

**Customer and Inventory Management System
C.I.M.S.**

By

Sean O'Melia

Submitted to
the Faculty of the Information Engineering Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Engineering Technology

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Date

Acknowledgements/Dedication

I would first like to thank the Mason Framing Gallery for working with me to help create this project with all their input. Secondly, I would like to thank Professor Schlemmer for helping me get through the Senior Design sequence so smoothly. I was lucky to have him as my advisor. Finally, I would like to thank my family for keeping me motivated to finish this project and for understanding my lack of time for them.

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Abstract

The Customer and Inventory Management System (CIMS) is a Windows application designed to allow employees to serve customers quickly and manage their business easier. The current Windows application has a confusing interface and many unnecessary features. This application also does not support a real-time product inventory into the point of sale functions (i.e. when a sale is made, that product's quantity is not subtracted from the inventory). Also, the current application is costly to purchase and maintain. My application, CIMS, is custom designed to the needs and wants of the Mason Framing Gallery. It only has the features needed and adds functionality for employees to accomplish tasks more quickly. CIMS was created with the latest programming technology (C#). It has a familiar Windows interface that allows employees to learn and use CIMS quickly and easily.

Customer and Inventory Management System: CIMS

1. Statement of the Problem

The previous system used for point of sale operations and inventory management was called “LifeSaver”. The staff at the Mason Framing Gallery had indicated a number of problems and issues they had with this program, including:

- Several features were overly complex for the framing gallery’s needs.
- Redundant menus and buttons that made the user interface cluttered.
- The frame ticketing system did not allow multiple frames on the same invoice (which increased the time and work necessary to serve each customer)
- Job quotes did not include specific details (only labor cost and material cost)
- Everyone had to use the same workstation to help customers
- No way of knowing which employee created a job or ticket
- Inventory was not tied to customer orders
- It was expensive to operate and maintain.

While the LifeSaver software did have an inventory database, it was not connected to the customer database. When a sale was made, those items were not subtracted from the inventory. When the stock was low, no notification was sent to alert the employees what needed to be reordered. Managing inventory properly is a major part in staying within budget.

2. Description of the Solution

The Customer and Inventory Management System (CIMS) provides a simple but effective user interface which satisfies the needs for an audience with intermediate

computer skills and a framing gallery background. CIMS combines “point of sale” functions with the customer and inventory database for business management.

Some of the key features for this application include:

- “Point of Sale” interface with customer ticket creation
- Capability to accept payment
- Ability to operate on multiple workstations and connect to a central database
- Employee log-ins for sales to track employee performance and manage jobs
- Reporting tools for customer history/trends
- Log book for jobs pending, in progress and completed
- Reporting tools for inventory history/trends and reordering of stock

The customer and inventory database is the foundation for CIMS, yet it is transparent to the users. An easy to understand graphical user interface helps employees be more productive and service customers quicker.

2.1 Intended Use

CIMS will be used by the employees to generate invoices and quotes for customers. As new invoices are created, the items purchased will be tied to the inventory database, allowing real-time tracking of inventory on hand. New customer accounts can be created and existing customers and invoices can be searched on.

2.2 User profiles

The users for this program are the staff at the Mason Framing Gallery. They are familiar with the Microsoft Windows operating system and the current point-of-sale software. The manager also maintains the inventory and uses basic accounting software on a weekly basis. The users have a medium to low computer skill set and rely on

external assistance for computer problems. There are two levels of user interaction with CIMS that control access.

2.2.1 Primary User

These employees provide customer services including framing, consulting on art and design choices, and point-of-sale functions. These users create new customer invoices, look up existing jobs, and create estimates for framing costs. All employees are considered primary users.

2.2.2 Manager

These employees manage the customer accounts and inventory database. The managers perform general maintenance such as entering new items to the inventory database, deleting old customer accounts, and updating employee information. There are currently two managers at the Mason Framing Gallery.

2.3 Design Protocols

My computing areas of focus for the project were application programming and database programming. Most of my time was spent creating the user interface and connecting it with the database. Application development was done with Microsoft Visual Studio .NET using C#. This involved creating windows forms and connecting to the database to populate the forms. I created the initial customer and inventory database with Microsoft Access 2000. The current LifeSaver software has an export function for its some of databases. I used this to import most of the existing data into the new Access database.

