PENNSTATE

Department of Industrial Engineering

Tyrone Hospital Materials Management Team
Final Report for Improving the Efficiency and Effectiveness of the Tyrone Hospital Inventory Management through Automation

April 15, 2010

Christina Noll
Rahul Panda
Garrett Siewert
Sean P. Fisher

At the bottom left of title page, be sure to indicate whether or not IP and NDA apply:

☐ Intellectual Property Rights Agreement Applies
☐ Non-Disclosure Agreement Applies

Executive Summary

The purpose of the team's study is to improve the efficiency and effectiveness of the materials management system for the Tyrone Hospital through automation. This report will outline a detailed proposed system, steps to develop the system, and recommendations for future work.

The proposed system will provide a breakdown of the budget, a project plan including milestones, and a failure modes and effects analysis. The report also includes the team's process plan which includes an analysis of our component selection and procedure for testing. In addition, there will be an overview of how to perform key procedures within the hospital's Meditech software.

Throughout the project, the team's objectives were to develop and deliver a detailed and comprehensive plan, which utilized Just in Time principles, for the purpose of streamlining the materials management supply chain of our sponsor. The team proposed an aggressive, yet feasible schedule to reform Tyrone Hospital's supply chain. After building a test module within Meditech 5.63, the team provided a demonstration of key elements to track inventory levels. This demonstration included the use of single line bar code readers for capturing patient charges. It also included a charge bar code label to capture the item usage in Meditech.

To determine if the proposed system met the sponsor's needs, a survey was administered to a select group of stakeholders which included representatives from the nursing staff and the materials manager. This survey attempted to evaluate the ease of use, confirmation of employee involvement, and confidence metrics of the plan. Overall the results were that stakeholders either strongly agreed or agreed that the proposed plan would benefit the hospital.

For future work the team recommends that the hospital develop a committee with a chair for full project implementation. Moreover, it is imperative that the Tyrone Hospital open lines of communication with a Meditech representative. Furthermore, the hospital should facilitate training in support of the new system for their staff.

Table of Contents

1.0 Introduction

Tyrone Hospital is located in Tyrone, Pennsylvania. It is a 25 bed critical access hospital that provides general medical and surgical care including a twenty-four hour emergency department, a wide range of outpatient diagnostic services, and a short term inpatient rehabilitation and skilled nursing care program. As a small hospital providing medical and surgical care, Tyrone Hospital dispenses a significant amount of medical supplies to patients. Supplies are used in four hospital departments which include the Emergency Department, Operating Room, Medical Surgical, and Intensive Care Unit. The costs associated with supplies are the second highest cost to operations of the hospital. Tyrone Hospital would like to see improved inventory turnover using par levels and eventually move to a Just in Time, or JIT, inventory strategy.

This report will outline the current problems that the Tyrone Hospital faces with materials management and present solutions and steps for automation implementation.

1.1 Initial Problem Statement

Currently, the inventory process is entirely manual, labor intensive, and difficult to monitor material levels. Par level stocking is dire not only to patient care, but also to Tyrone Hospital's financial capability. Also critical is the effective capture of patient charges linked with the use of supplies for patient care.

The team would like to improve the efficiency and effectiveness of the Tyrone Hospital inventory management through automation with use of the existing Meditech information system. Meditech has the functional features to generate online supply requisitions, electronic ordering, and par level inventory management.

When supplies are removed from the each of the four departments, nurses manually denote the usage so that a charge for the item is assigned to the patient's bill. Later the department supply areas are restocked from a general supply room. Currently, this process is entirely manual. This process can be automated through par level inventory methods through Meditech and bar coding. Meditech has bar coding capabilities. With bar coding and Meditech, supply replenishment can be made easy. Automation will improve the cost effectiveness and the efficiency of the inventory management process. A comprehensive and detailed plan will be discussed for the automation of the inventory management process.

1.2 Objectives

The objective of this endeavour is to come up with a detailed and comprehensive plan for Tyrone Hospital to employ JIT over an undisclosed period of time for the purpose of streamlining their materials management supply chain. The team will look into configuring the existing Meditech software to this end. In addition, the team will investigate the possibility of conducting a demo of the new process. Another consideration the team will take into account is the stakeholders' concerns regarding the tendency for resistance to change when implementing new systems.

