SYSTEM DESIGN AND PLANNING

SYSTEM OBJECTIVES

Before Proper design a conclusion had to be made to determine what exactly the system would look like, how it would help to make things faster and what it's supposed to do.

In the end the following personal aims were set and system objectives were agreed on:

AIMS

- A system with a basic look, nothing too complicated in order to achieve the goal of being as user friendly as possible but hiding the com
- A system that will allow making note of a transaction faster than writing the whole transaction out using "the Book Keeping."
- A system that allows easy input in terms of addition of new products and basic communication when a normal transaction is happening with the application.

FINAL OBJECTIVES

- A Product File that stores all the products with their individual details forming the main file of the program.
    - This file must automatically update after each transaction.
        - Quantity = Quantity – Amount Sold.
    - The system must also check products after deduction of quantity from result of a sale
        - If Quantity <= Reorder Level then the product needs Reorder
- A Transaction File must be made that records all the transactions/sales that occur and their details which can be accessed and assessed when need arises, in the extremely unlikely situation where by a receipt is requested the system can produce a hard copy of the transaction details.
    - Each transaction will have
        - Date and Time
        - Products Bought
        - Sub Total
        - Transaction Id
- A notification to the user as he logs in, informing him about realized shortages and or any upcoming/predicted.
- A Statistics File that records all the sales details for a particular time period different from the transaction file although transaction file can be main data source and a Statistics Menu that can, at any time period give chart results on what's happening during any time period (month, year, week), showing the user statistics about the business' performance and products that he might have to stop selling or others that he has to increase in terms of quantity or even variety.

- An option that can add new products to inventory for whichever reasons the user has to do so.
- An option that allows deletion of product records, when the user decides to stop selling it for one reason or the other.
- A system that can modify or alter of a product record in case of prices being raised for one reason or the next or fixing an input mistake.
- A system that has some form of authentication so that only the user or employee can have access and another “master key password” of which will be kept by an individual of the owners choice in case of emergencies and for important access right including modifying records.
- A main transaction screen (counter) which has an icon related interface involving every product for easy identification, also to have tabs depending on the product type to help with the navigation of the many products available.
- A function that allows the user to search for a particular product for product detail modification purposes.
- A help option which shows the user a virtual manual that consists of instructions for each and every appropriate angle (form) of the system in English.
    - This will also contain shortcuts linked to key words as a form of easier navigation around the “Application”

DATA TABLES

UNNORMALISED DATA TABLES:

The structure of the tables in which data will be stored, input and altered with the system the system. Along with estimated sizes, and currently not normalized.

TRANSACTION TABLE

- *This is the table that will contain the details of each transaction:*

Field Name	***Description***	***Data Type***	***L***
Prod ID (foreign)	*This is not exactly an auto number in reality because it matches the number in the product list book, it's a unique field for each product(Also in Other Table)*	*Auto Number*	*3*
Order time	The date at which the product is purchased	Time	6
Transaction Date	The date at which the transaction occurred	Date	8
Transaction Time	The date at which the transaction occurred	Time (Date / Time)	8
Total Purchased Quantity	The total Quantity of the product purchased that day	Number	3
Daily Balance	The monetary balance of the day at the particular time	Currency	8

PRODUCT INFORMATION TABLE

- This is the main table that contains information on all the Products being sold:

Field Name	***Description***	***Data Type***	***Length***	***Va***
Prod ID	*This is not exactly an auto number in reality because it matches the number in the product list book, it's a unique field for each product*	*Auto Number*	*3*	*Nu 0 t*
Product Description	*Basically contains details on what the product is.*	*Text*	*30*	*Str*
Product Type	*Details on what type of product it is. E.g. it could be a beverage or Cereal…*	*Text*	*15*	*Str*
Product Manufacturer	*Info on which company made the product.*	*Text*	*25*	*Str*
Product Quantity	*How many items of that product are in stock*	*Number*	*2*	*Nu 40*

Product Selling Price	*Basic product price to the customer*	*Currency*	*8*	*Cu*
Product Buying Price	*Basic Price of product for the user at whole sale, or reorder price per unit*	*currency*	*10*	*Cu*
Product Profit	*Basic amount of profit made from each time the product is sold(Selling price- buying price)*	*Currency*	*8*	*Cu*
Reorder	*If the product is below reorder level the yes otherwise no*	*Boolean*	*1*	*Bo*
Product Reorder Level	*Number at which an individual product when exceeded will trigger the reorder Boolean field to display "Yes" to show that the product needs attention as it is running out*	*Number*	*2*	*Nu*

NORMALIZATION PROCESS OF TABLES

From the tables we have above:

Unnormalized Form:

PRODUCTS (ProdID, ProdDesc, ProdType, ProdManu, ProdSellPrice, ProdBuyPrice, Profit, Reorder, ReorderLevel, ProdQuantity)

TRANSACTION (OrderDate, Dailybal, TotalQuantity)

First Normal Form:

PRODUCTS (ProdID, ProdDesc, ProdType, ProdManu, ProdSellPrice, ProdBuyPrice, Profit, Reorder, ReorderLevel, ProdQuantity)

TRANSACTION (TransID, OrderDate, Dailybal, TotalQuantity)

Second Normal Form:

PRODUCT (ProdID, ProdDesc, ProdType, ProdManu Profit, Reorder, ReorderLevel, ProdQuantity)

ORDER (ProdID, ProdSellPrice, ProdBuyPrice, Profit)

TRANSACTION (TransID, OrderDate, Dailybal, TotalQuantity)

Third Normal Forms:

PRODUCT (ProdID, ProdDesc, ProdSellPrice, ProdType, ReorderLevel, Reorder)

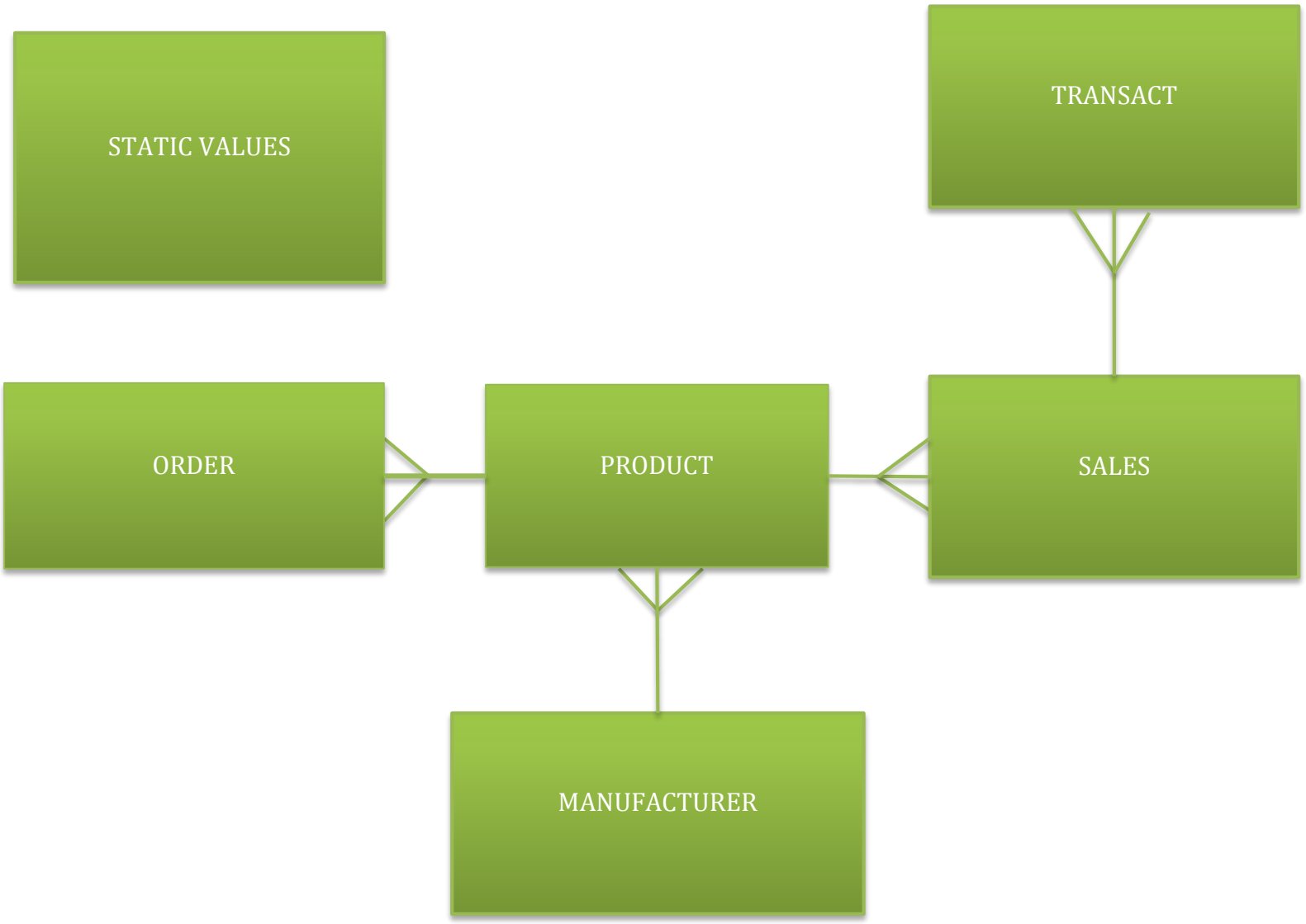
ORDER (OrderID, ProdID, ProdBuyPrice, TotalOrderNum)

MANUFACTURER (ManufacturerID, ProdManu)

TRANSACTION (TransID, ProdID, SubTotal QuantityBought)

Static Values (MainPassword, MasterPassword, LoginAttempts, AdminRight, SystemLock)

NORMALIZED ER – DIAGRAM



NORMALIZED DATA TABLES

STATIC VALUES TABLES

This Table will contain all the values that are to remain constant for the whole program e.g. Passwords. It has no relation with the other tables.

