Development of an Inventory Control Management Program

By

Mark Petkovsek, Tim Hunter

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

University of Cincinnati
College of Applied Science
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Department Head — Date: 3/5/01

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Abstract

The use of an Inventory Control Management Program (ICMP) allows for small restaurants to keep track of their inventory costs. The use of DOS based programs has been used for years in the industry. Smaller restaurants have not had the luxury of computer-based programs to help them maintain food costs and inventory. A less expensive, dynamically updated, and data driven program is needed in this field. The restaurant industry has commonly been behind in adopting and using new technology. Most point of sale (POS) and inventory management systems are home grown applications developed using older technologies. We have developed a windows based inventory control system that will help a restaurant maintain stock levels as well as simplify and track hidden costs. Our system has to be flexible enough to work with many types of restaurants as well as the various POS systems implemented at these locations. This paper summarizes the need of the ICMP and development of a windows based inventory control system utilizing Visual Basic, SQL Server, and MS Access to accomplish this application.

Development of an Inventory Control Management Program

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1. Statement of the Problem

1.1 Definition of the Need

There is a need to develop MS Windows-based inventory control management program (ICMP) specifically for restaurants. Most programs that are used by restaurants are either obsolete MS-DOS based systems or "home-grown" mainframe-type systems. Although these types of systems have proven their worth they are neither intuitive nor flexible. The new system would need to be flexible enough to either interface with the current database solution for the point of sale or be able to import a list of values to analyze.

2. ICMP Implementation

"Restaurants' inventory replenishment systems are paper-based, error-prone and time-consuming.... The missing ingredient that will allow restaurateurs to (either reduce prices or add value to the food and services they provide) is, of course, Information Technology (IT).... Although almost all big chains and many independent restaurants recognize the strategic value of technology, IT's full potential is far from realized in the restaurant industry."[3] Restaurateurs must do this because of the growing competition. Restaurants are willing to offer more tailored services and achieve supply chain efficiencies to increase profits. To accomplish this, an easy to manage inventory control program must be implemented to save food costs and to accurately advise the user when to reorder product to reduce waste. On the other hand, restaurants are slow to change their

technology, "New technology takes time to evaluate and implement. An owner must decide if investing in a new technology is worth the time and money; most small to medium sized restaurants and inventory control companies are behind in the fast-paced IT industry. Once a restaurant has an inventory system working, employees are hesitant to try something new."[1] By the time an approval is made for the current proposed design, a new technology might have become available that can be somewhat better, but cost and time prohibit the implementation.

2.1 Cost Savings and Benefits of the ICMP

We will be able to provide a solution that will benefit all restaurants regardless of size with a solution that will not only fit into their budget but that they will find absolutely necessary to stay in business. A company should take any opportunity to cut overhead. The ICMP will calculate food costs and maintain the required selling prices based on a desired gross profit and/or desired gross profit percentage. Most successful restaurants typically generate food costs between 27 to 32 percent of food sales.[5] Restaurants that do not track food costs are losing product and sales, resulting in lower profits.[8] Restaurants can lose money by having a too high or too low food cost percentage. Low food costs show that the menu items are priced too high and are not selling while high food costs reveal over-portioning or food loss. The ICMP can reveal where the loss is occurring. This program will maintain the physical inventory and costs so there is accurate information to base the next inventory on. Differences in supplier costs and food losses can been interpreted with the ICMP. Using "Just-in-Time" inventory is also beneficial, Just-in-Time inventory tracks the Ideal food usage, not the estimated stock; this results in lower inventory levels reducing count errors, money invested, less waste and spoilage.[4]

2.2 Need for ICMP

Similar obsolete DOS-based programs such as OPIS[2] have proven to control unnecessary food waste while providing the customer with best food cost profit possible. Large corporations will use a team of programmers to build such a system for that corporation only. Our proposed Windows 95/98/NT GUI based program will allow the user to enter known information into a system that builds the necessary formulas into valuable inventory information, at a cost far below that of building individual programs that have no universal use.

2.3 User Profile

The users of the ICMP will include employees or consultants that are familiar with the day-to-day operations of the particular restaurant. Administrative input into the ICMP will require the knowledge and costs of sales orders, purchase orders from suppliers, the menu items for sale, and the ingredients used. The end user who actually inputs data must be familiar with the Microsoft Windows operating system, this user will be trained to input data into the system and print reports. The end user needs to be able to pay close attention to detail so data is inputted correctly.

2.4 Benefits of ICMP

Tracking benefits:

- Item usages and costs
- Deliveries, price changes
- Order tracking
- Recipe inventory items

- Inventory worth
- Vendor purchases.

Inventory Data:

- Individual register item food costs
- Register item gross profit margins
- Updates at every price change
- Reports on inventory, sale items

Identification of unknown waste/theft items and dollar amount (profit):

- Theft
- Portion control
- Vendor shortage
- Increase profits

Inventory order amounts by vendor shows:

- Cash flow
- Shortages
- Purchase Orders
- Increase profits

Allows user to obtain all price increases from vendor:

- Fluctuations
- Price gouging
- Errors (by vendors)
- Comparisons/bidding.

3. Objectives of ICMP

The overall objective is to develop a flexible, customizable, reliable and easy-to-use inventory software package for restaurants, and similar businesses. The final project is being developed in Microsoft Visual Basic 6.0. It will include code for doing numerous calculations to analyze data and to read input from other data sources. It will include help files and install documentation for end users.

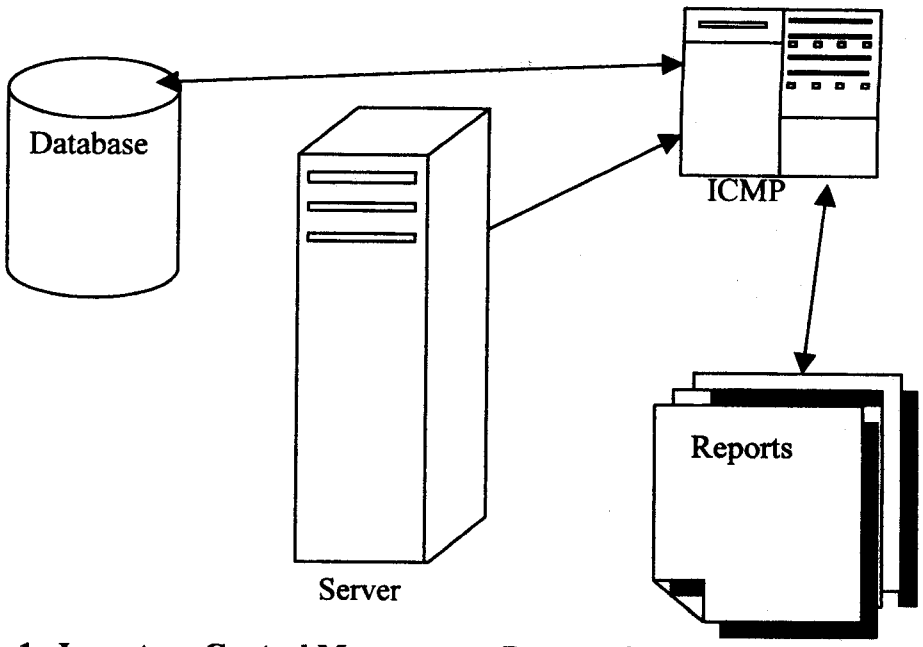

Figure 1. Inventory Control Management Program's basic design structure

4. Design and Development

The basic system will provide reports on your food and beverage costs, product sales, and products that need to be ordered. The system will provide actual cost variance analysis by product, inventory levels and menu analysis. It will be easily configurable and be able to directly interface with Point of Sale packages such as *Pixel Point*[6] and many others with the use of import and export utilities. The program will be used to analyze food usage for cost effective management while increasing the profitability of the

company. Many inventory problems are corrected by handling material properly and by reducing waste. The following chart shows the additional sales necessary to make up for various amounts of lost or damaged goods:[7]

$$\frac{\text{Value of Lost Goods}}{\text{Net Profit before Taxes}} = \text{Additional Sales Needed To Make Up for Lost/Broken Material}$$