I also had a secondary area that was be important to the project. It involved setting up a network environment to take advantage of multiple workstations. The

Framing Gallery only had one point of sale workstation and added one more in the last month. A structured cabling system of Category 5e cable was already in place throughout the building along with a 4-port 10/100 Mbps hub. I set up each station and configured it for the peer-to-peer network environment.

2.3.1 User Interface Design

The user interface is divided into three key areas which are accessed from the main form. See Figure 1. below.

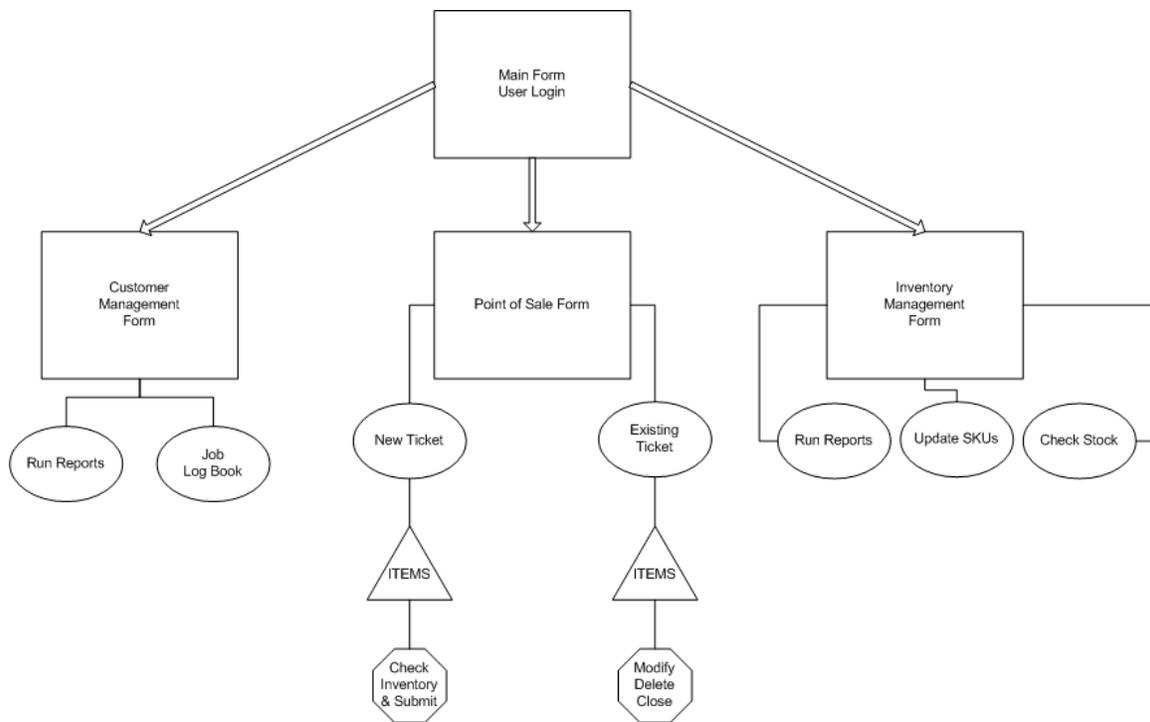


Figure 1. Basic diagram for the GUI

2.3.1.1 Main Form

The main form is the point of entry for employees. They log in with an employee ID. This allows employees to search tickets by who created them without having to search for a specific customer. Employee information can be added and log-ins created from the main form.

2.3.1.2 Customer Management

The customer management form is used to add customers (without creating a ticket first), modify customer accounts, and delete customer accounts. Reports can be run to check for outstanding customer accounts, look up purchase history, and more. Scheduled jobs can be looked up and modified in the job log book.

2.3.1.3 Point of Sale

The point of sale form is where employees create new work tickets for customers and look up existing/pending tickets. Employees can add products by typing in the item number or by searching. New customer accounts can be added in the point of sale form at the same time the ticket is created. Estimates can also be generated with this form.

2.3.1.4 Inventory Management

The inventory management form is used to update manufacturer prices, run reports on sales, and check on-hand inventory. Basic functions such as changing the re-order level for a product or the description can be accomplished.