Field Name	*Description*	*Data Type*	*Length*
Master Password	This is the master password used when high privileges are required or when the main password has been forgotten	String	4 - 16 (Program Restricted)
Main Password	This is for the normal login. This is the password to be used by the employee if the need of hiring one arises and of course it allows normal day to day running	String	4 - 16 (Program Restricted)

Login Attempts	This records the existing login attempts so that it doesn't change when opened	Numerical	2
Database Lock	This is true when the login attempts have been exceeded and signals the lock of the database	Boolean	1
Admin Right	This is true when the user logs in with admin credentials	Boolean	1
Current Product Description	This holds the product that is currently being placed into the check-out list	String	40

MANUFACTURER TABLE

- This is the table that will contain the information about the different manufacturers that have products being sold in the tuck shop.

Field Name	*Description*	*Data Type*	*Length*	*Validation*
Manufacturer ID (ManuID)	Unique number for each manufacturer	Auto Number	3	Numeric va Repetitions
Manufacturer Description (ManuDesc)	This is The Manufactures Name	String	20	String/Text

ORDER TABLE

This is The main Order table used to record transactions where by the user has ordered products either from a reorder or a new product and is now entering them into the system.

Field Name	*Description*	*Data Type*	*Length*
Order ID	This is the unique number for each reorder	Auto number	5
Product ID (ProdID)	*This is not exactly an auto number in reality because it matches the number in the product list book, it's a unique field for each product*	*Auto Number (Lookup)*	*3*
Total Order Quantity	This is the amount of products that have been reordered	Number	3
Order Date	This is the date when the order is input so that when the order is needed for reference the date helps to filter out	Date/Time	8

TRANSACT TABLE

- This is the main transaction table that records the transactions with customer as they occur, it has one to much relationship with the sales table because a transaction is made up of one or many sales.

Field Name	*Description*	*Data Type*	*Length*	*Validati*
Transaction ID (TransID)	This is the unique number for each transaction	This is the unique number for	5	Numeric

		each reorder		
Transaction Date	This is the date at which the transaction would have taken place	Date/time	8	Date in f
Transaction Time	This is the time at which the transaction would have taken place	Date/Time	8	Time in
SubTotal (SubTotal)	This is the total amount of all the products involved in the transaction	Currency	7	Currency - $999.9

PRODUCT TABLE

- This is the table that contains all the information relevant to each and every product being sold by the business.

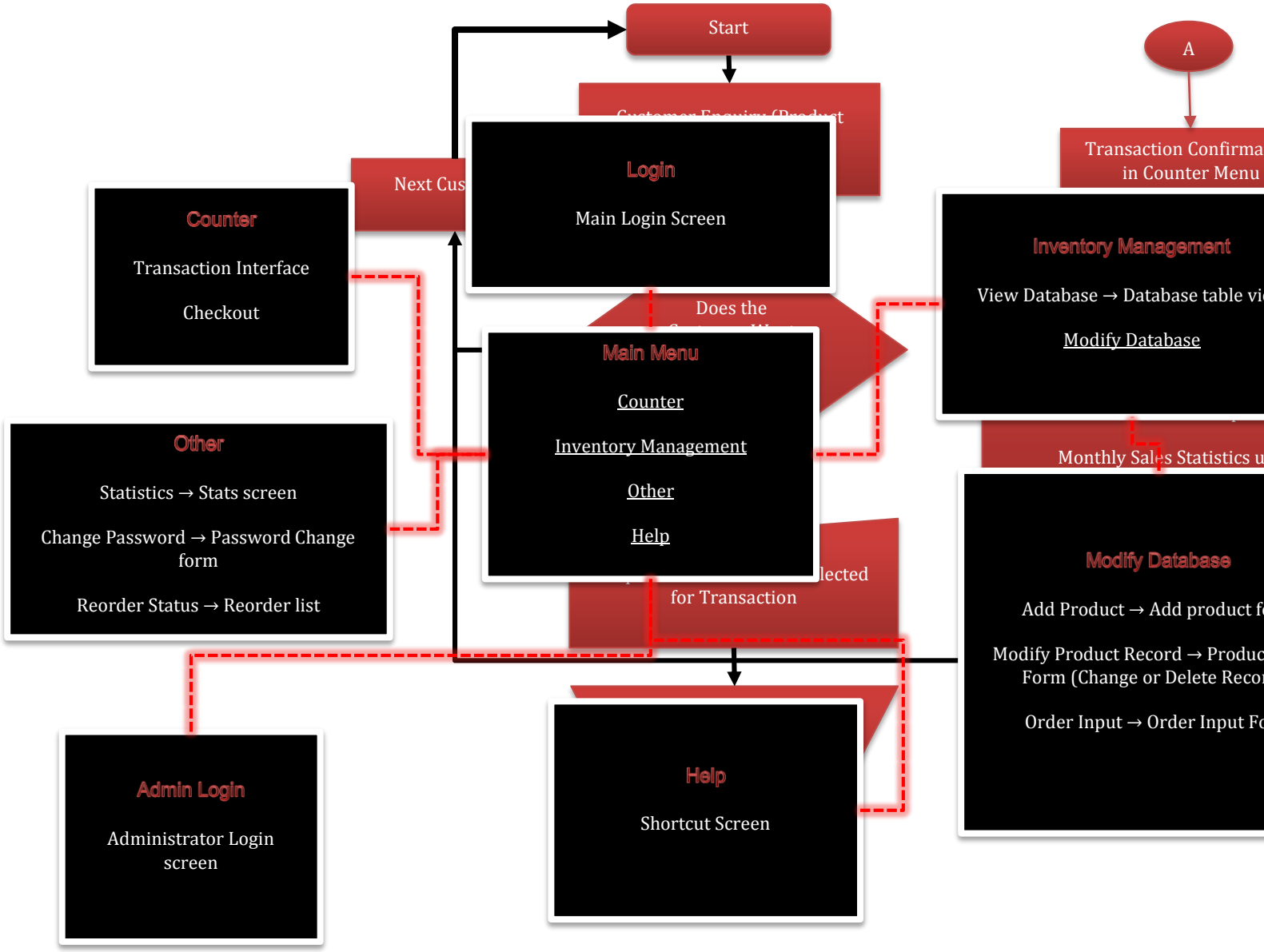
Field Name	*Description*	*Data Type*	*Length*
Product ID (ProdID)	*This is not exactly an auto number in reality because it matches the number in the product list book, it's a unique field for each product*	*Auto Number*	*3*
Product Description	*Basically contains details on what the product is.*	*Text*	*30*
Product Type	*Details on what type of product it is. E.g. it could be a beverage or Cereal…*	*Text*	*15*
Product Quantity	*How many items of that product are in stock*	*Number*	*2*
Product Selling Price	*Basic product price to the customer*	*Currency*	*8*
Product Reorder Level	*Number at which an individual product when exceeded will trigger the reorder Boolean field to display "Yes" to show that the product needs attention as it is running out*	*Number*	*2*
Manufacturer ID	*Unique number for each manufacturer linking to the Manufacturer table*	*Number (Auto number in Manufacturer table)*	*3*
Product Image	*This will contain the embedded picture for each record*	*Image (OLE Object)*	*(100-200)k*

ORIGINS OF NEW DATA FOR THE SYSTEM

- Product names and details including manufacturer, type and so on will be gathered from the product books as a basis for the database and will late be updated by other means of natural running of the software
- Dates and times will be taken by the system as dates and times from system clock (Timer) (only required when a transaction is taking place or when an order is being recorded.)
- Reorder Levels will be generated 100% by the owner as Mr. Mafukidze is the one who knows the business well and they can later be adjusted depending on the way the system is working.
- Input on the counter screen including product selection and so on, will be taken from the customer as they govern what products they would want to buy.
- Money related inputs and outputs are taken from the calculated totals, the invoice/receipts when an order has happened and information stored on the table depending on the particular situation.
- Order quantities and other order related inputs are taken from the receipts/invoices of reorder e.g. Bakers Inn invoice after ordering bread in the Investigation section.
- User change is calculated depending on how much money the customer has given in contrast to how much money the customer was supposed to pay in the first place.
- Totals and statistical data will be calculated using the runtime transact data as the system runs normally.