Net Profit Before Tax:	4%	3%	2%	1%
Value of Lost Material				
$50	$1,250	$1,667	$2,500	$5,000
$100	$2,500	$3,333	$5,000	$10,000
$250	$6,250	$8,333	$12,500	$25,000
$500	$12,500	$16,667	$25,000	$50,000
$1,000	$25,000	$33,333	$50,000	$100,000
$10,000	$250,000	$333,333	$500,000	$1,000,000

Figure 2. Table showing additional sales needed to make up for lost goods

The ICMP will be used to show profit margins of the restaurant food and bar sales. This system is adaptable to any restaurant operation and allows the small and medium size organizations to have the same control of their inventory and food costs as the large organization, at a fraction of the price. The ICMP we implement will have the capability to input data from any type of system and manipulate for the needs of inventory management. The overall color and visual schemes of the software package will be familiar to knowledgeable MS Windows users. The system will consist of easy to navigate screens and menus. An installation document and a help system will be included in the application. The overall feasibility of this program is sound, the concepts have been around for several years but have not put into an easy to use product.

4.1 Software

The tools are Visual Basic 6.0, SQL Server 7.0 and Microsoft Access 2000. These particular tools were chosen because they are readily available, interface easily with each other, and the POS system we mentioned could easily interface with them.

4.2 Budget

Our budget is zero dollars. The required development tools are already in use in the University labs. The actual programs used for development include:

Software and Hardware Costs	
Microsoft Visual Studio 6.0	Retail cost: $1299 for Enterprise Edition
Microsoft SQL Server 7.0	Retail cost: $1399 with 5 client licenses
Microsoft Access 2000	Retail cost $300
Server hardware capable of running the following software: Microsoft Windows NT 4.0 or 2000 Server	Approximately $1,500
Workstation hardware capable of running the following software: Windows 98/ME/NT4.0/2000	Approximately $1,000

Figure 3. Table showing costs of software and hardware

We do not anticipate any major changes in these tools since they are proven tools in program development.

4.3 Timeline (See Appendix A for further detail)

Senior Design I

- Design product
- Research Tools
- Set timelines and budget
- Research market feasibility

CO-OP

- Further research in the industry
- Find out the products that are in use

Senior Design II

- Develop a working prototype
- Build tables and enter data
- Create application with working login and data
- Refine process and present prototype

CO-OP

- Work on usability
- Build more forms, combining data with user interface
- Documentation

Senior Design III

- Work out final forms
- Work out final documentation
- Test, test, test
- Test
- Fix the leftover errors
- Present final product

4.4 Feasibility

We have explored the fundamental issues involved in creating such a program by consulting with professionals in the industry, reviewing costs of time and software necessary to develop such a program. We have developed and obtained our resources

accordingly by the use of the Internet and through professionals working in the Inventory Management field. We can effectively move into phase II-III of our agenda now: to develop the software program described.

4.5 Deliverables

The ICMP will specifically provide the following items:

- An executable application that will run on the MS Operating system
- Connects to a MS Access database
- User input tables for Purchase Orders
- User input tables for Ingredients
- User input tables for Menu Items
- User input tables for Sales Orders
- User input tables for Receiving Orders
- Report Printing of Inventory Items, and Total Cost of Inventory
- Employee Lists for simple management
- Multiple Access levels under user control
- Flexible and intuitive Microsoft Windows design

5. Proof of Design

The final project allows a restaurant to save time and money by utilizing product tracking and user controlled reporting. The Admin user is able to setup a reorder amounts for inventory items and make sure that the inventory matches the actual output of what is being sold. Total setup time will vary dependent upon the amount of the products needed to be inputted into the system, the current point of sale the company uses, and the competency of the users to train. This method is already proven with

several DOS based programs,[2] however most of these DOS programs are not able to be networked or easy to use for the end user. The application fulfills the following project objectives:

- Shows how time and money can be saved with the use of the ICMP with data tracking.
- Illustration of database before and after a piece of data has been changed.
- Viewing of inventory and vendor printout sheets.
- Inventory levels
- Populated ICMP with data
- Shows differences in beginning and ending balances through printed reports.
- Shows how forms and reports are interdependent on the data in the database.
- Shows the easy to navigate screens and menus.
- Importation or manually entered rows of data.
- Illustrates help files and user documentation
- The end goal of the system controlled the inventory and food costs that were created in our test system.

6. Conclusions and Recommendations

The project created functions and fulfills the project scope stated. The ICMP was tested and shows the ability to function reliably. The maintenance of the program will be ongoing with continual updates to the database whether updating incoming inventory, price changes, or quantities sold. Maintenance will also include product updates, report printing modifications, and feature requests by the end users as they use it over time. The future goals of the project consist of having a help system for posting problems to a web

site and creating a user feedback section. A frequently asked questions page for posting common errors during setups will be considered. Possibly Web enabling the entire system for ease of deployment, administration, and usability across platforms. Finally, interfacing the ordering process directly with suppliers and scanning the deliveries with bar code scanners.

References

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4. Johnson Technologies, Inc. "EZ Stock". On-line service/web page. http://www.johnsontech.com/products.htm. November 30, 1999.