2.3.2 Database Design

The database was created with Microsoft Access 2000 and contains five tables. Most of the maintenance that will be required for the database can be accomplished with

the customer and inventory management forms. The database contains the tables and relationships shown in Figure 2. below.

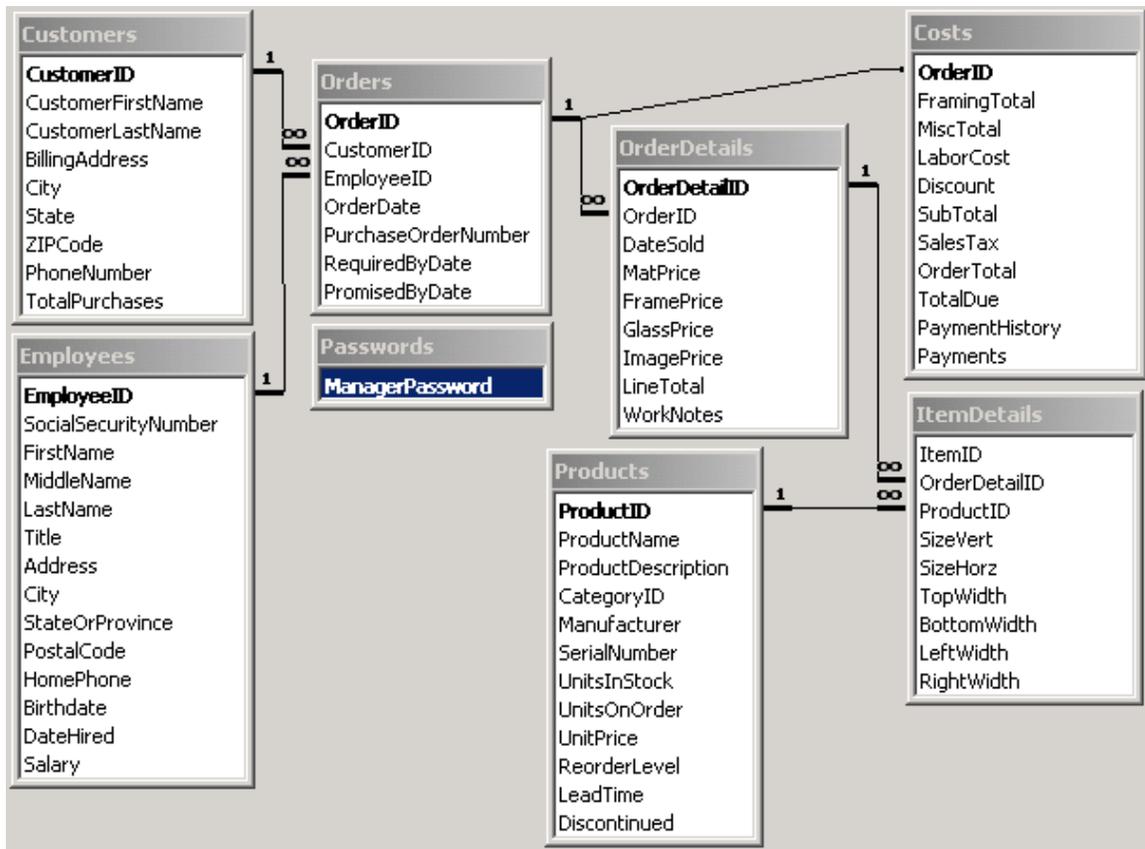


Figure 2. CIMS database relationships

3. Deliverables

To meet the needs and requirements of the Mason Framing Gallery, the following deliverables were defined for the Windows application:

1. Employees will use a login (employee number and password) to create and open orders as well as managing customers and inventory.
2. The application will be developed to allow employees to serve customers quickly with the use of an MDI (Multiple Document Interface) to perform multiple tasks.
3. The existing inventory and customer databases will be imported into the project.
4. The project will operate simultaneously on multiple workstations in a peer-to-peer networking environment.
5. The project will contain three main divisions: point of sale, customer management, and inventory management.
6. The project will keep track of inventory through available stock, in real-time, as items are sold.
7. Management reports will be created to allow employees to track inventory, customers and orders.
8. The project will be compatible with Windows 2000 and XP.