DATA FLOW AND PROCESS DIAGRAMS

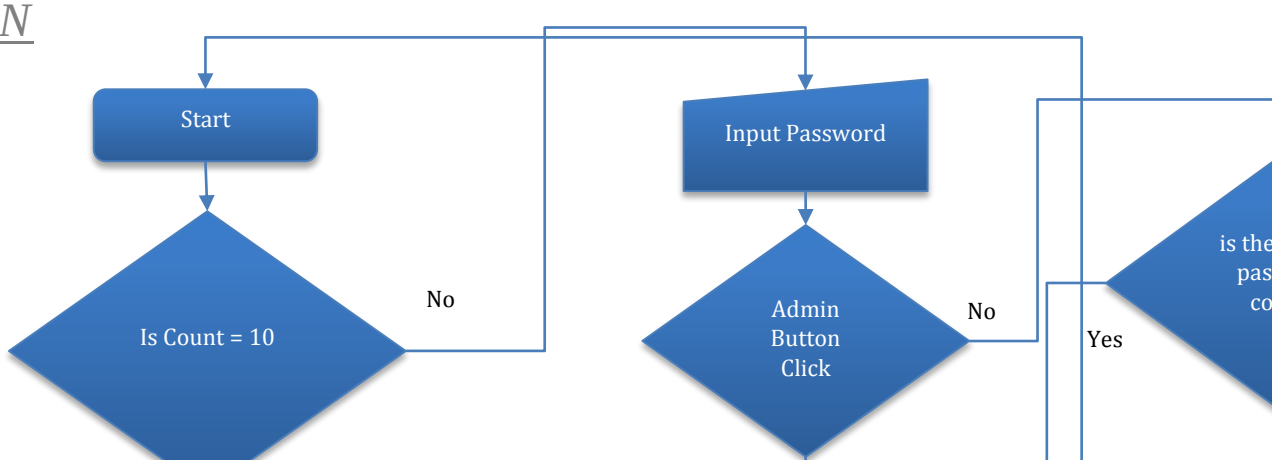
OVERALL TRANSACTION PROCESS



OVERVIEW FORM DESIGN [TREE DIAGRAM]

Flow Charts of System Processes Brocken Down

LOGIN



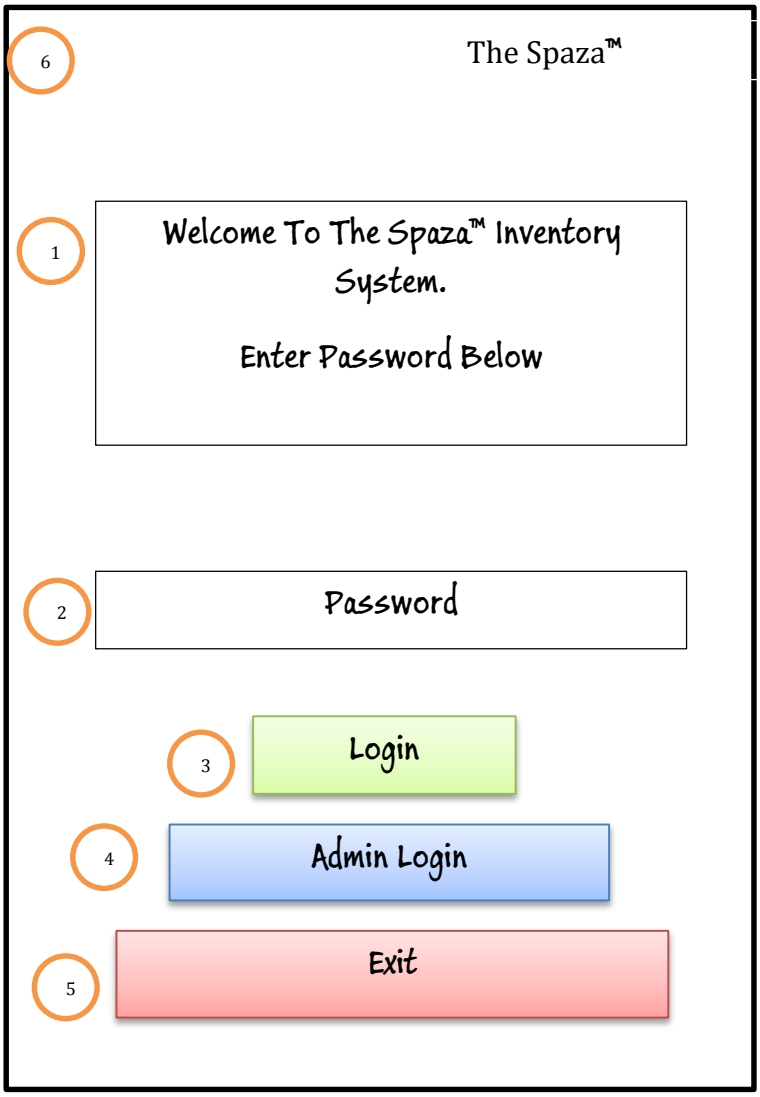
SCREEN DESIGNS

These are basic screen designs. These are mere plans for the final application made to the Users requests noting that they could change depending on the user or other factors.

Input screens would contain the Login screens, Add product forms etc…

INPUT AND OUTPUT SCREENS:

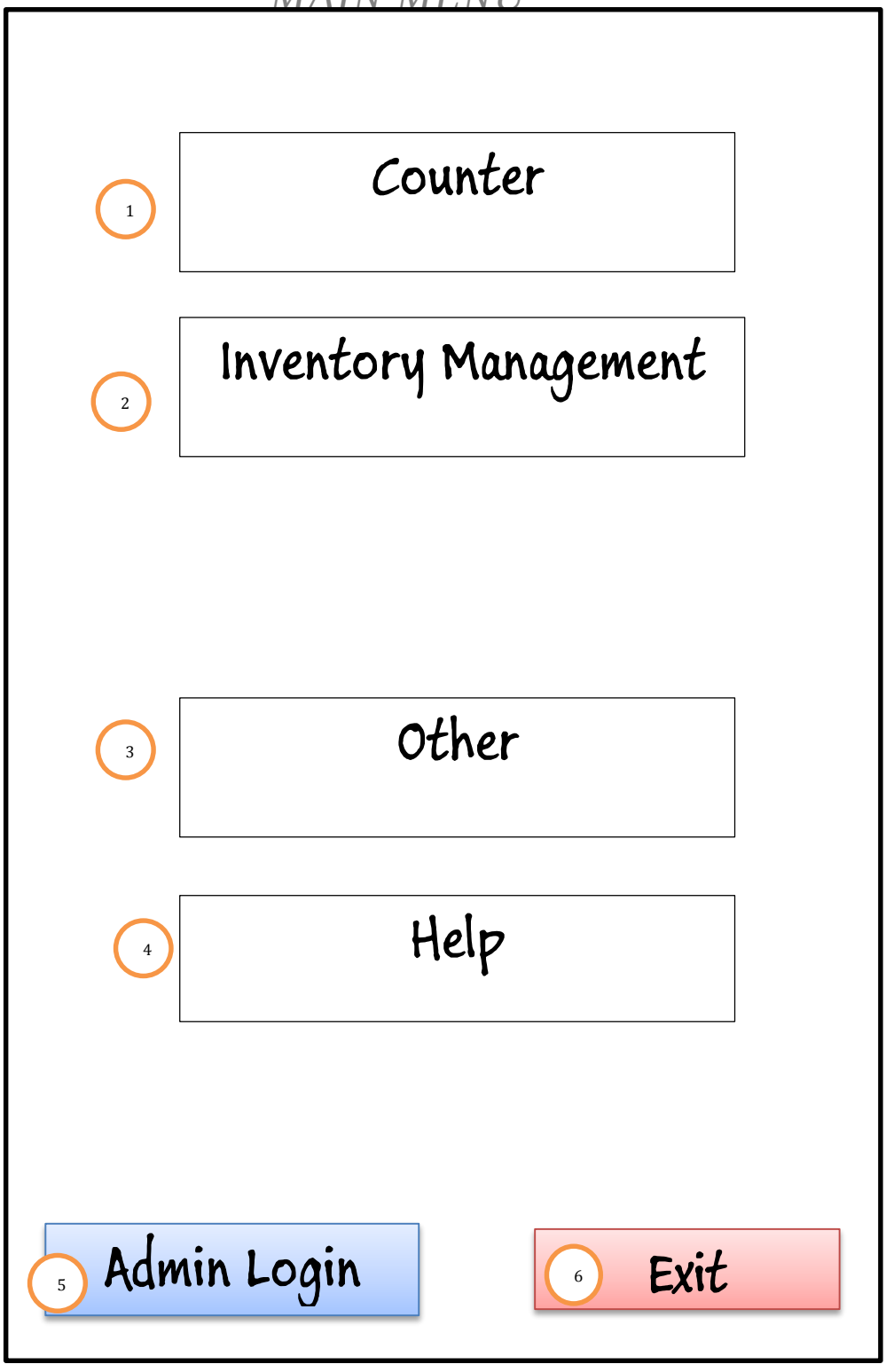
LOGIN FORM


6
The Spaza™
1
Welcome To The Spaza™ Inventory System.
Enter Password Below
2
Password
3
Login
4
Admin Login
5
Exit

LOGIN FORM

1. Simply contains the title or main header of the form in this case it's a welcoming notation.
2. This is the box where the user places in their password.
3. When the password has been entered assuming it's the normal password. This "Login" button logs the normal user in and takes them into the main menu or initiates the authentication process of checking whether the password is correct and then logs the user in if not will display a dialog box showing that the password is incorrect.
4. The admin login button assumes that whoever is logging in is using the admin password which takes the user to a special settings place where he manages the passwords or even adjusts the settings of the application.
5. This is a normal exit button that allows the user to exit the program
6. This is the application header and will contain a logo when the final product is made.