5. Kennison, Bert. "Evaluations". On-line service/web page. http://www.therestaurantguy.com/index8.htm. 1999.

6. Pixel Point http://pixelpointpos.com. 2001.

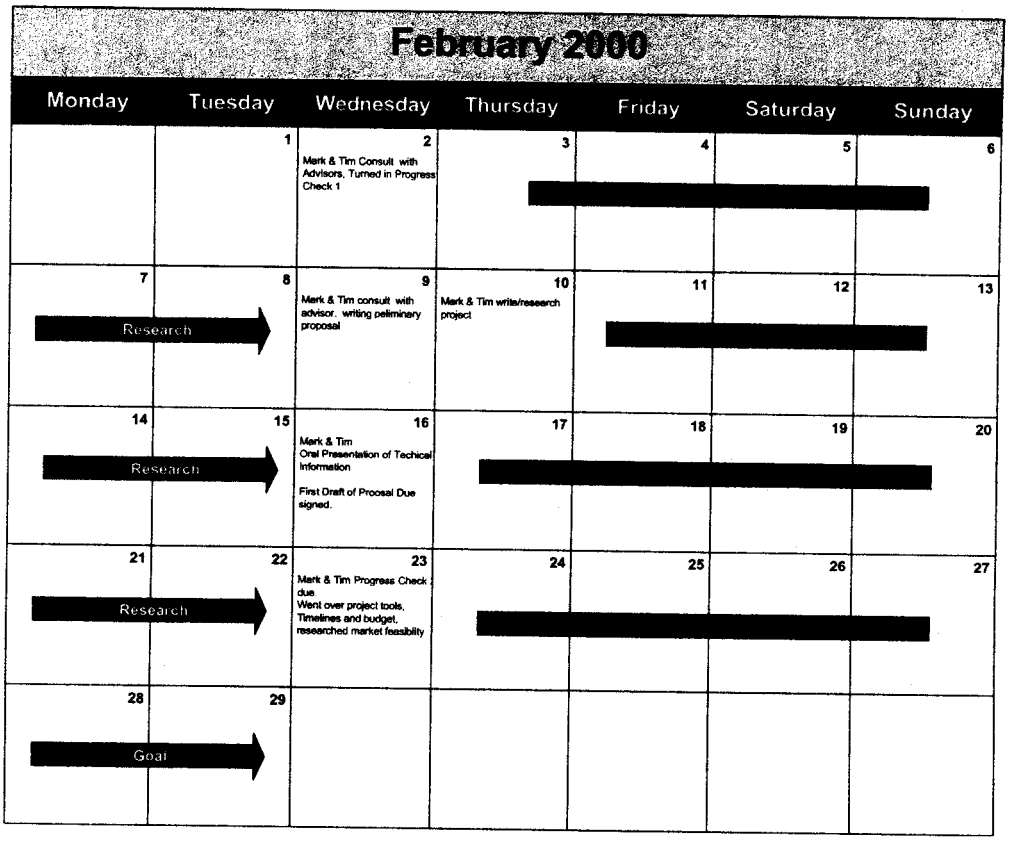
7. Schriebfeder, Jon, "Do Your Employees Understand the True Cost of Lost Materials?" http://www.effectiveinventory.com/article7.html. 1999.

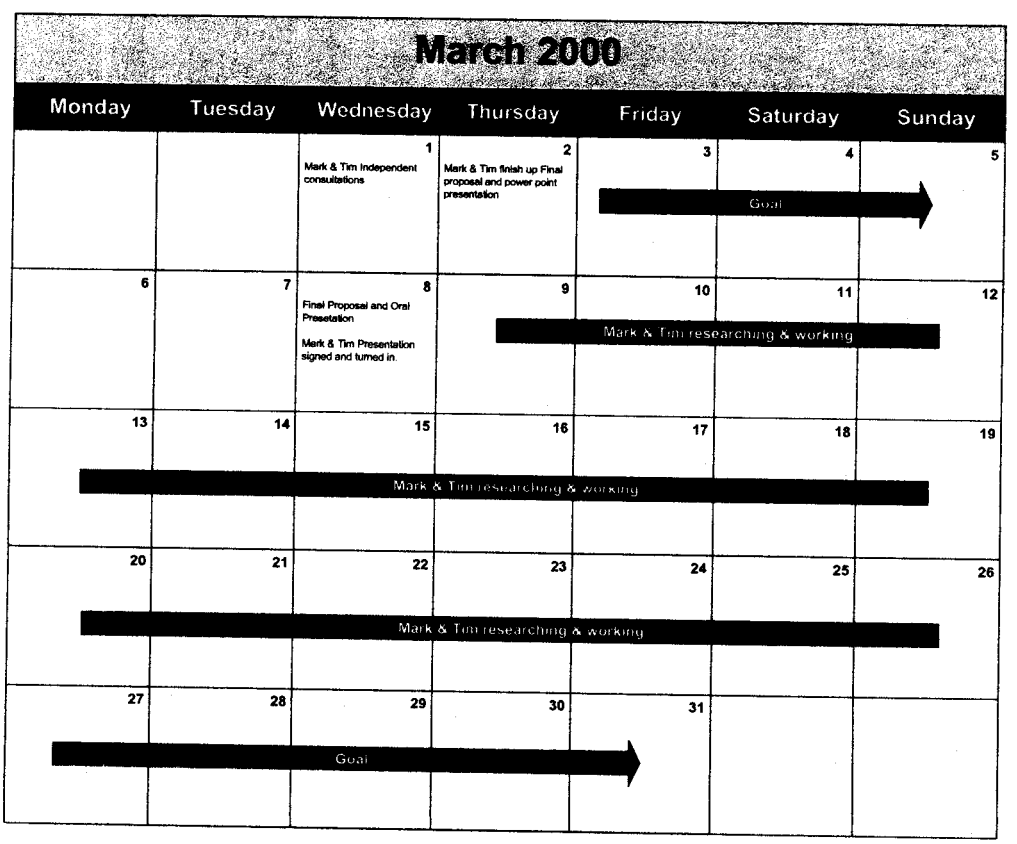
8. Schreibfeder, Jon. "Implementing Effective Inventory Management". On-line service/web page. http://www.effectiveinventory.com/article3.html. 1999.

Appendix A.
Timeline Detail

January 2000

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
					1	2
3	4	5 Introduction to Senior Design, Goals, and Expectations	6 Mark & Tim decide on the project we will accomplish	7	8	9
10	11	12 Mark & Tim meet with advisor, decide if creating inventory application is acceptable	13	14	15	16
17	18	19 Dr. Sam Geonetta Writing a proposal	20	21	22	23
24 31	25	26 Mark & Tim Independent Consultations with advisor, Problem/Area of Inquiry Selection decided	27	28	29	30


February 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
2
Mark & Tim Consult with Advisors, Turned in Progress Check 1
3
4
5
6
7
8
Research
9
Mark & Tim consult with advisor. writing peliminary proposal
10
Mark & Tim write/research project
11
12
13
14
15
Research
16
Mark & Tim
Oral Presentation of Techical Information
First Draft of Proosal Due signed.
17
18
19
20
21
22
Research
23
Mark & Tim Progress Check due
Went over project tools, Timelines and budget, researched market feasibility
24
25
26
27
28
Goal
29


March 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
Mark & Tim Independent consultations
2
Mark & Tim finish up Final proposal and power point presentation
3
4
Goal
5
6
7
8
Final Proposal and Oral Presetation
Mark & Tim Presentation signed and turned in.
9
10
11
Mark & Tim researching & working
12
13
14
15
16
17
18
Mark & Tim researching & working
19
20
21
22
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24
25
Mark & Tim researching & working
26
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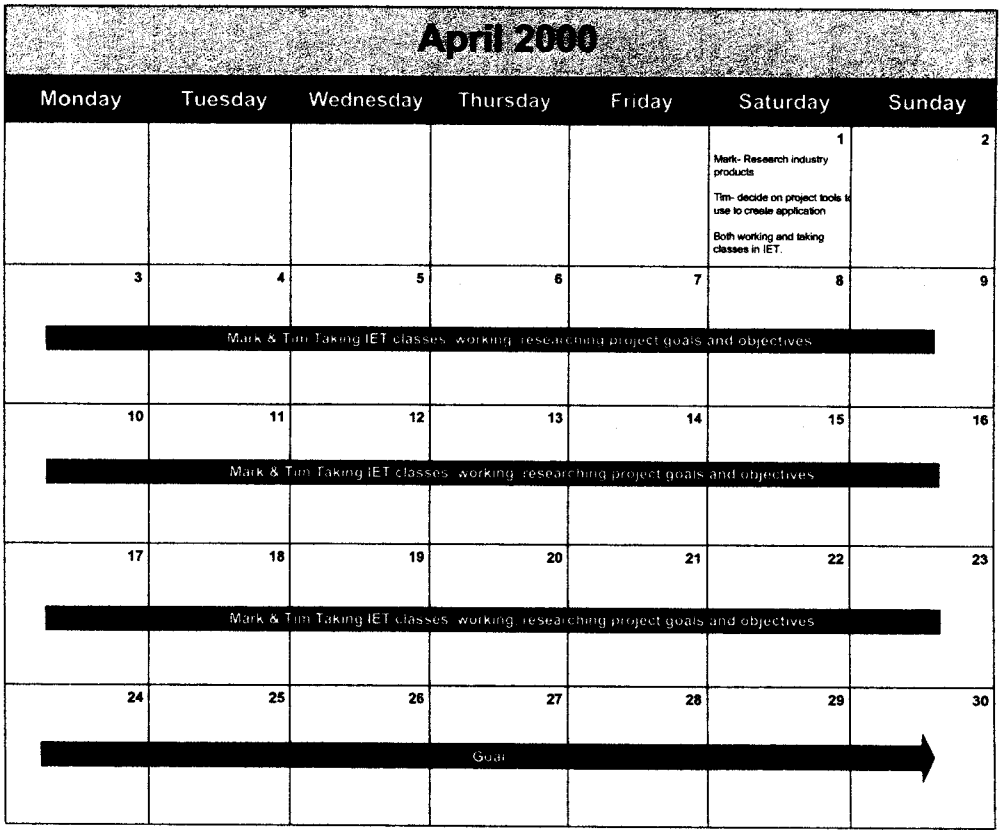
28
29
30
31
Goal