4. Timeline and Budget

The following sections cover my timeline for each quarter of Senior Design and the budget for my software and books and the Mason Framing Gallery's hardware.

4.1 Timeline

4.1.1 Senior Design I

During Senior Design I, I completed the following items:

- Found a company with a real-world technology-related problem.
- Researched existing solutions for the company's problems.

- Met with employees of the Mason Framing Gallery to create a layout of the specific needs and goals of the project.
- Purchased programming books to increase knowledge of .NET and Access databases.
- Created the proposal and oral presentation of the project.

4.1.2 Senior Design II

During Senior Design II, I completed the following items:

- Researched programming methods for Windows applications and Access databases using C#.
- Created a test database based on the existing database.
- Began programming the Windows application.
- Meet with employees for user testing and feedback on the project.
- Setup a new workstation on the company's network.
- Created the design freeze and oral presentation of the project.
- Presented a working prototype to the faculty and students.

4.1.3 Senior Design III

During Senior Design III, I completed the following items:

- Met with employees again for user testing and feedback.
- Completed programming of the final version of my project.
- Created the final documentation and oral presentation of the project.

4.2 Budget

The final budget for CIMS did not change much from the proposed budget. The framing gallery did purchase a new computer system and I purchased a couple books for reference. See Figure 3 below.

	Item	Explantion	Cost
Software	Microsoft Visual Studio .NET	company license	\$ 999.95
	Microsoft Access 2000	own	275.00
Hardware			
	External Zip-100	own	50.00
	Company Laptop	own	1,800.00
	IET Lab Desktop	own	1,500.00
	MFG Desktop 1	own	1,150.00
	MFG Desktop 2	purchased	1,000.00
Misc.			
	MS Access text books	purchased	100.00
	C# and .NET text books	own	200.00
	-----	-----	-----
	Total Costs		\$ 7,074.95
	Actual Costs		\$ 1,100.00

Figure 3. Final budget for CIMS development.

5. Proof of Design

The following section will explain each deliverable, how they were met and problems encountered during the project.

5.1 Employee Login

Previously, employees had no login to keep track of customer orders or control access to certain information (i.e. Salary information). There was no method for tracking which employee created an order for a customer. CIMS solves these problems by having unique employee id numbers used to create new customer order tickets. Access to

employee information and other manager function requires an employee id and a password. See Figure 4. below.

The image shows a screenshot of a software window titled "Sales Ticket". The window has a standard Windows-style title bar with a close button (X) in the top right corner. Inside the window, there are two text input fields. The first is labeled "Employee ID:" and the second is labeled "Ticket ID:". To the right of these input fields, there are three blue buttons stacked vertically. The top button is labeled "New ticket", the middle button is labeled "Open ticket", and the bottom button is labeled "Close".

Figure 4. CIMS login screen for sales tickets.

5.2 Multiple Document Interface (MDI)

Because the Mason Framing Gallery only has two computers, they wanted to have the ability of keeping several customer orders open at the same time. This is critical for being able to serve customers quickly when only having two computers. To accomplish this task, CIMS uses a “multiple document interface” or MDI that has one parent form and many child forms. The parent form contains all the child forms to keep everything in one place and organized (by tiling/cascading the open child forms). See figure 5 on the next page.