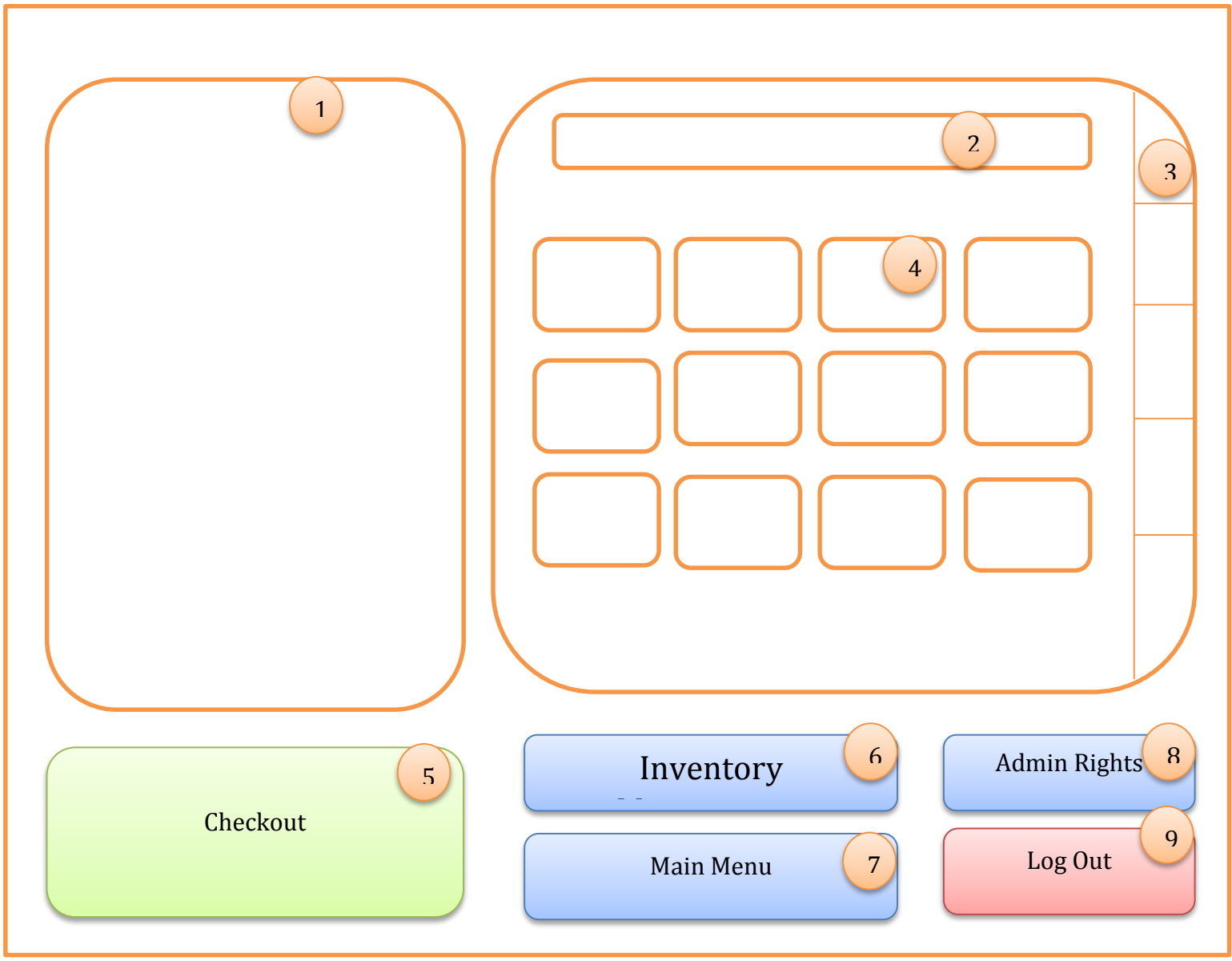
MAIN MENU


1
Counter
2
Inventory Management
3
Other
4
Help
5
Admin Login
6
Exit

MAIN MENU

1. This will take the user to “The Counter Menu” this is basically the main part of the application where all the transactions take place in terms of recording... virtual receipt making and so on. This is where there is an icon like interface using images as icons to make transaction recording a lot simple.
2. This Inventory Management takes the user to a menu where he can make changes to the inventory in terms of adding products, deleting product records and making changes to them. In that menu he can also just browse through the database of the products and their details as well.
3. Other contains the extra menus that will not fit into the criteria of the other menus on the main menu.
4. “The Help Button” takes the user to an in application menu which has instructions of where he is, how he can get to what he is looking for and an overview of how the system works exactly of course not being as detailed as the hardcopy manual but it will have shortcuts to different areas of the application.
5. Admin login takes the user to another login page but this one is strictly for the admin rights as the user would have already logged in as a normal user.
6. This allows the user to exit the application

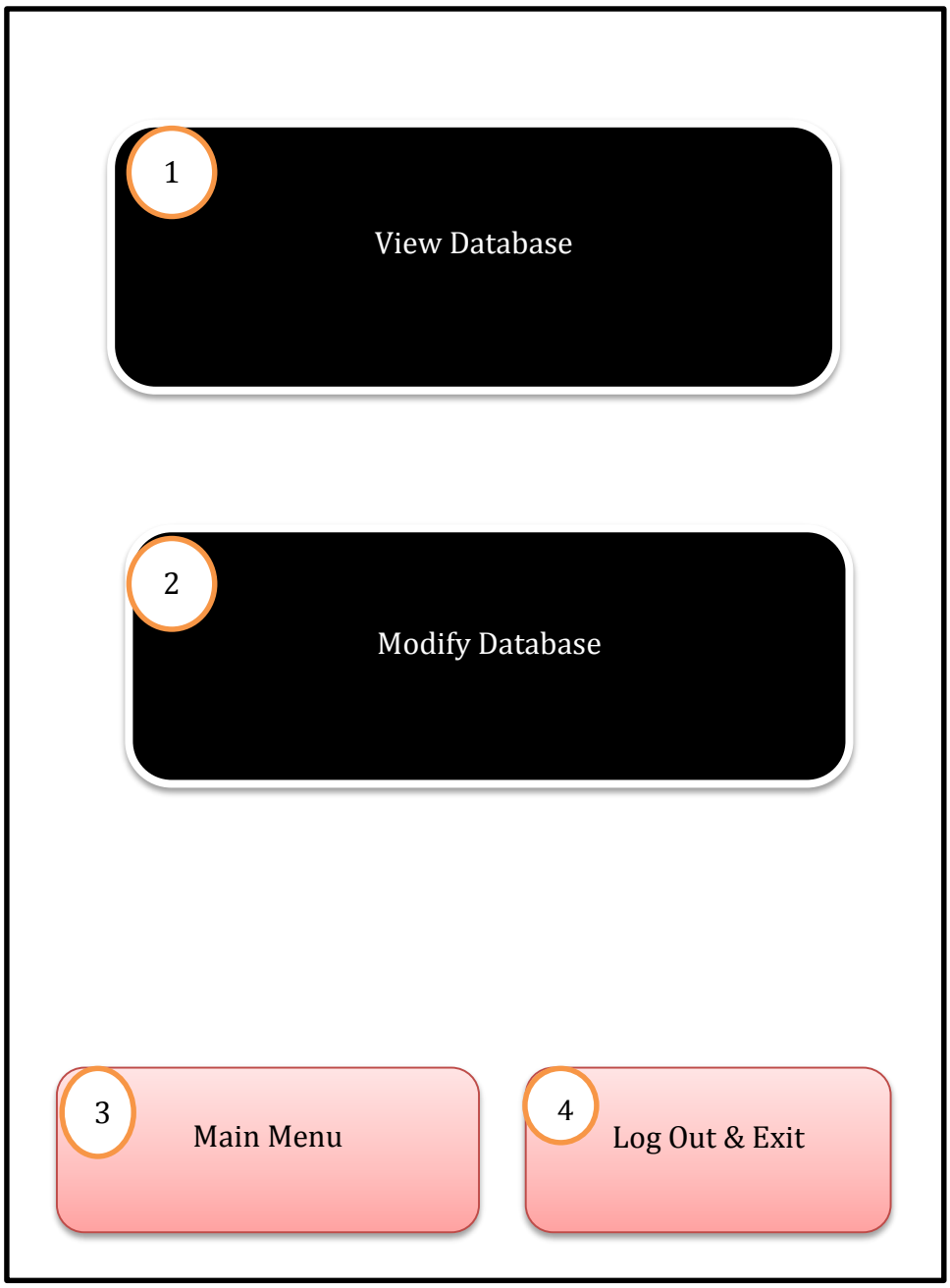
COUNTER MENU (LANDSCAPE)



COUNTER MENU

1. This is a display of the details about the transaction that is currently taking place.
    i. This section is the virtual receipt section. In order to be as simple as possible the owner disregarded the idea of a receipt but approved the idea of a virtual one that is kept
2. This is a search box in order to filter icons of products when they are being searched for.
3. These are tabs that let you alternate between product types to make navigation to particular product icons as quick as possible because the system has to work as quickly as possible.
4. These are product icons at which when clicked on will send the details of the product to the virtual receipt.
5. The “Checkout Button” serves the purpose of opening a transaction confirmation dialog box which when approved will perform the normal procedures of decrease stock levels for the items that were involved in the transaction and other calculations and record the transaction.
6. Takes the user to the Inventory Management Menu.
7. Takes the user back to the Main Menu.
8. Takes the user to the admin login page.
9. Logs the user off and closes the program.