April 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
Mark- Research industry products
Tim- decide on project tools to use to create application
Both working and taking classes in IET.
2
3
4
5
6
7
8
9
Mark & Tim Taking IET classes working researching project goals and objectives
10
11
12
13
14
15
16
Mark & Tim Taking IET classes working researching project goals and objectives
17
18
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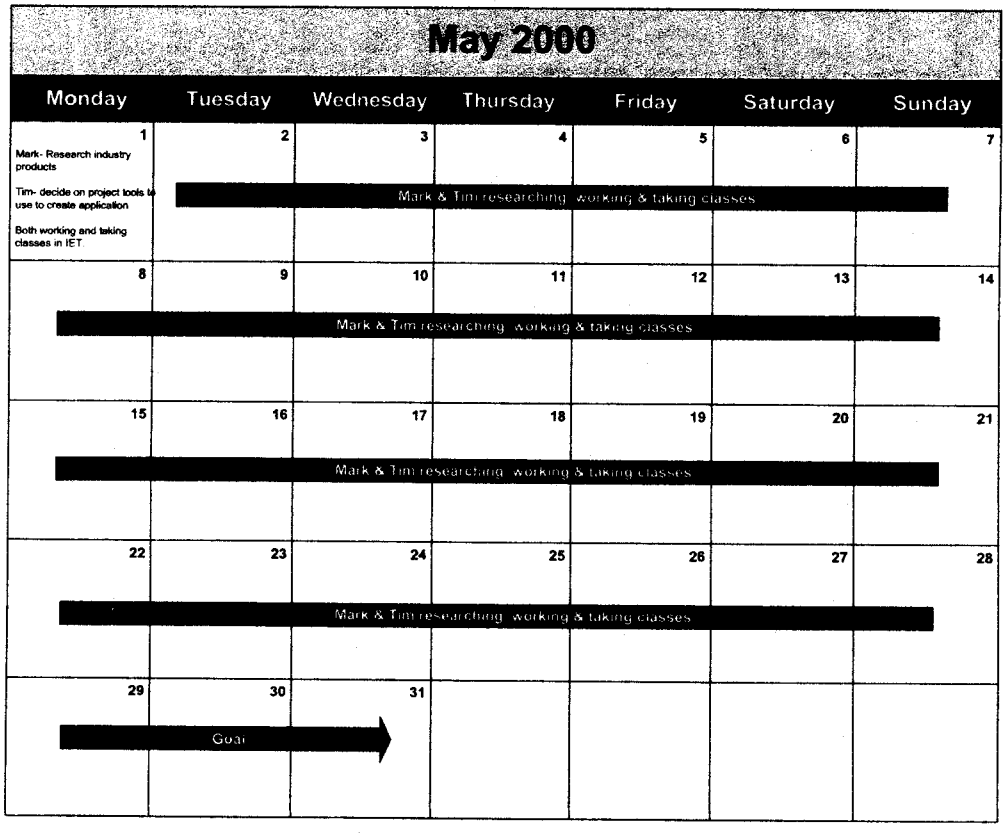
21
22
23
Mark & Tim Taking IET classes working researching project goals and objectives
24
25
26
27
28
29
30
Goal


May 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
Mark- Research industry products
Tim- decide on project tools to use to create application
Both working and taking classes in IET.
2
3
4
5
6
7
Mark & Tim researching working & taking classes
8
9
10
11
12
13
14
Mark & Tim researching working & taking classes
15
16
17
18
19
20
21
Mark & Tim researching working & taking classes
22
23
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25
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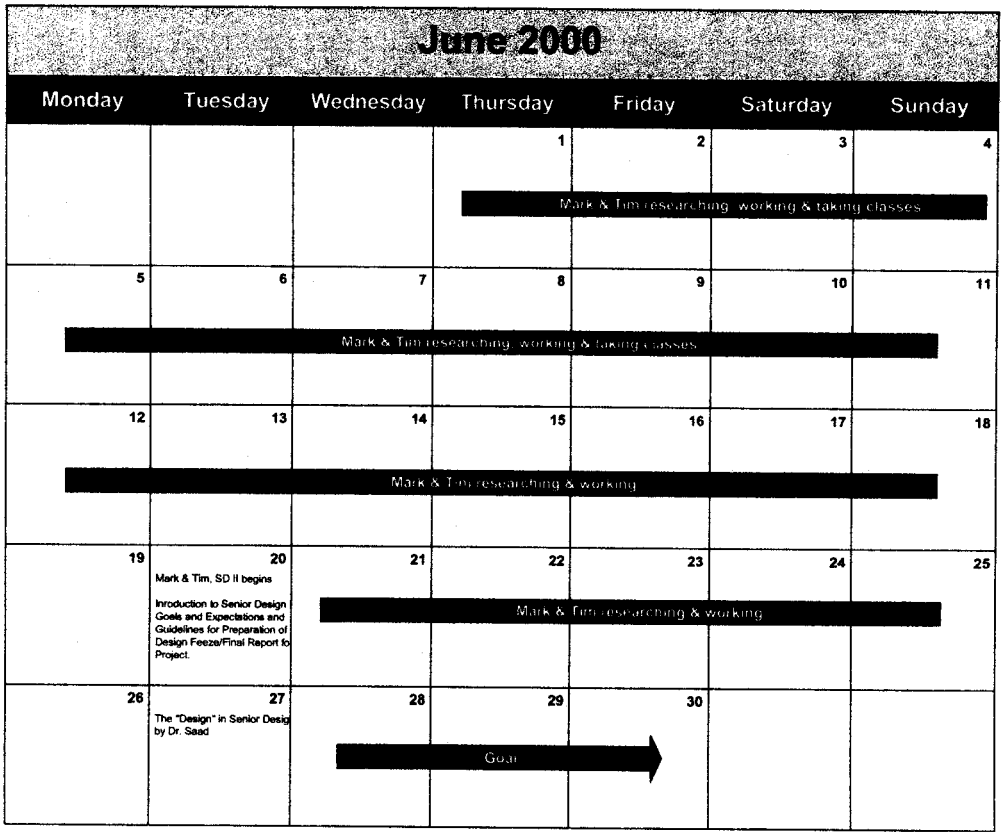
27
28
Mark & Tim researching working & taking classes
29
30
31
Goal