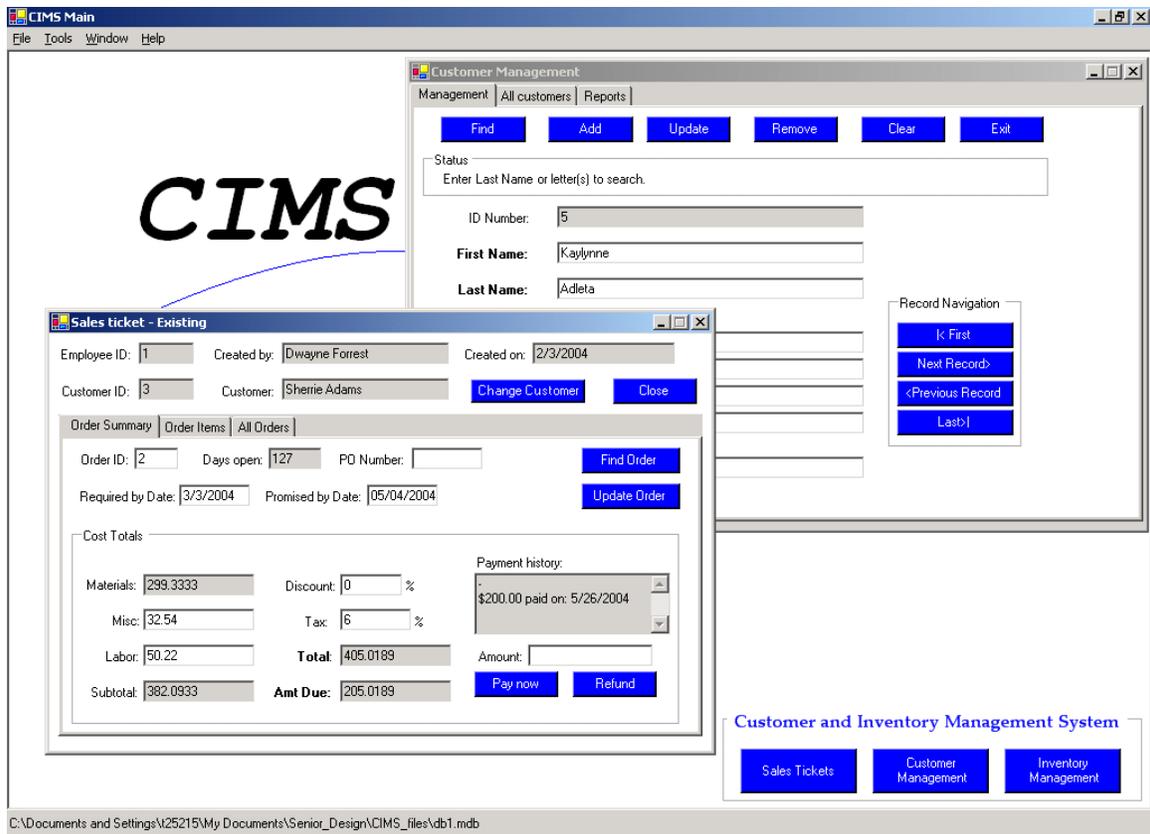


Figure 5. MDI example.

5.3 Importing existing databases

The existing program is using a FoxPro database and it does not have a full export option for that database. Some the data, such as the customer information, I was able to export directly from within the program. The inventory and order information I was not able to export from within and I had to locate that information on the local hard drive.

5.4 Network operation

I design CIMS with the idea of it function on a small peer-to-peer network where the database would be located on one pc and accessed from other (from with CIMS). The physical networking (cables, hubs, etc) were already in place at the framing gallery.

5.5 Three Main project functions

CIMS has three main functions: point of sale, customer management and inventory management.

5.5.1 Point of sale

The point of sale interface is used to create customer orders, modify existing orders and create estimates for future orders. This function will be used the most by employees in their day to day activities. See Figure 6 below.

Sales ticket - Existing

Employee ID: 2 Created by: Sean OMelia Created on: 2/14/2004

Customer ID: 2 Customer: Susan Abell [Change Customer](#) [Close](#)

Order Summary Order Items All Orders

Order ID: 3 Days open: 116 PO Number: 4593749 [Find Order](#)

Required by Date: 4/4/2004 Promised by Date: 4/4/2004 [Update Order](#)

Cost Totals

Materials: 100.1367	Discount: 0 %	Payment history: - \$100 paid on: 5/26/2004 \$21 paid on: 5/26/2004
Misc: 23	Tax: 7 %	
Labor: 56	Total: 191.6763	Amount: <input type="text"/>
Subtotal: 179.1367	Amt Due: 191.6763	Pay now Refund

Figure 6. Existing ticket example form.

5.5.2 Customer management

The customer management function is used to view, create, modify and delete customers to and from the database. This function is used to find/add a customer during the point of sale operations. See figure 7 on the next page.

Customer Management

Management | All customers | Reports

Find Add Update Remove Clear Exit

Status
Enter Last Name or letter(s) to search.