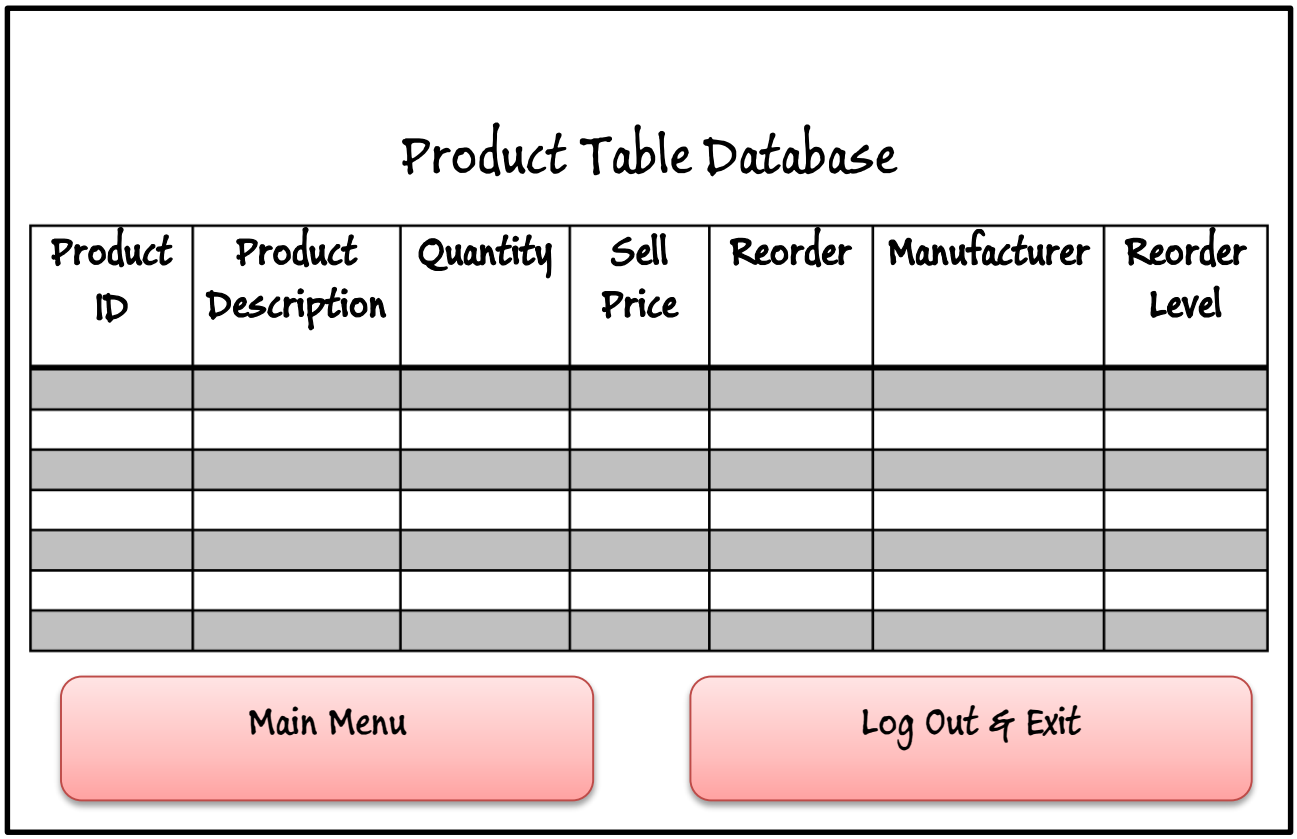
INVENTORY MENU



INVENTORY MENU

1. Leads the user to a universal view of the database to see the product records and details stored in the tables
2. Leads to another menu that will allow the modification of records that are in the table.
3. Takes the user back to the Main Menu.
4. Logs the user off and closes the program.