June 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
2
3
4
Mark & Tim researching, working & taking classes
5
6
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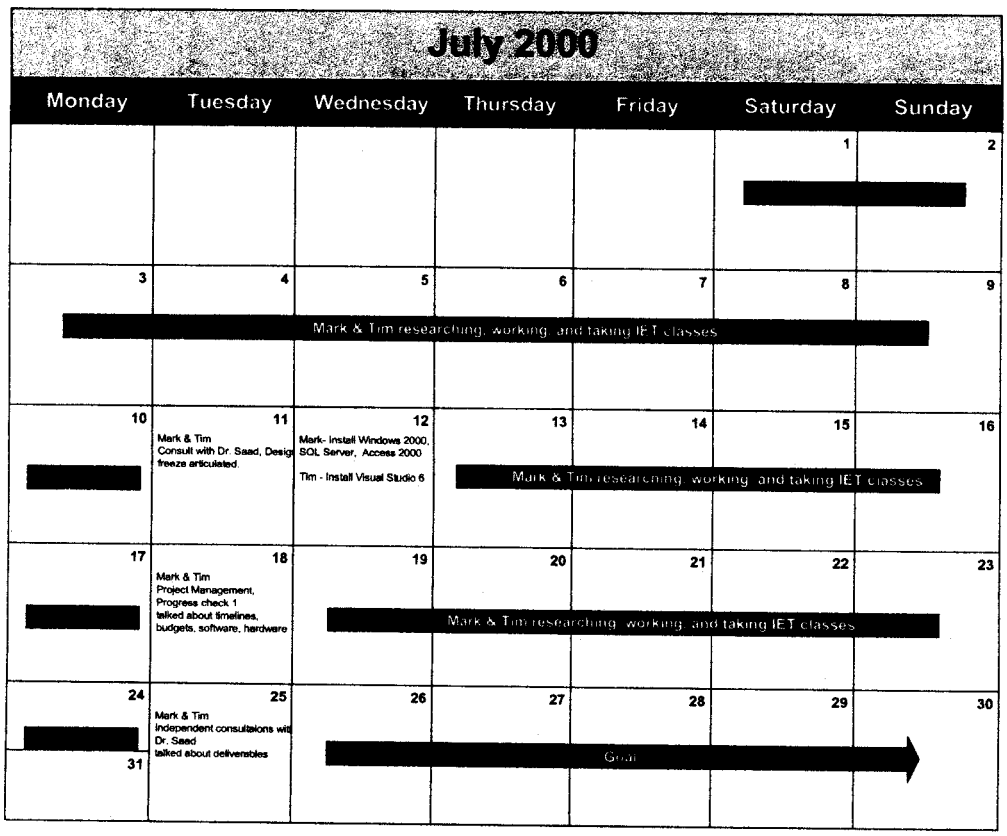
10
11
Mark & Tim researching, working & taking classes
12
13
14
15
16
17
18
Mark & Tim researching & working
19
20
Mark & Tim, SD II begins
Introduction to Senior Design
Goals and Expectations and
Guidelines for Preparation of
Design Feeze/Final Report fo
Project.
21
22
23
24
25
Mark & Tim researching & working
26
27
The "Design" in Senior Desig
by Dr. Saad
28
29
30
Goal


July 2000
Monday
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Thursday
Friday
Saturday
Sunday
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7
8
9
Mark & Tim researching, working, and taking IET classes
10
11
Mark & Tim
Consult with Dr. Saad, Desig
freeze articulated.
12
Mark- Install Windows 2000,
SQL Server, Access 2000
Tim - Install Visual Studio 6
13
14
15
16
Mark & Tim researching, working, and taking IET classes
17
18
Mark & Tim
Project Management,
Progress check 1
talked about timelines,
budgets, software, hardware
19
20
21
22
23
Mark & Tim researching, working, and taking IET classes
24
25
Mark & Tim
Independent consultations wit
Dr. Saad
talked about deliverables
26
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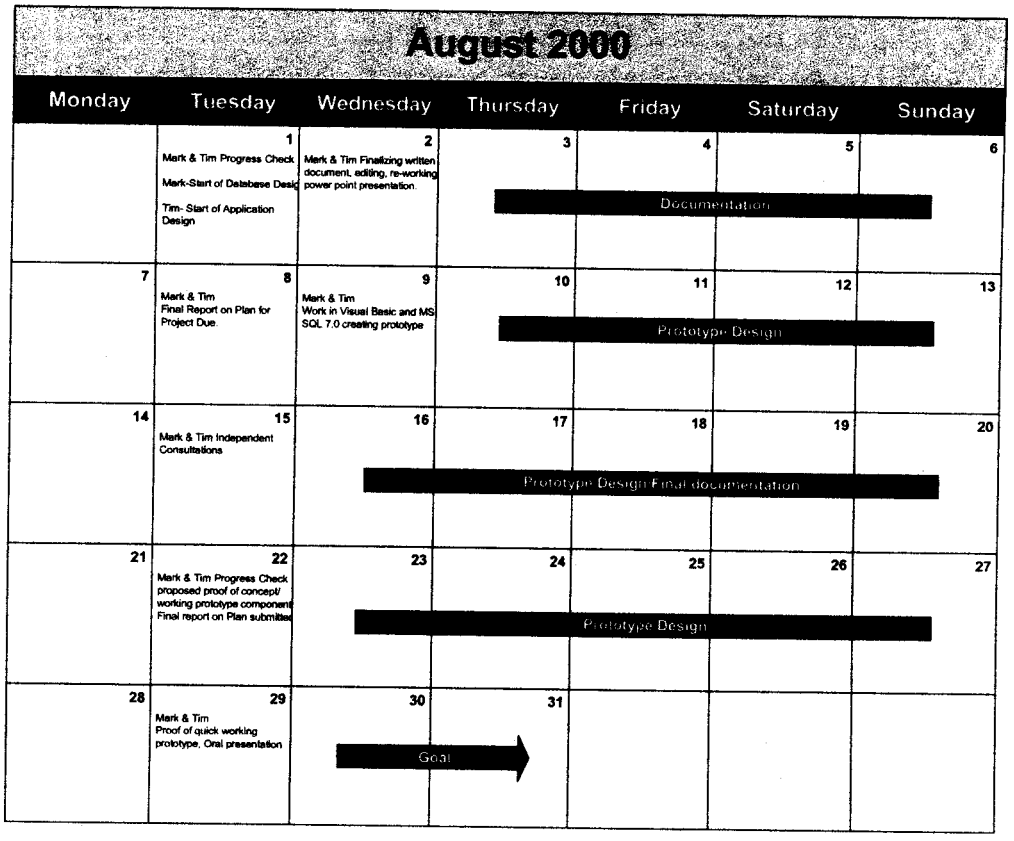
Goal