ID Number: 2

First Name: Berry

Last Name: Jones

Address: 5632 Pass Lane

City: Stamford

State: CT

ZIP Code: 233456632

Home Phone: 5345566632

Email: uhoh@shiza.com

Record Navigation

< First

Next Record >

< Previous Record

Last >|

Figure 7. Customer management form.

5.5.3 Inventory management

The inventory management function is used to view, modify, delete and add items to and from the inventory database. This function, like the customer management function, is used during the point of sale function to find and add items to the orders. See figure 8 on the next page.

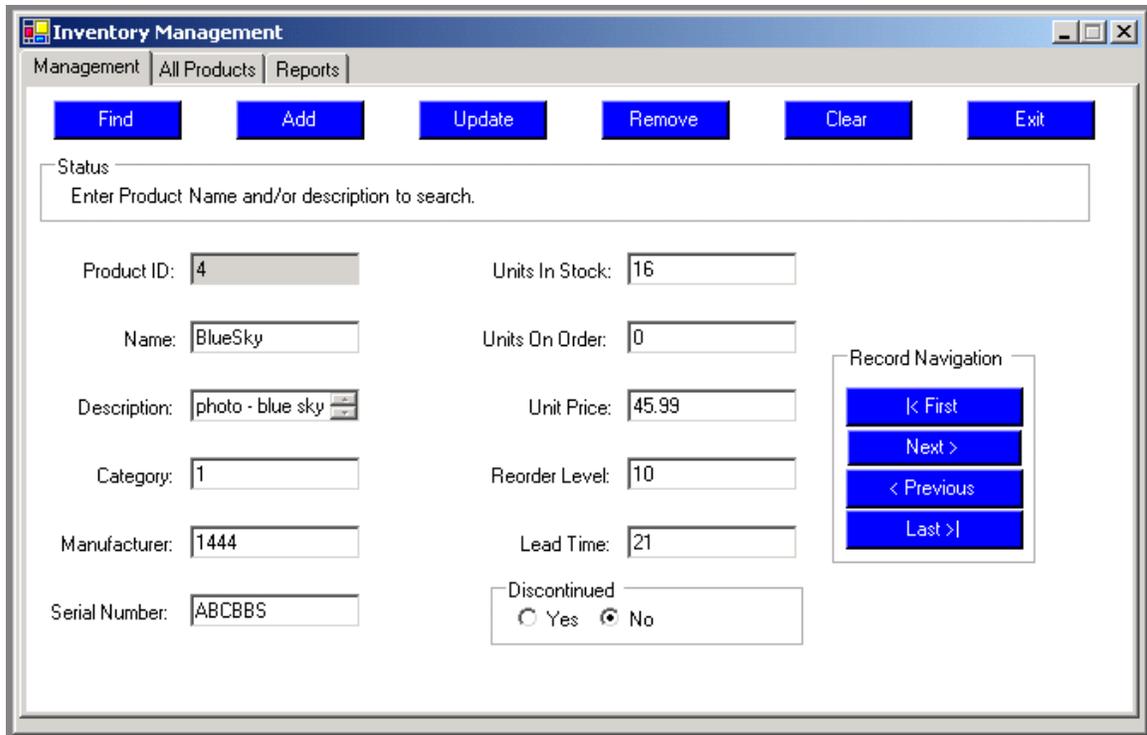


Figure 8. Inventory management example.

5.6 Real-time inventory

Unlike the previous application used by the Mason Framing Gallery, CIMS inventory data is directly affected by what products are sold. This allows the employees to know right away if an item is out of stock, low on stock, etc. See figure 9 on the next page.