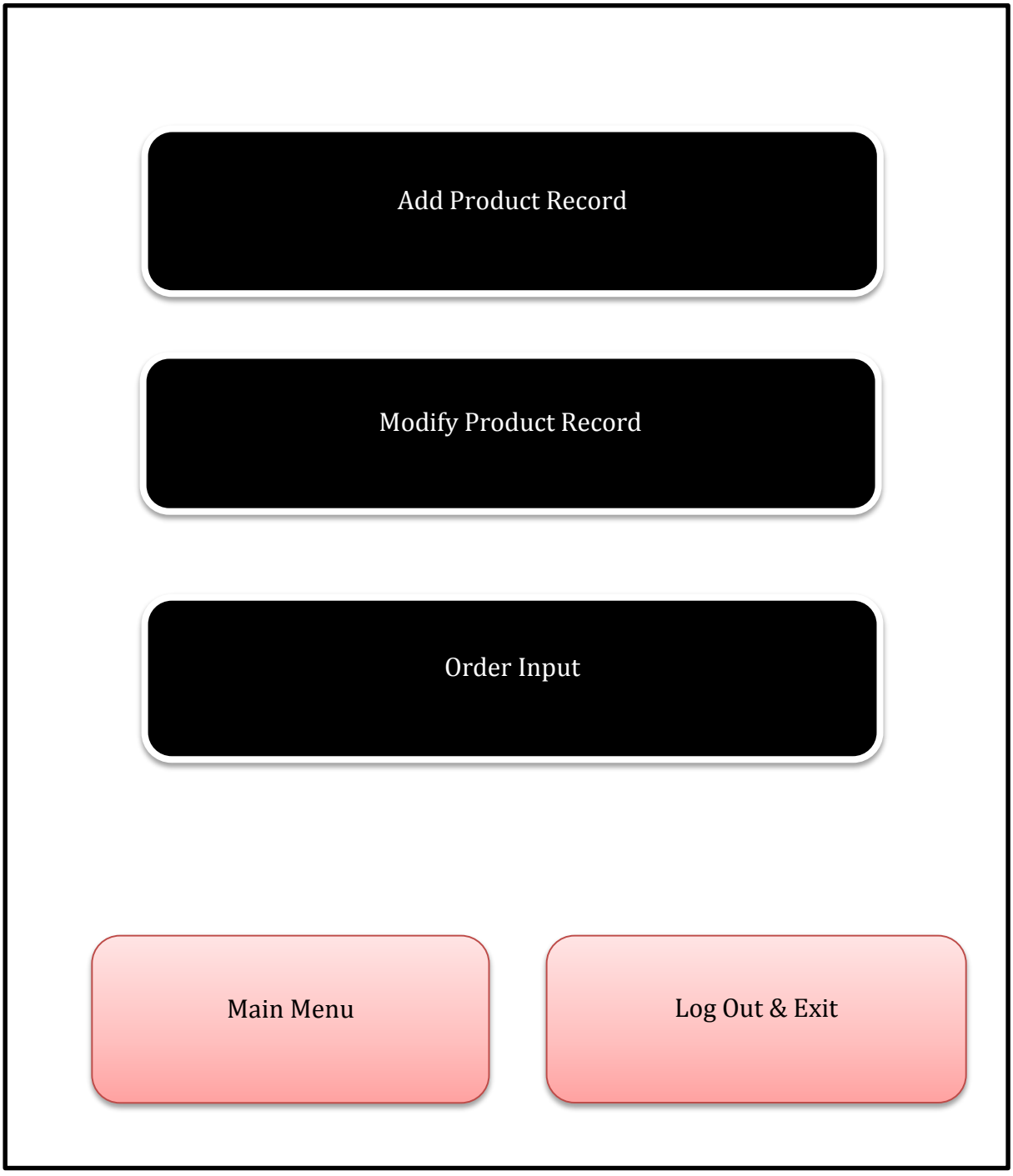
VIEW DATABASE



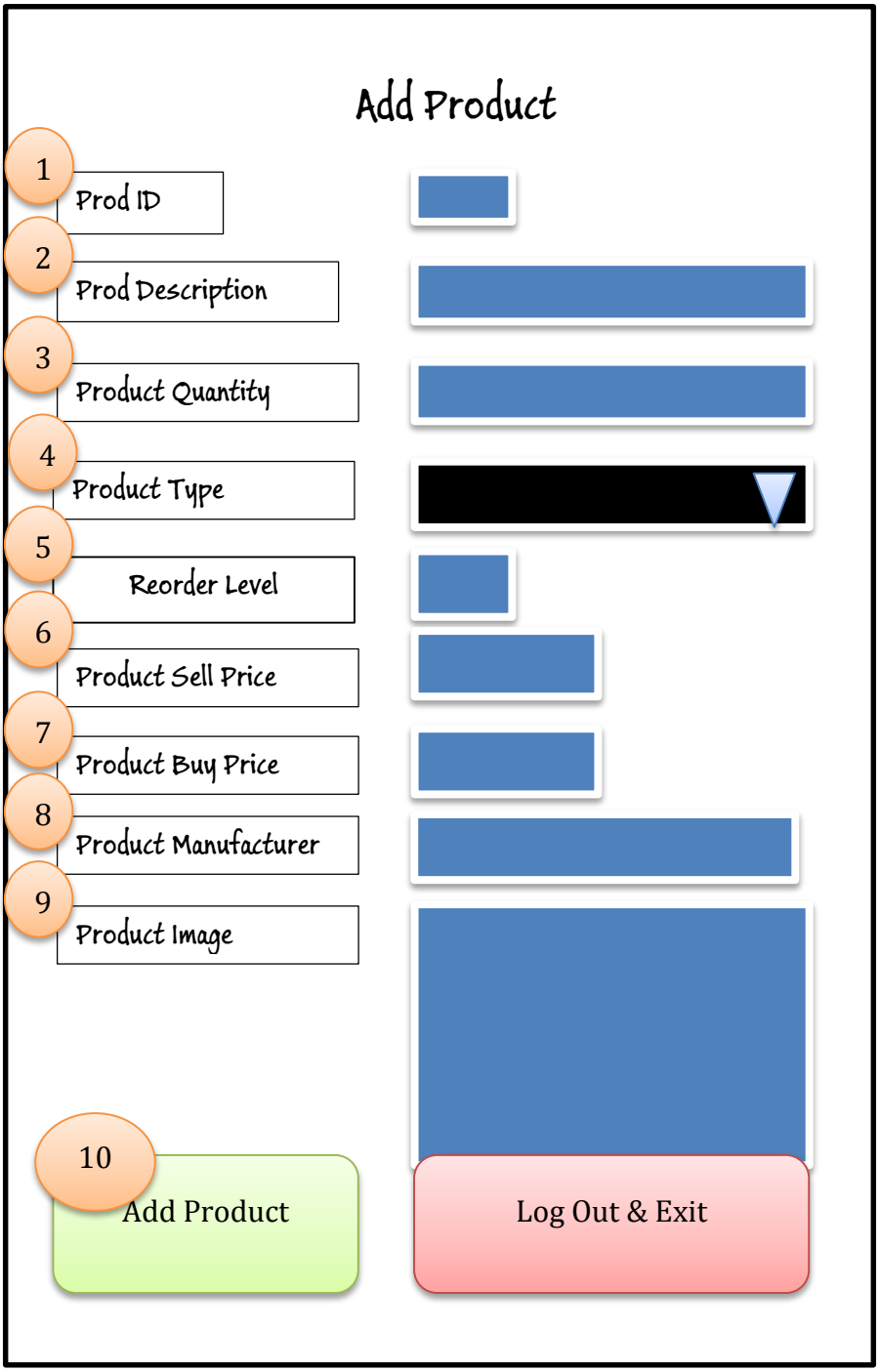
VIEW DATABASE

- This is basically a detailed view of the entire database consisting of all the product records etc.

MODIFY DATABASE



ADD PRODUCT FORM



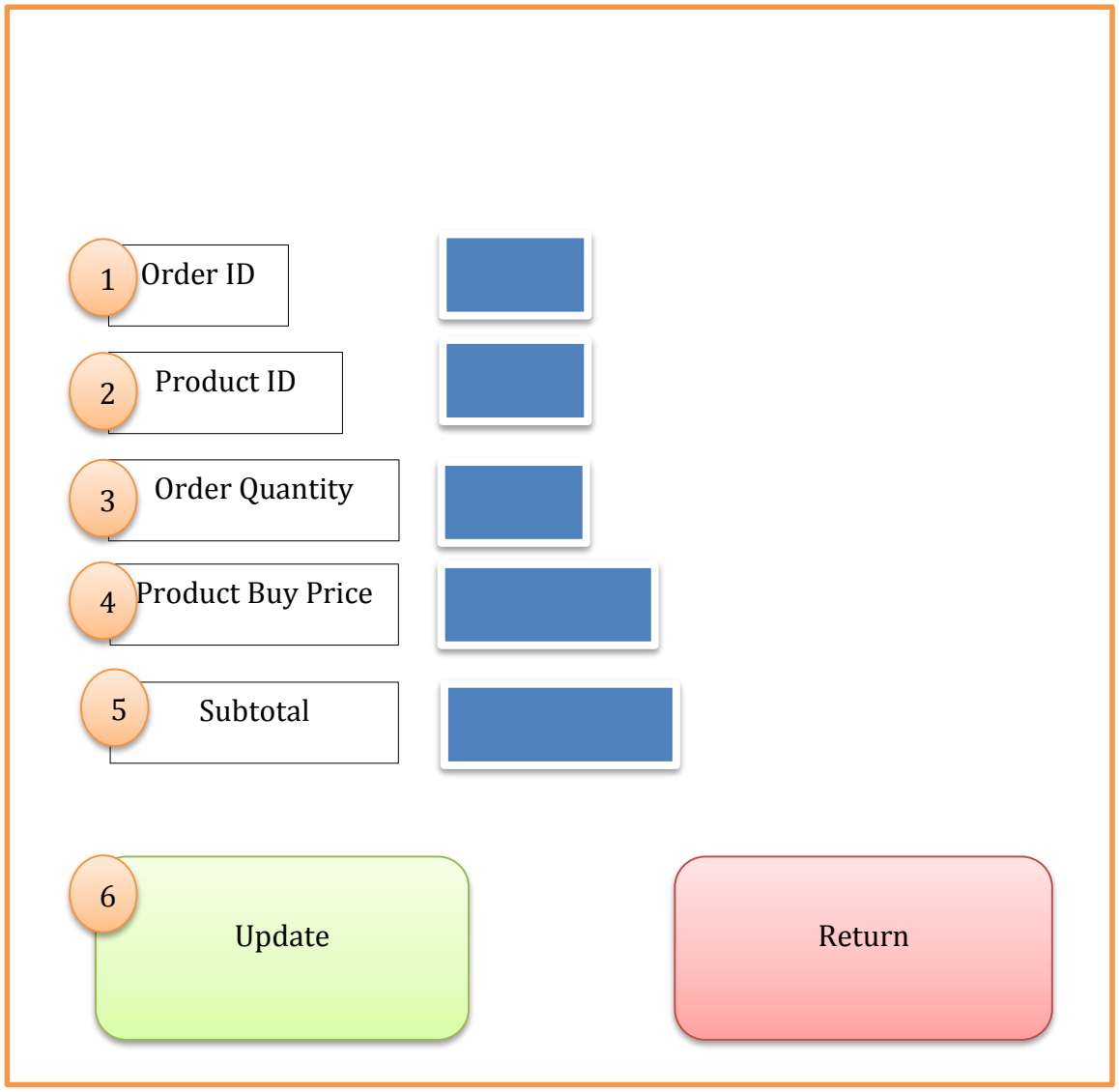
ADD PRODUCT FORM

1. Product Identification input box for the Prod Id found in the Product Table.
2. Product Description input box for information on the particular product (ProdDesc) found in the Product Table.
3. Product Quantity input box for the amount of products that are in stock at that particular moment found in the Product Table.
4. Product Type option box for selection of which product category the product falls into with predefined options.
5. Reorder: This is left out as the system will update this field as the transactions occur depending on the reorder level and quantity.
6. Product Sell Price: This is the monetary amount at which the product will be sold at to the customers found in the Product Table.
7. Product Buy Price: This is the monetary amount at which the owner/employee would have paid for each product at his source. This is used to calculate how much profit he makes every time one of the products is sold using the sell price of course found in the Product Table.
8. Product Manufacturer: The main manufacturer of the particular product for identification and filtering processed found in the Product Table.
9. Product Image: This is the image that will be displayed on the counter as an icon. It must be relevant to the product and be of reasonable size.
10. Add Product button which will add the details to the table and save.
    a. This will result in a confirmation dialog box to confirm that the products are correct. Then when approved would be finally saved
    b.

MODIFY

The Modify Menu will bring up the add product form with the filled in details of the product but with a few changes of a save button instead of an Add button and will have a Delete Button in between the save button and log out and exit buttons