August 2000
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
Mark & Tim Progress Check
Mark-Start of Database Desig
Tim- Start of Application Design
2
Mark & Tim Finalizing written document, editing, re-working power point presentation.
3
4
5
6
Documentation
7
8
Mark & Tim
Final Report on Plan for Project Due.
9
Mark & Tim
Work in Visual Basic and MS SQL 7.0 creating prototype
10
11
12
13
Prototype Design
14
15
Mark & Tim Independent Consultations
16
17
18
19
20
Prototype Design Final documentation
21
22
Mark & Tim Progress Check proposed proof of concept/ working prototype component Final report on Plan submitted
23
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Prototype Design
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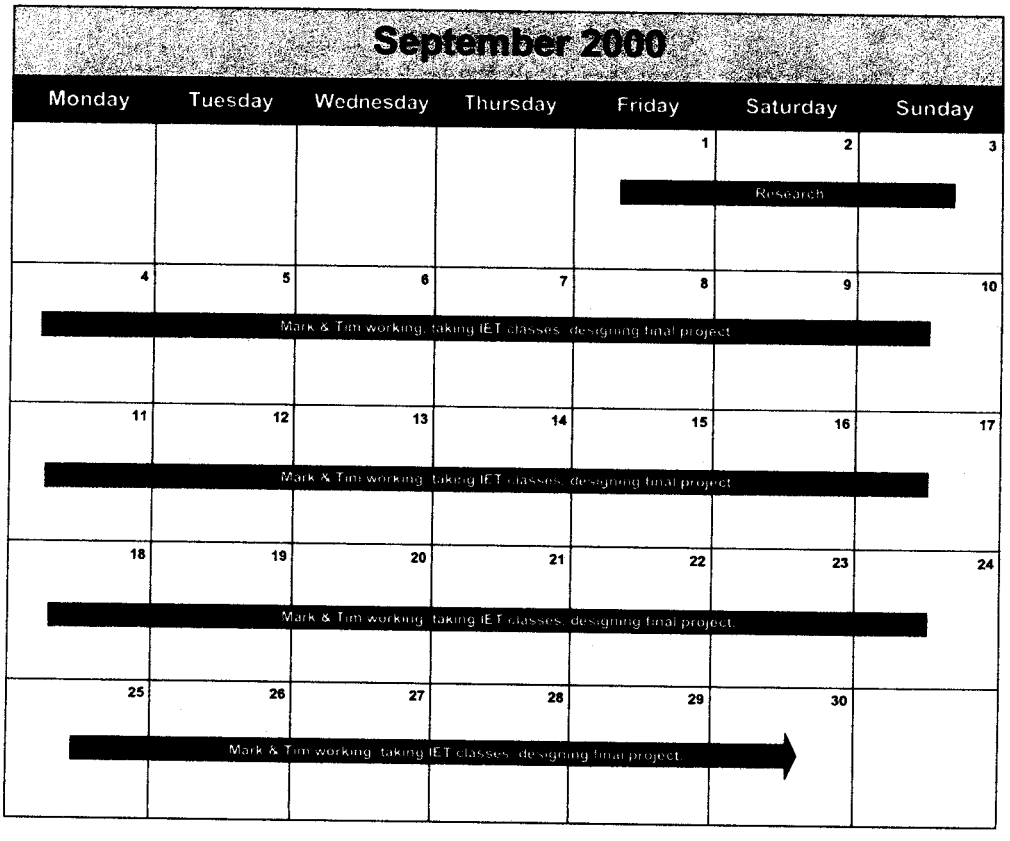
29
Mark & Tim
Proof of quick working prototype, Oral presentation
30
31
Goal


September 2000
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Research
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Mark & Tim working, taking IET classes, designing final project
11
12
13
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17
Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, designing final project
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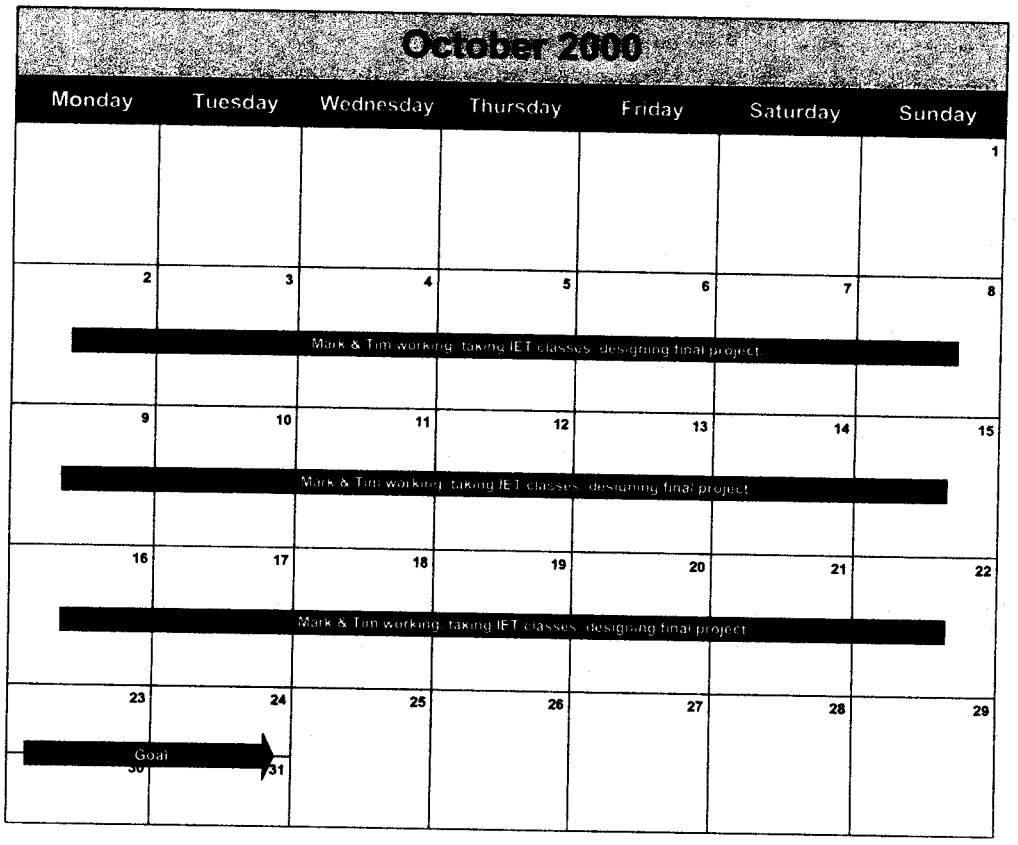
Mark & Tim working, taking IET classes, designing final project