Due to time restrictions the team will not be able to oversee the implementation of the new Just in Time system. The team will focus effort to the ICU unit with the understanding that the improvements could be translated to the other departments within the hospital.

2.0 Customer Needs Assessment

2.1 Gathering Customer Input

The team's initial meeting with the CFO, Graduate Intern at Pennsylvania Office of Rural Health, and the Materials Management Manager served to outline the major areas of concern for the team to investigate. These included a reduction of inventory turns associated, a general assessment of their supply chain, "looking for quick fixes", a process review of material flow within the hospital and a plan to implement an automated materials management system.

2.2 Weighting of Customer Needs

In order to properly address the needs of the customer, it is necessary to determine how they perceive the problems and solutions at hand. One method of quantifying this is an AHP pair wise comparison of alternatives. In order to implement this, our team determined five metrics for comparison. These metrics were determined from information communicated to us in our initial visit with our sponsor. These metrics were then presented to our sponsor for comparison. An ordinal scale of value was used to rate the metrics. This information is presented in table 1 which is incomplete due to a miscommunication upon delivering the comparison to the sponsor. Using the data that was collected, we determined that the main objectives for the new materials management system are ease of use and automation.

Table 1: AHP Pair Wise Comparison Table to Determine Weighting for Main Objective Categories

	Effective	Ease of Use	Cost	Efficient	Automated
Effective	1.00	2.25	1.75	1.75	2.25
Ease of Use	0.40	1.00			
Cost	0.57		1.00		
Efficient	0.57			1.00	
Automated	0.40				1.00

3.0 External Search

3.1 Existing Products or Approaches

In an effort to investigate current approaches to implement a JIT inventory strategy to a healthcare setting, the team attempted to open lines of communication with the Hershey Medical Center. The purpose will be to investigate their current use of their JIT procedures.

Additionally, in order to be familiarized and understand the functionalities of Meditech, the team was in contact with the material management departments at both Mount Nittany Medical Center and J.C. Blair Memorial Hospital.

To configure the Meditech software to perform the functions necessary for the proposed materials management plan, the team utilized the Meditech software manuals and the Meditech website. The team also investigated journal publications involving implementing change within the healthcare industry.

4.0 Engineering Specifications

4.1 Establishing Target Specifications

The first discussion that immediately came to the team's attention was the amount of room for improvement at Tyrone Hospital. Initially, the goal was to define and incorporate new processes to manage and track their weekly inventory. With this first challenge in mind, the first step was to understand the Meditech software system. The team felt that the system was being greatly underutilized. The team was concerned about the hospital not fully using Meditech and made sure that it was addressed. Some reasons why that Meditech was not used due to: lack of Meditech training, resistance to technology, lack of technological resources, and lack of human resources.

The team chose to formally address this issue with Tyrone Hospital as the first goal of the project because once this hurdle had been overcome; it would set a path for other future improvements in the hospital such as improving individual patient billing for item use and automatically sending inventory update reports to the appropriate employees. The team felt that once all issues were resolved, Tyrone Hospital would start saving money. This would ultimately cut down inventory as to move the hospital to a Just in Time process. The present goal of efficiency would be obtained while the future goal of full automation would be underway.

