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For valid client login

Test Case	Client login with valid user name and password
Input	Valid client user name and password (Password must be six characters or more)
Expected Output	System redirects to client's home page (i.e. Billing page)
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For invalid client login

Test Case	Client login with invalid user name and password
Input	Invalid client user name and password
Expected Output	System generates an appropriate error message
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For bill generation item removal

Test Case	Removing item from cart which is not present
Input	While item selected is not present in the cart, client clicks on 'Remove from cart' button
Expected Output	System pops up a message indicating that the item is not present in the cart
Obtained output	As per expected
Remarks	No Deviation

Test procedure: For bill generation item addition

Test Case	Adding an item to the cart while its already present
Input	Client selects such an items which is already present and adds it
Expected Output	System should increase its quantity without making a separate entry
Obtained output	As per expected
Remarks	No Deviation

6. CONCLUSION:

Thus, we have successfully completed our project on 'Inventory Control System of Supermarket'. We have included many features that are necessary for an Inventory Control System of Supermarket.

The features are as follows:

1. Detailed Sales Analysis
    - ABC Analysis
    - Product Comparison
    - Time Line Analysis
2. Checking of Alerts
3. Product Information Management
4. Reorder Strategy
5. Vendor Information Management
6. Billing Module

While making the software, every effort has been taken to make a very easy to use Graphical User Interface (GUI). We have tried our best to include as much features as we can in the available time limit.

Some additional advance features can also be implemented like

- Using a barcode system
- Recording of customer information for the study of buying habits

But these features are kept for future development.

7. REFERENCES:

The following Books were used as references for the Project and preparing this Project Report:

1. Cost Accounting
   -Board of studies, The Institute of Chartered Accountants of India
2. Management and Production Planning
   - By Michael Vaz, Vinayak Paralikar
3. Beginning VB.NET 2003 (Third Edition)
   - By Thearon Willis, Richard Blair
4. Visual Basic .NET 2003 Programming – Black Book
   - By Steven Holzner
5. SQL Server 2000 Bible
   - By Paul Nielsen
6. SQL Server 2000 Unleashed
   - By Paul Bertucci, Ray Rankins

The following Websites were used as references for the Project and preparing this Project Report:

1. www.startvbdotnet.com
2. www.sql-server-helper.com