October 2000
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Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, designing final project
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Goal
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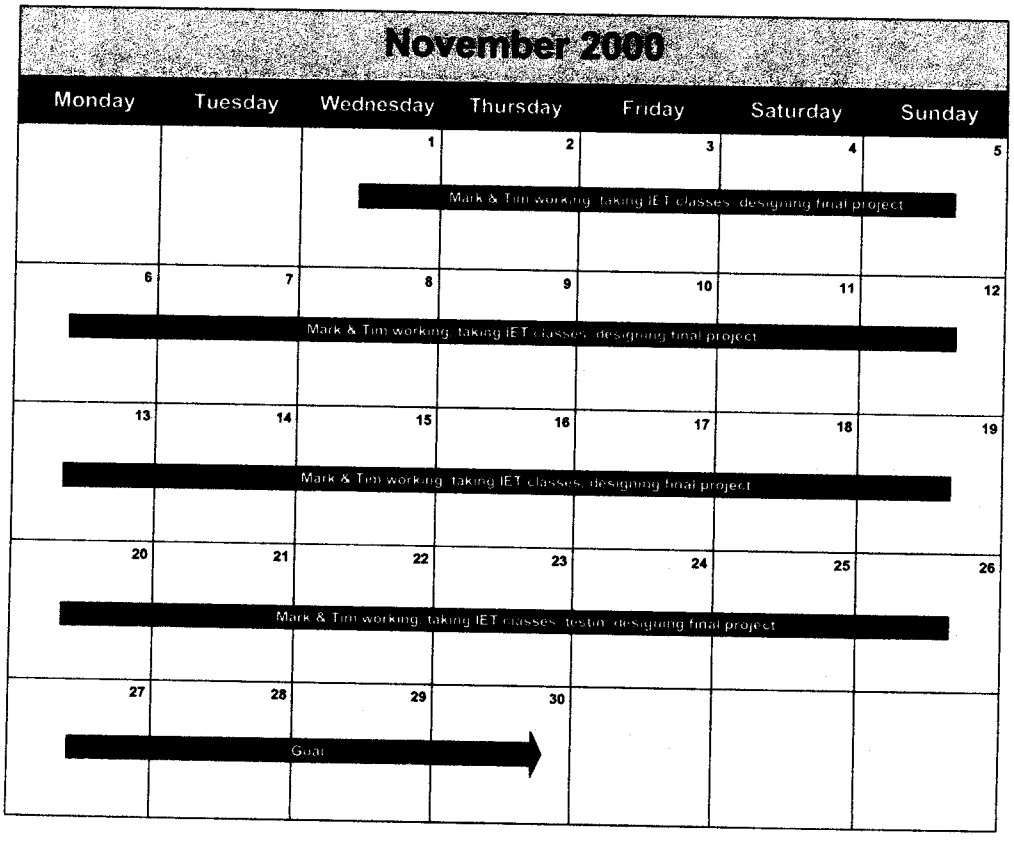
November 2000
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Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, designing final project
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Mark & Tim working, taking IET classes, testin, designing final project
27
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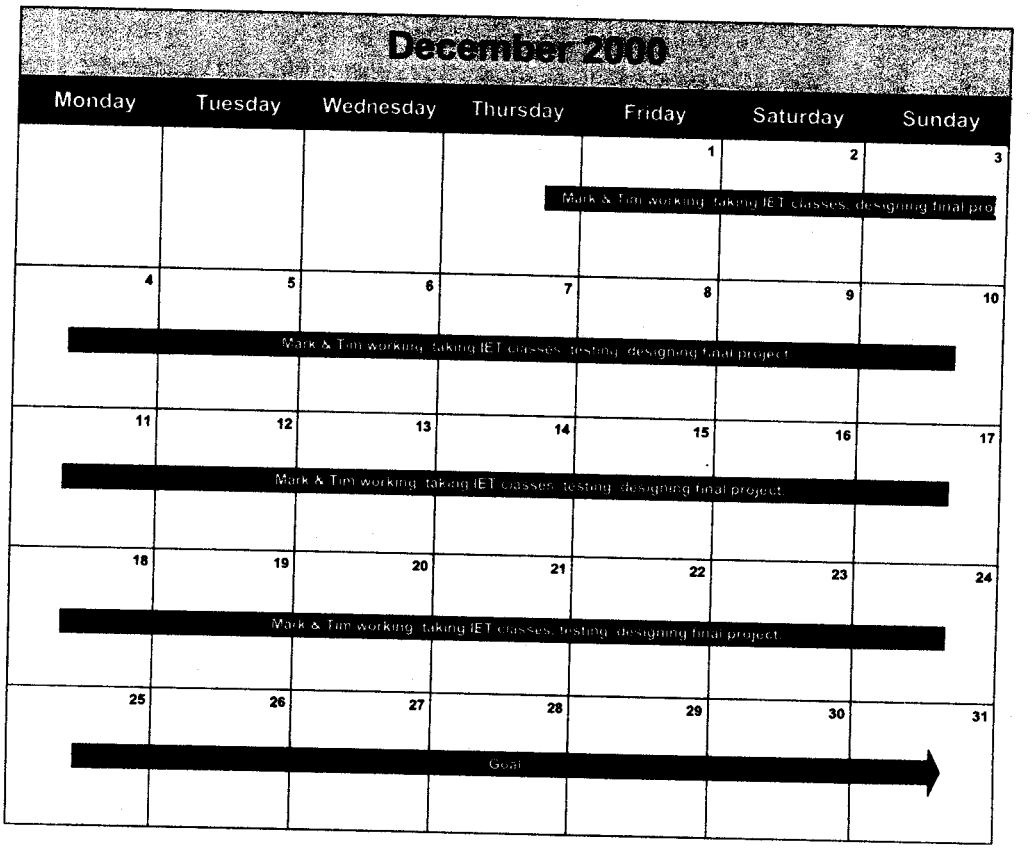
Goal