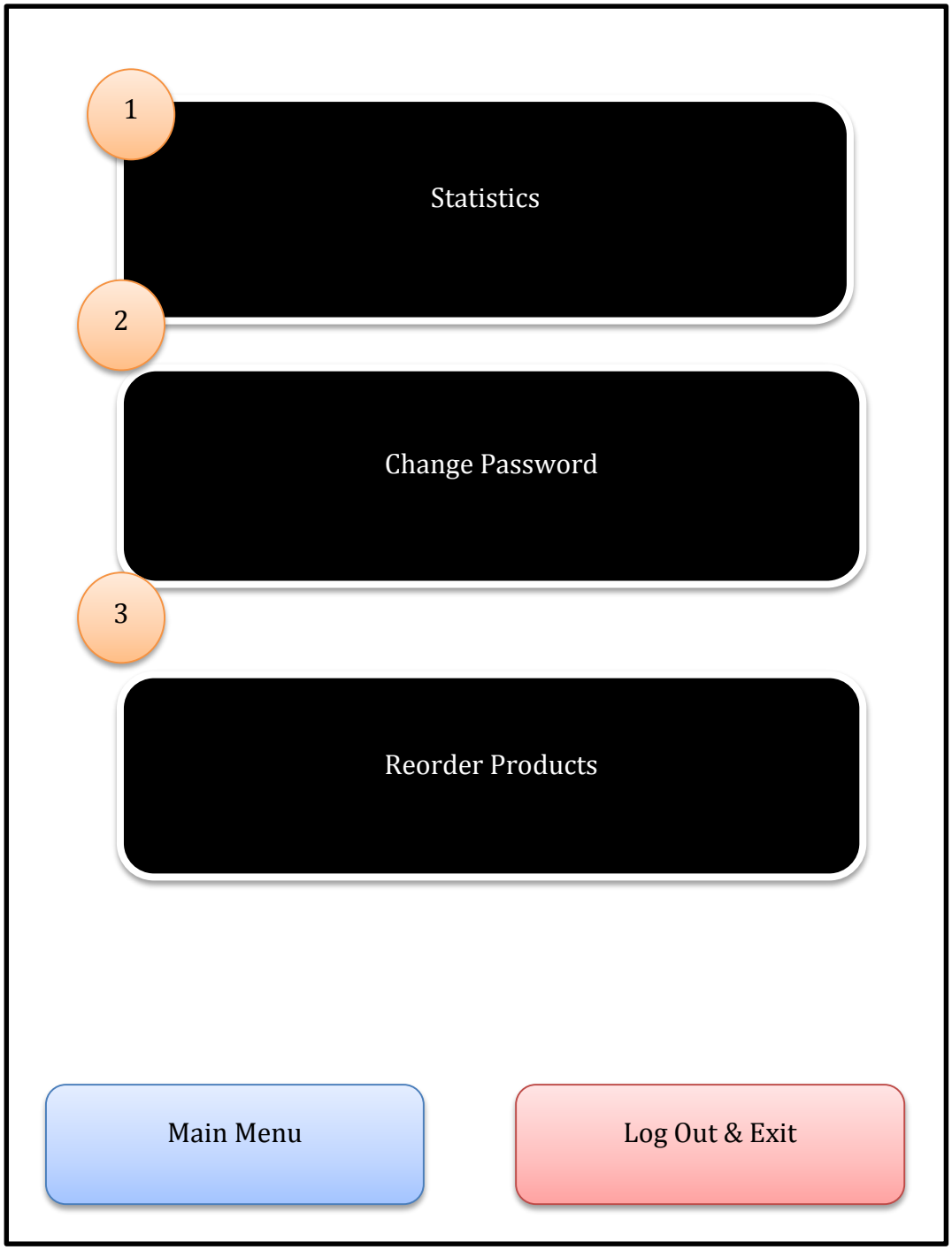
Order Input Form



Order Input Form

1. Order Id field is for the recording of the order it will self-fill in as it is an auto number.
2. Product ID is for the ID of the product that had been ordered.
3. Order quantity is for the input of the amount of products ordered.
4. Product Buy Price is for the cost of one unit of what was bought.
5. Subtotal is the total amount of the order (Order Quantity* Product Buy Price).
6. Update button will check if everything was input correctly and will add the quantity to the quantity in the normal product table when confirmed.

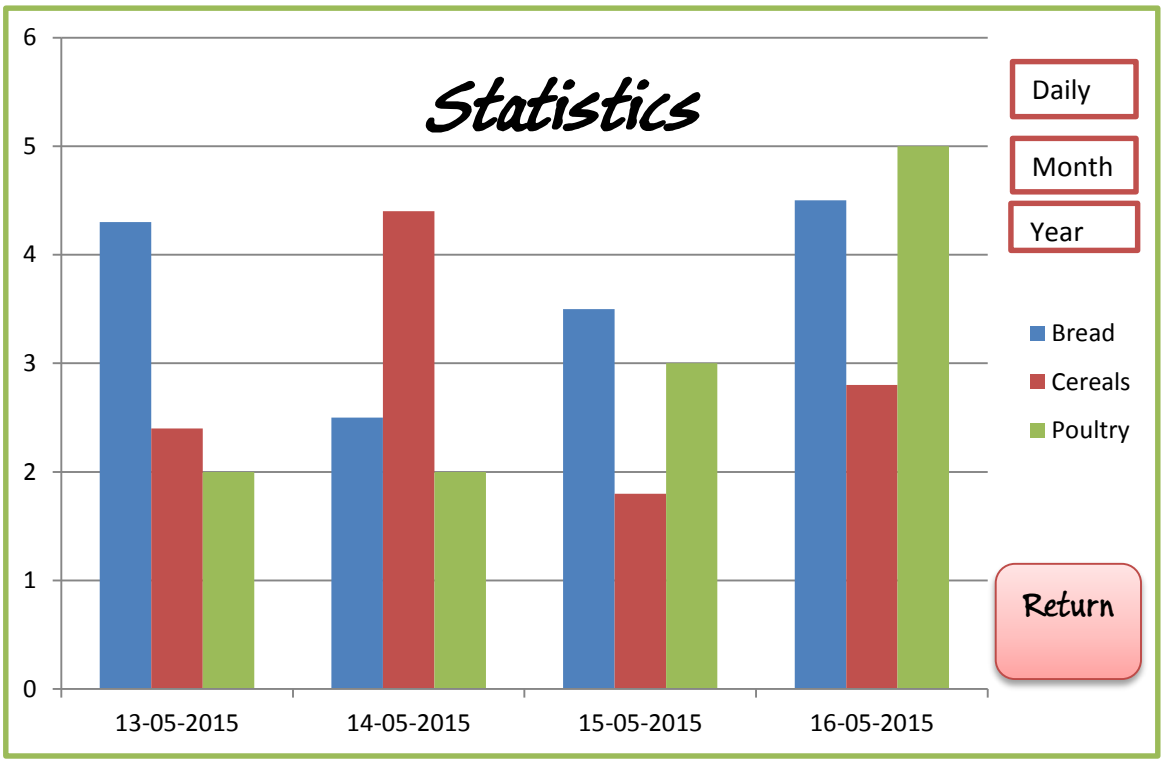
OTHERS MENU


1
Statistics
2
Change Password
3
Reorder Products
Main Menu
Log Out & Exit

OTHERS MENU

1. The Statistics option takes the user to a page where by his charts with details of how the business is doing is located along with a menu that just has statistics in textual form.
2. The change password option is to change the main user password for one reason or the next but the previous password or the admin password is required to do so.
3. The Reorder option will show the list of products that need to be reordered as of that moment as they will be running out

STATISTICS PAGE

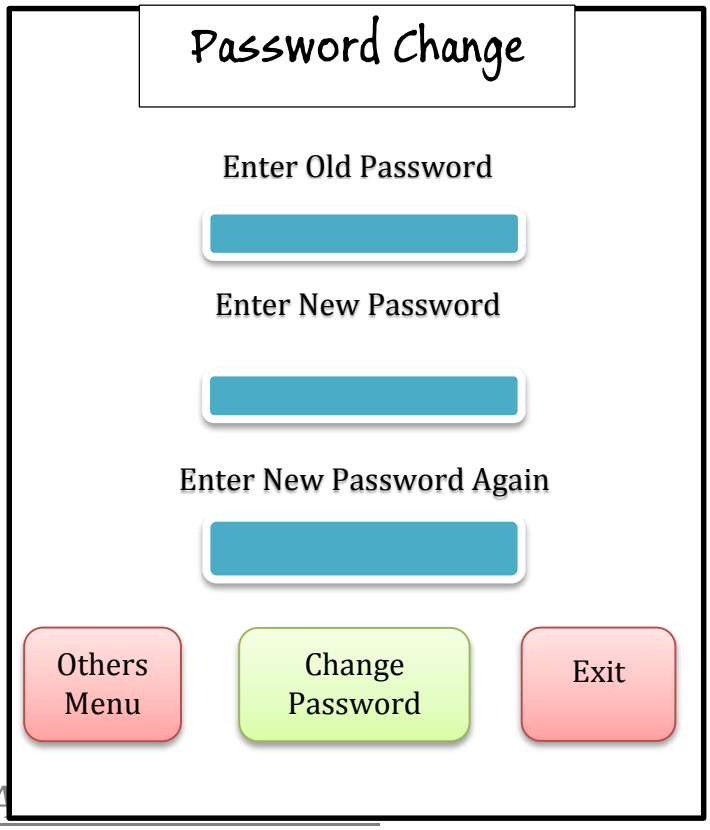


STATISTICS PAGES

The stats page consists of a column/ bar chart representing the business' performance with particular labels and allows the user to toggle the time periods and which data set to show e.g. day view, month view… etc.

There is a special option called textual that shows the statistics in a textual representation instead of a graph.