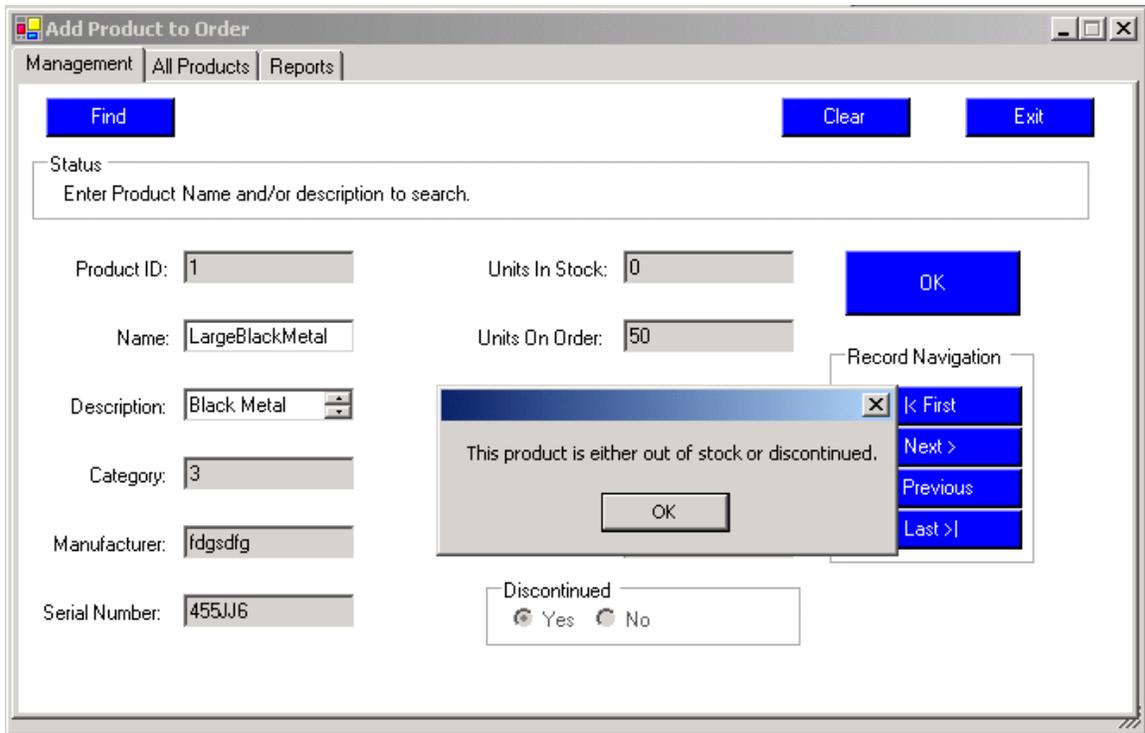


Figure 9. Warning for an out of stock product.

5.7 Reports

Several reports are available to employees for customer information, the inventory and orders. They can check on items that are low on stock, which customers have outstanding balances, discontinued items, top spending customer and more. See figures 10 and 11 on the next page.

The screenshot shows a window titled "Customer Management" with tabs for "Management", "All customers", and "Reports". Below the tabs are three buttons: "Top Customers", "Balance Due", and "??". The "Balance Due" button is selected, and a report titled "Customers with a balance due: 3" is displayed. The report contains a table with the following data:

CustomerID	CustomerFirst	CustomerLast	PhoneNumbe	OrderID	OrderTotal	TotalDue
3	Yoko	Dada	513-555-432	2	921.793	220.35
6	Joanna	OMelia	645778798	22	299.98	53.66
9	James	Obrien	4347665465	23	154.071	154.071

Figure 10. Report showing customer with a balance due.

The screenshot shows a window titled "Inventory Management" with tabs for "Management", "All Products", and "Reports". Below the tabs are four buttons: "Out of Stock", "Low Stock", "Full Stock", and "Discontinued". The "Discontinued" button is selected, and a report titled "Discontinued item(s): 4" is displayed. The report contains a table with the following data:

ProductID	ProductName	ProductDescri	CategoryID	Manufacturer	SerialNumber	UnitsInStock	UnitsOnOrder	Uni
1	LargeBlackM	Black Metal F	3	fdgsdfg	455JJ6	0	50	2.9
2	SmallBlackW	Black Wood F	3	445	776UU7	32	10	1.3
25	asdf	asdf	1	sdfs3	ew32ewds	23	23	23
26	fdrfgd	sdfd3	23	2	234	23	234	45

Figure 11. Report showing discontinued products.

5.8 Operating system compatibility

The Mason Framing Gallery's older computer uses Windows 2000 and the newly purchase computer uses XP. CIMS was tested and it operates correctly on both systems.