4.2 Relating Specifications to Customer Needs

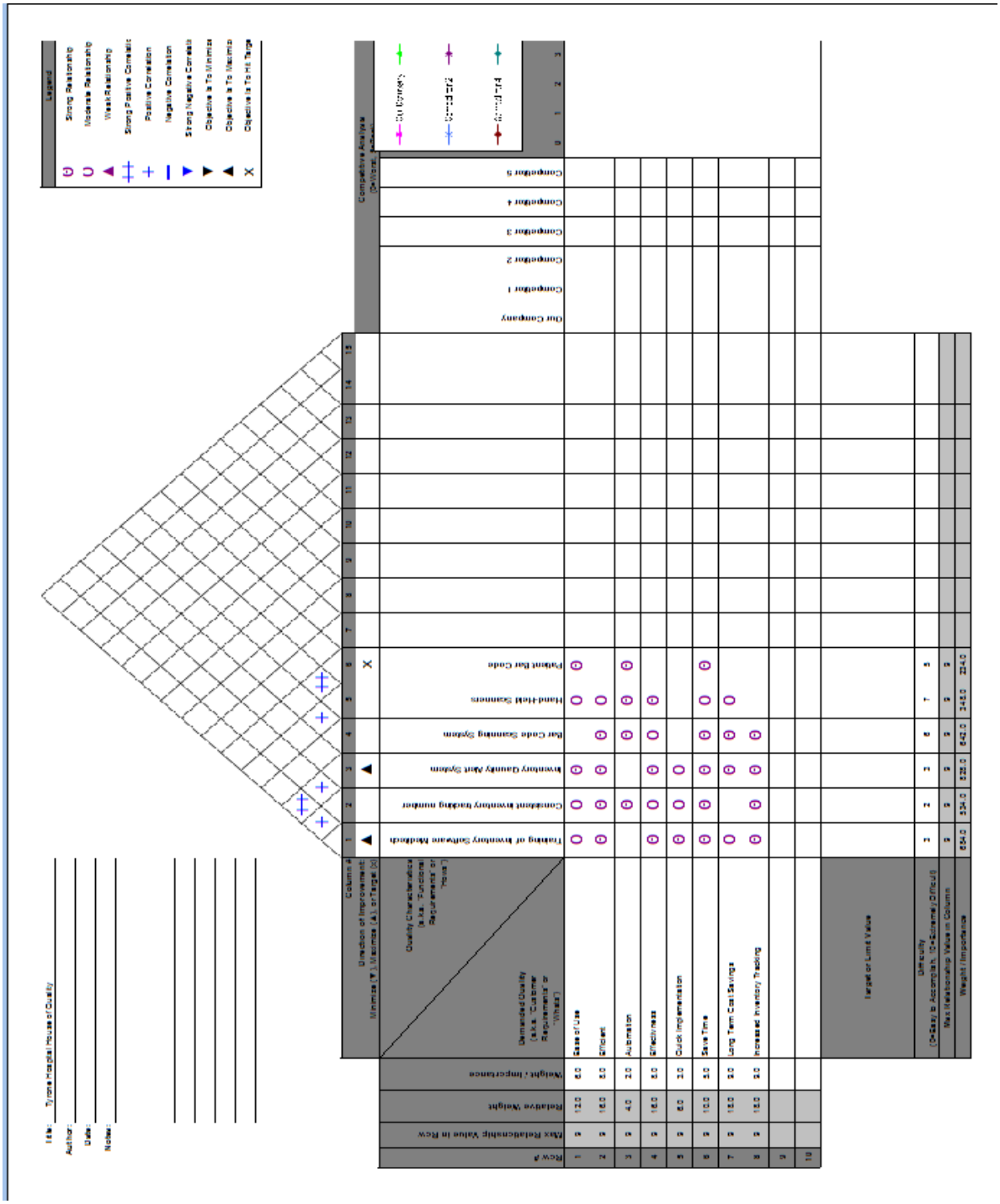

Figure 1: Customer Needs Metrics

5.0 Concept Generation

5.1 Problem Clarification

Tyrone Hospital dispenses medical supplies for patient care needs. Examples of supplies include tracheal tubes, catheters and syringes. The customer, the patient receives and pays for these supplies. An example of the flow of the medical supplies is the ordering and receipt of syringes.

First, the medical supplies are ordered by hand. Tyrone Hospital's process for syringe supply involves weekly deliveries on Tuesday from the supply distributor, Cardinal. The materials management assistant takes the delivered boxes into the general supply room. Weekly, 400 syringes arrive at Tyrone Hospital. Then a manual count check of the items is conducted. With one person, this takes one and a half hours. If a new item arrives that is not already on the shelves, the assistant generates an item/stock number by entering the item into the existing Meditech hospital information system.

After the inventory count, the items are put on the shelves in the general supply room. Shelves that have individual location numbers organize the material. The inventory stays in the general supply room until nurses manually fill out inventory requisition forms.

In the Intensive Care Unit, or ICU, there are supply storage areas. The nurses in the ICU manually count the supplies daily. On average, it is estimated that ICU nurses will request about 50 syringes weekly. When the nurses feel they are under supplied, they fill out an inventory requisition form on paper. A department manager signs off on the paper request and someone from the general supplies room brings the request to the nurses. Then the inventory sits in the ICU supply storage until a patient needs the supplies.