CHANGE PASSWORD FORM

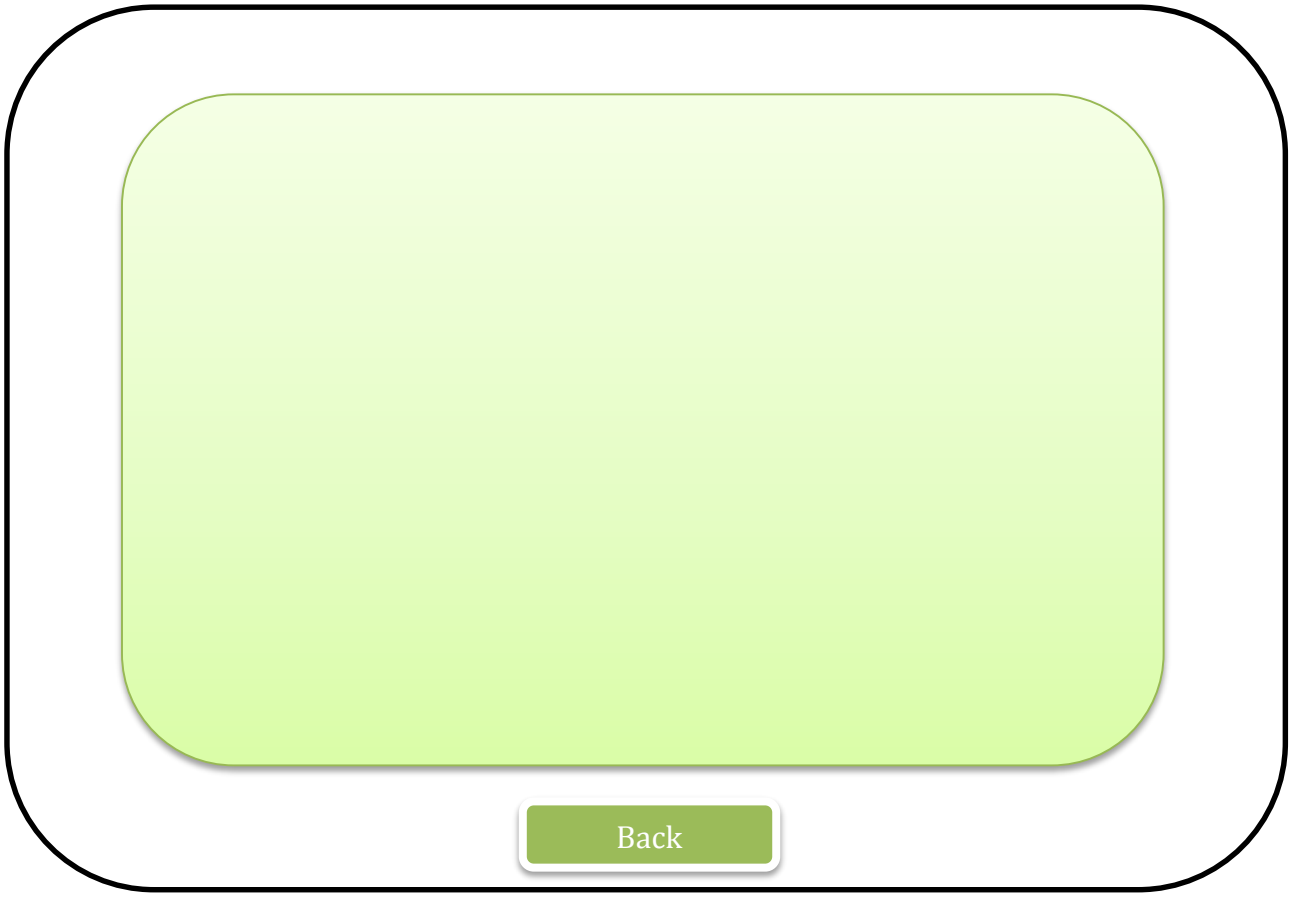


CHANGE PA

The change password form consists of three textboxes which requires the user to input the old password and the password he wants to replace it with twice to make sure. When the change password box is clicked a confirmation dialog box pops us if the data is correct and a notification dialog box afterwards.

The Reorder form is the same is the one in modify database.

HELP MENU



HELP MENU

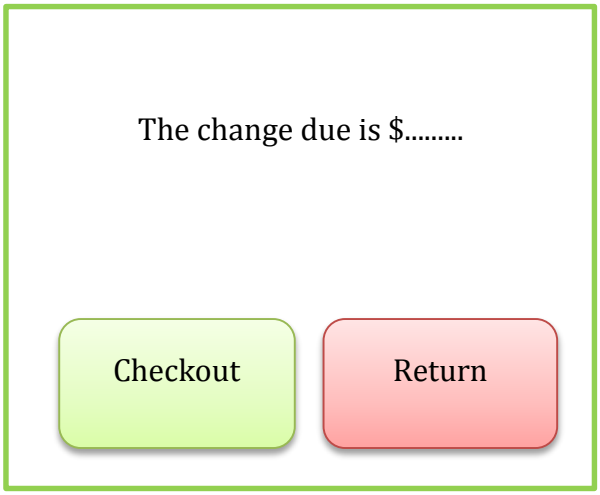
- The help menu for simplicity purposes only contains 3 parts the main part will be where the illustrations are displayed in the form of detailed diagrams with everything explained.
- There are links / buttons to go to any form
- There is a hover function that tells the user what the form is about

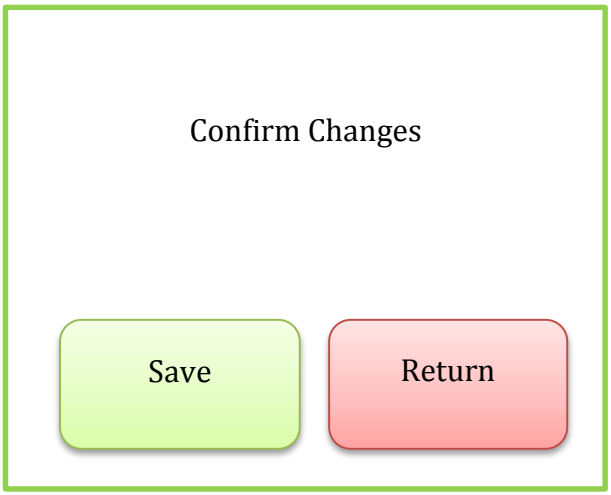
Dialog Boxes

CONFIRMATIONS

The following dialog boxes serve the use of allowing the user to confirm his actions either

- Confirming a transaction.
- Saving a product change.
- Adding a product to the database.
- Deleting a product from the database.
- Changing The Password to the database



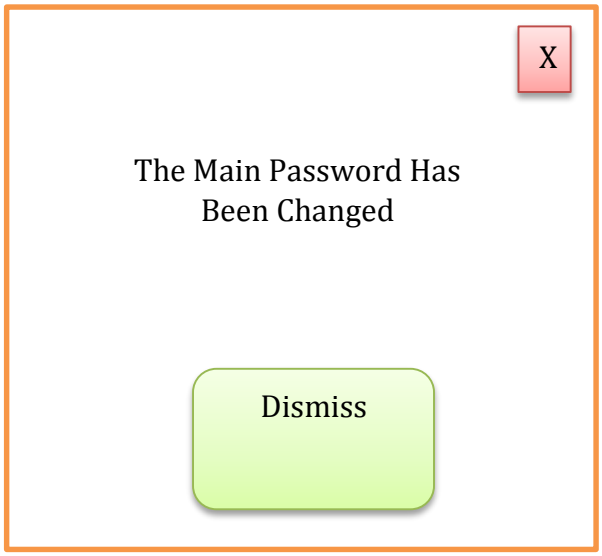


NOTIFICATIONS

On the left we Have the dialog box that will pop up when the add product button is pressed after the user has typed in the product details and this is to serve as a notification that the record has been saved.

On the right we have the dialog box that will appear after the user has modified a product and has clicked on the save button this will again serve the same basic purpose of notifying the user that his changes have been saved

Below there is the dialog box that will pop up when the delete button has been pressed and the operation was successful.



INTENDED BENEFITS

This system is designed in such a way as to minimize complications so that calculations can be done as quickly as possible to make time lost as low as possible.

The system allows easy recording of changes as a transaction happens also adding to the factor of saving as much time as possible allowing more transactions to happen compared to a set time using the old methods.

The statistics allow easy understanding of where the business is going in terms of performance as compared to the original methods as statistics would have to be worked out when requested using the material from all books and other invoices.

Recording of orders becomes ever so basic as it updates the stock levels and other secondary variables at once instead of adjusting each section.

Because of validation checks on input data, the errors become reduced as data that doesn't make sense will be rebuked and correct, sensible data will be requested again.

LIMITATIONS OF THE SCOPE AND ADJUSTMENTS

Even after the system is designed the system can't stop the physical theft of products but it can allow easy realization of theft because the money wouldn't add up as explained in the section above.

If the system is run by a person who is very unfamiliar to computers then it could really slow down the operation but a person with the basis of knowing how to handle a mouse and keyboard would have no trouble.

The product records still are not 100% safe in the sense that a virus attacks the computer then the files can become corrupted, it's just as bad as a water spill or fire damage on the original books of the business

Not all of the customers' requirements in terms of extra features might be achieved as the program was not made by the most skilled of programmers out there therefore the programming knowledge is rather limited yet growing.

The system would work at optimum capacity if a touch screen interface was provided but due to instructions of minimizing cost it wouldn't make sense to get high tech objects for a business that is meant to be as simple as possible to maximize profits.

Although validation checks are present this doesn't stop the user from entering incorrect data in the terms of data that isn't correct but is "correct enough" to bypass the validation checks.

A few adjustments had to be made in terms of using a mouse and key board as opposed to the desired touch interface.

Reduced complications in terms of features elaborated in the above points. The statistics page in particular was deprived of its complicated

CALCULATIONS OF ESTIMATIONS OF FILE SIZES AND GENERATED RECORD AMOUNTS

Table Names	Size of particular record	Byte Size of particular fields	Estimated number of records after time period of (2 Years)	Total (max) size of date	Total Memory (max) + 10% (Overhead)
Order	25	5, 3, 3, 7 and 7	600	15000B = 14.65 KB	16.11 KB
Transaction	20	6, 8, 8, 3, 3 and 7	146000	4990 KB = 4.88 MB	5.37 MB
Product	30	3, 30, 15, 2, 8 and 2	200	12000B = 11.7KB	12.9 KB
Manufacturer	23	3 and 20	100	2300B =2.25 KB	2.48 KB
Static Values	36	16, 16, 2, 1 and 1	1	36B	40b
Total	134	172	146901	5139096 = 5018.65KB = 4.90MB	5.39 MB

The Total estimated file size of the database will be about 5.40 megabytes including overflow with records over a time period of 2 years

The stock files would total to 172 bytes