6. Testing Procedures

CIMS was designed to replace an existing application that lacked the features and functionality need by the Mason Framing Gallery. Because of this, it was critical that CIMS operated correctly to fulfill those needs. After each main section of programming, I went to the framing gallery to allow the employees to "break" my program.

As any programmer can tell you, the average user can usually find a way to cause unexpected errors. This testing after each main section of development allowed me to reduce the number of program errors near the end of development.

The CIMS prototypes were tested on both Windows 2000 and Windows XP. I compiled the program on my development computer and copied the executable and test database to each computer at the framing gallery. The employees that tested CIMS all have about the same computer skill level.

7. Conclusions and Recommendations

7.1 Conclusions

The Customer and Inventory Management System was needed to help a small business improve their operations. I created CIMS to meet specific requirements to replace the existing software package. CIMS met its goals in providing an interface more suited to the company's needs and added functionality necessary to stay competitive in

the market. I used Visual Studio .NET to write CIMS in C# and Microsoft Access 2000 to design the database. The total cost to complete CIMS was approximately \$1100. This cost includes a new computer system purchased by the Mason Framing Gallery and reference books to aid in my development process. I tested the program during each step of development to reduce programming bugs and adjust the requirements to satisfy the concerns of employees. I met all of my deliverables laid out in the design freeze.

7.2 Recommendations

During Senior Design, I spent a lot of time on this project researching the specific needs of a framing gallery. While the general functions of CIMS can be applied to almost any business, the point of sale functions had to be designed for a framing gallery's daily operations. This research greatly improved the functionality of the first prototype because many of the needed and requested features were already included.

Prior to this project, I had never written a windows application in any language. I had finished three quarters of object oriented programming in C# about 12 months before starting this project. This required me to spend time creating simple windows applications in C# to learn and test my abilities. While this did add to my development time, I feel I learned a lot more about windows applications because I was forced to "learn as I go".

One of my main challenges was working with the software the framing gallery was previously using. It did not have a friendly interface; even I, someone with lots of computer experience, had trouble navigating through the strange menus. Some of the data was exportable with a menu option, but majority of it was not. This caused a lot of extra time to be spent finding ways to get the data so it could be imported to the new

database. Initially, I figured this process would only take a few hours at most, but it ended up taking multiple trips to figure out.

Finally, teaching the employees to use CIMS was fairly quick and easy. I feel that using a lot of the same terms and methods of the previous software helped this process. Overall, they approved of CIMS as a replacement. Some features of the old software, such as vendor supplied SKU numbers, have yet to be implemented into CIMS. I did not have enough time or experience to add this feature in this version. I will continue to refine and update CIMS as the employees of the Mason Framing Gallery use it more and make suggestions.

Appendix A

Software and Hardware Requirements

Hardware

For development of the application and the database I used a company laptop and the IET (Information Engineering Technology) computer lab. The current workstations at the Framing Gallery are fairly new and needed no upgrades to run the project.

The main development hardware items included:

Company Laptop:

Processor: Intel Pentium 4(m) - 1.8 Ghz

RAM: 512 Mb PC133

Storage: 30 Gb hard drive and external ZIP drive

IET Lab Desktops:

Processor: Intel Pentium 4 – 1.9 Ghz

RAM: 1 Gb PC133

Storage: 40 Gb hard drive, internal ZIP drive, CD-RW

The main production hardware items include:

Existing Desktop 1:

Processor: Intel Pentium 4 - 3.0 Ghz

RAM: 512 Mb PC133

Storage: 40 Gb hard drive

New Desktop 2:

Processor: Intel Pentium 4 - 3.0 Ghz

RAM: 512 Mb PC133

Storage: 40 Gb hard drive

Software

I used Microsoft products as they are the most widely supported. I chose to write the application in C# as it was a current language that will provide all the necessary functions for CIMS to operate.

Microsoft Visual Studio .NET

I used this software to develop the graphical user interface and do all the programming for connecting to the databases. I followed the programming standards for the C# language.

Microsoft Access 2000

To keep operating costs low, I used Access to develop the customer and inventory database. Because my primary users are familiar with Access, they will be able to perform any management tasks on the database with Access if necessary.