Every step of a supply item from delivery to patient care was challenged as to whether it is valuable, capable, available, and adequate. A step was determined valuable if the step was left out would the customer/hospital care or be satisfied. Likewise, a capable step implies a good result is achieved. A step was determined to be available if the step performs when needed. Moreover, an adequate step is the degree to which capacity is in place.

Figure 2 shows a Value Stream Map (VSM) of the current movement of syringes from a supplier to an ICU patient. A symbol key can be found in Figure 14 in Appendix A.

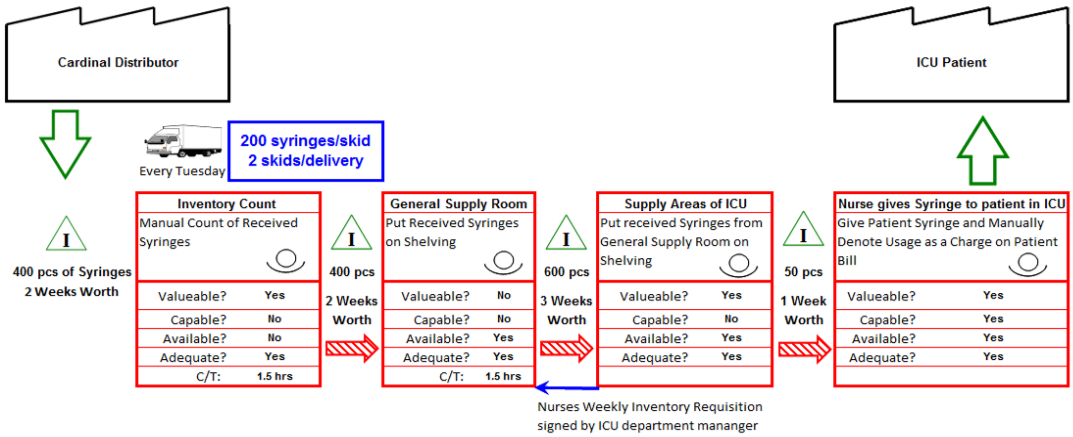

Figure 2: Current Syringes Movement VSM

The current process presents several problems. First, under utilization of Meditech occurs. Meditech's functionality highlights the ability to achieve optimal stock levels, order supplies electronically, and automatically update quantity on hand for par level (Meditech, 2010).

Furthermore, par levels in the ICU supply areas and the general supply room need to be determined. Currently, 400 pieces of syringes arrive at Tyrone Hospital weekly. The ICU requests 50 syringes per week but may not need them all. The assumption was made that the Emergency Department, or ED, Operating Room, or OR, Medical Surgical, and ICU approximately request the same number of syringes weekly. Ultimately, one extra week worth of syringes is being delivered to Tyrone Hospital every week resulting in overstocking in the general supply room as well as the ICU supply areas. In other words, the current method is a push system based on keeping up with present inventory levels rather than patient demand.

Another problem identified was that purchase orders are hand written every time an order is made. This step can be automated with Meditech. In addition, supplies are counted when received. If a vendor is qualified and approved, this step can be removed. Also, when new item is ordered that is not currently on the shelves, this item should be entered into Meditech as soon as the order is placed and not after it is received.

Moreover, before manually taking inventory counts, daily inventory requisition forms are printed out off of Meditech, which is considered to be a wasted step. Another non-value added procedure is when the requisition forms are signed off by the department manager.

An additional issue is that the item numbers in Meditech are not vendor specific-they are general. For example, syringes listed in Meditech do not include the vendor name, in the event they change vendors in the future. This makes it difficult for the nurses to match the inventory on the shelves with the supply name on the inventory requisition sheet.

Likewise, another concern is when a patient is charged an item; the charge master is not linked to the item numbers in Meditech. The numbers in the charge master each begin with 270 and end with the last five digits of the stock number from materials management department. When the numbers in Meditech are not vendor specific, this makes it a problem to match the supplies given to the patients to the charge master account. Currently, the nurses note by hand the patient supply usage and then give that information to the billing department. With an establishment of a universal code number system, Tyrone Hospital can be closer to par level inventory with improved turnovers.