December 2000
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Tuesday
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Thursday
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Saturday
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Mark & Tim working, taking IET classes, designing final proj
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6
7
8
9
10
Mark & Tim working, taking IET classes, testing, designing final project
11
12
13
14
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16
17
Mark & Tim working, taking IET classes, testing, designing final project
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Mark & Tim working, taking IET classes, testing, designing final project
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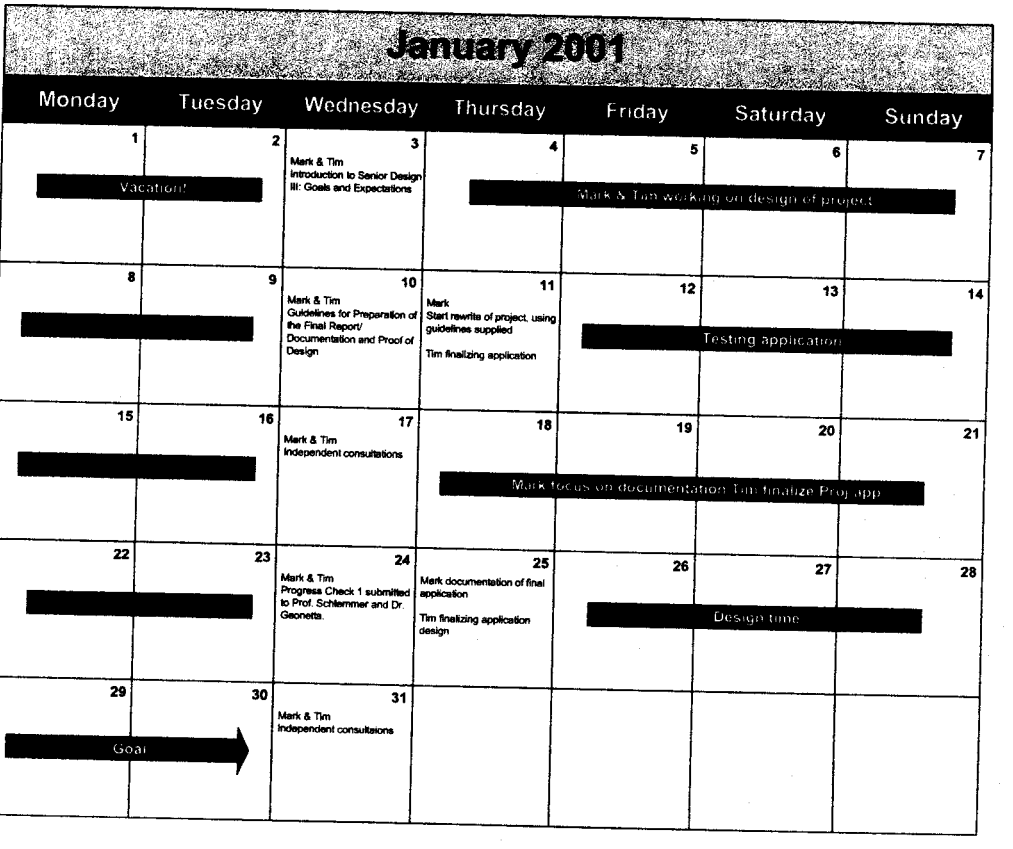
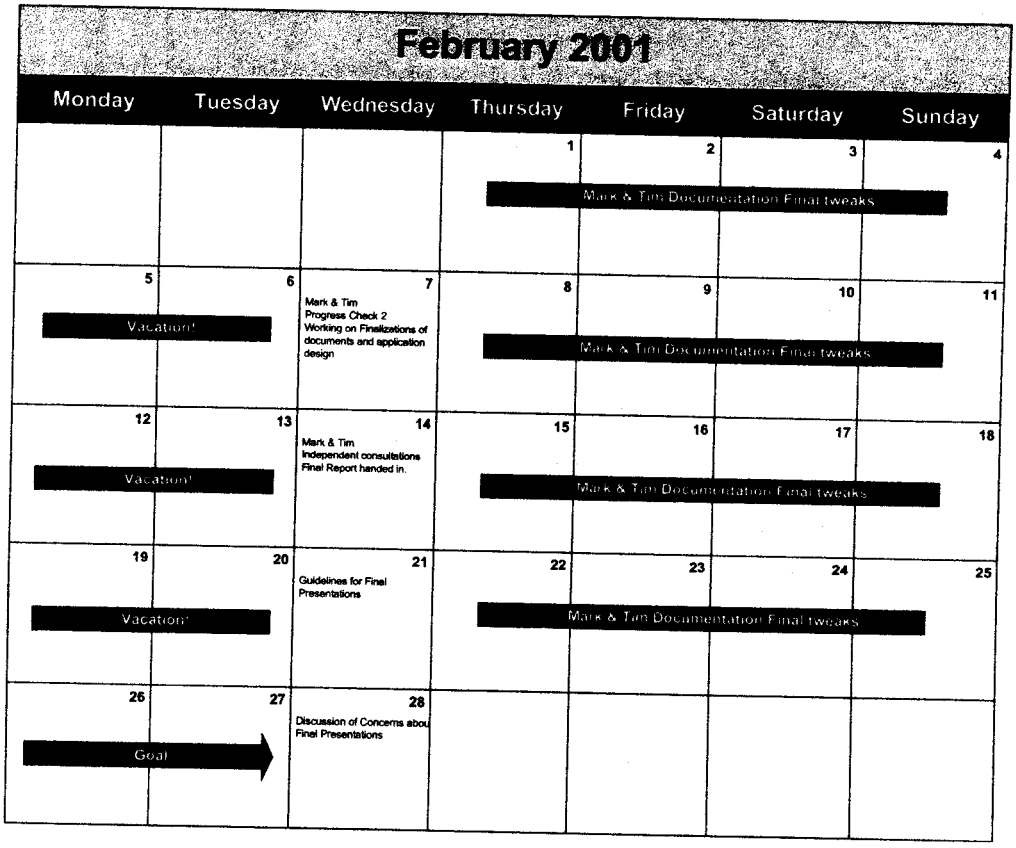
31
Goal


January 2001
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
Vacation!
2
3
Mark & Tim
Introduction to Senior Design III: Goals and Expectations
4
5
6
7
Mark & Tim working on design of project
8
9
10
Mark & Tim
Guidelines for Preparation of the Final Report/ Documentation and Proof of Design
11
Mark
Start rewrite of project, using guidelines supplied
Tim finalizing application
12
13
14
Testing application
15
16
17
Mark & Tim
Independent consultations
18
19
20
21
Mark focus on documentation Tim finalize Proj app
22
23
24
Mark & Tim
Progress Check 1 submitted to Prof. Schlemmer and Dr. Geonetta.
25
Mark documentation of final application
Tim finalizing application design
26
27
28
Design time
29
Goal
30
31
Mark & Tim
Independent consultations


February 2001
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
1
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4
Mark & Tim Documentation Final tweaks
5
6
Vacation!
7
Mark & Tim
Progress Check 2
Working on Finalizations of documents and application design
8
9
10
11
Mark & Tim Documentation Final tweaks
12
13
Vacation!
14
Mark & Tim
Independent consultations
Final Report handed in.
15
16
17
18
Mark & Tim Documentation Final tweaks
19
20
Vacation!
21
Guidelines for Final Presentations
22
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Mark & Tim Documentation Final tweaks
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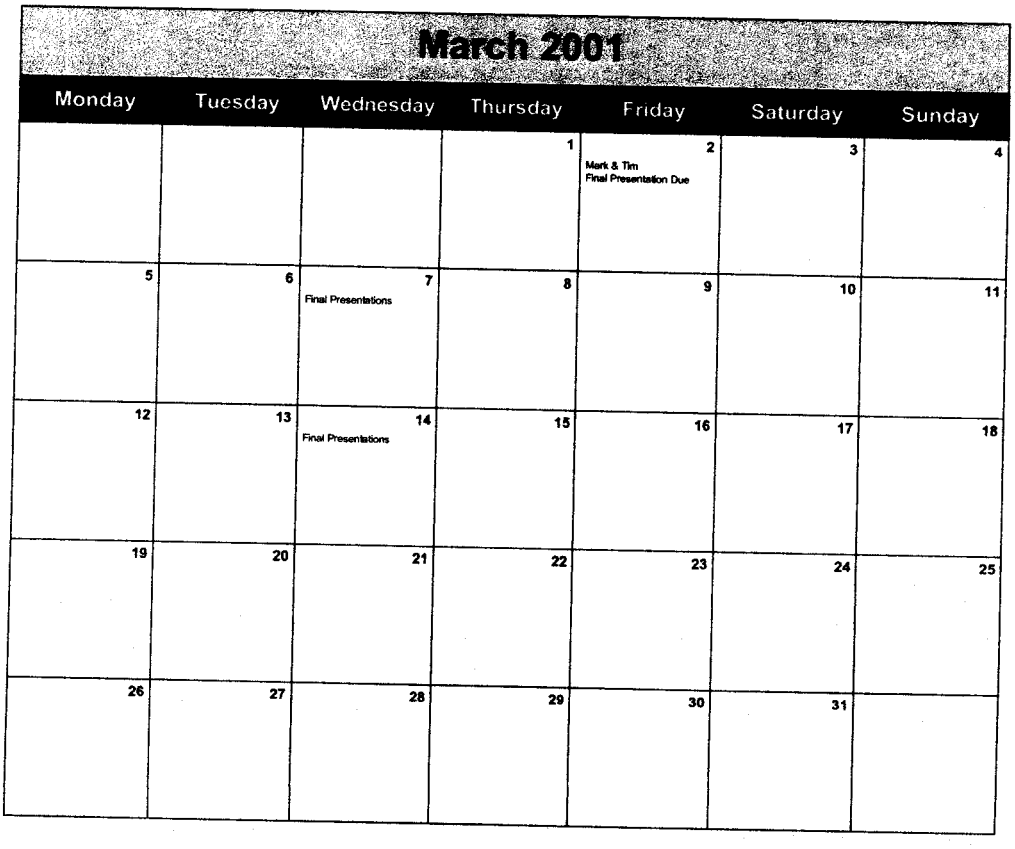
27
Goal
28
Discussion of Concerns abou
Final Presentations


March 2001
Monday
Tuesday
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Thursday
Friday
Saturday
Sunday
1
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Mark & Tim
Final Presentation Due
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Final Presentations
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Final Presentations
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