Another problem that Tyrone Hospital faces is the demand of supplies of visiting doctors. Visiting doctors like to use their preferred supplies. This adds to overstocking. A committee needs to be developed and headed by a chair to sit down and talk to the doctors to see if they are willing to use the supplies that Tyrone Hospital already stores.

5.2 Concept Generation

Many problems were identified. Possible approaches to accomplishing solving the problem include:

- Solution 1, Plan for Manual Recording with Par-Levels Known
- Solution 2, Plan to use Existing Meditech Software through Automation with Bar Coding
- Solution 3, Plan to use RFID Technology for Real Time Assessment

Solution 1 would encompass the current Tyrone Hospital procedure. However, if current data is properly recorded and accessible to forecast, the result implies a better ICU patient's supply demand using time studies. When a forecast is more accurate, par levels of inventory can be determined to improve inventory turnover.

Solution 2 eliminates the waste of manual counting. Currently, Meditech is has many inventory management capabilities for Tyrone Hospital to utilize. With bar codes, there is a universal inventory item number code to link the materials management number to the charge master.

Solution 3 would be set up like Solution 2 but incorporate RFID technology. RFID could eliminate the waste of manually scanning with radio transmitters.

All three solutions need to deploy a plan where the stake holders feel equally represented to ensure that all aspects of a good system design are considered. The change must be managed and not just happened. Each solution must have engagement, explanation, and expectation.

5.3 Concept Selection

This is a comparison of options for how to improve the effectiveness of the Tyrone Hospital inventory management. The three options include a plan for manual recording with known par levels, using existing Meditech system with bar codes to automate the supply chain, and using RFID for automation. The following are pros and cons to each solution:

Solution 1, Plan for Manual Recording with Par-Levels Known
+ Effective once par levels are known to improve inventory turnover
+ Zero costs, excluding travel expenses
- Not efficient with manual recording as wasted time

Solution 2, Plan to use Existing Meditech Software through Automation with Bar Coding
+ Effective
+ Efficient with Automation
- Additional costs include a single line bar code reader for patient charges ($130-$260) (QD2100, 2010) and a Hand Held Terminal, or HHT, to keep track of inventory quantities ($3600) (StockTaker, 2010).

Solution 3, Plan to use RFID Technology for Real Time Assessment
+ Effective
+ Efficient with Automation, more than bar codes with an increased read rate, eliminates line of sight reading, and can read/write (RFID)
- Additional costs include RFID scanner ($3989) (Symbol), Active RFID tags ($15-$100/tag) (Active)

There are criteria to help evaluate and compare the three alternatives. These criteria include effectiveness, efficiency, and cost. All three solutions would be effective. Solutions 2 and 3 would be efficient. However solution 3 would be the least cost effective. Considering all three criteria, Solution 2 is the better alternative to help improve the efficiency and effectiveness of Tyrone Hospital inventory management through automation.

6.0 System Level Design

Due to the unavailability of historical inventory data, par levels will be created using the department head nurses' experience and intuition. These initial par levels will be used for the first six months. Utilizing this generated data, a user can run optimize functions within Meditech to output new par levels that are optimal levels. Pars will be placed on bin labels in departments to keep track of items on the shelves. Items are individually labeled, and when used, the label will be attached to the patient charge sheet. At the day's end, those sheets will be collected and captured in the system by a barcode scanner which can be seen in Figure 14 of Appendix B. The system will record how many items are used in a designated period and the number that needs to be replaced. Furthermore, three days a week, items will be counted and entered into a Hand Held Terminal, or HHT, seen in Figure 15 of the Appendix B, to assure bins are meeting the par levels. This system design is outlined as a process flow diagram in Figure 3.

As Tyrone Hospital continues to monitor and track inventory data in Meditech, the levels will move to a more efficient par level. After six months of using the new system, an ABC analysis should be run through Meditech. This will use the six months of inventory data to create more appropriate par levels and distinguish importance among all the products used. This step should be completed at least every six months to ensure par levels are moving to a more efficient average, which over time, takes into accounts specific patterns and seasonality changes. As time progresses, Tyrone Hospital will see a vast improvement in its efficiency and inventory costs.

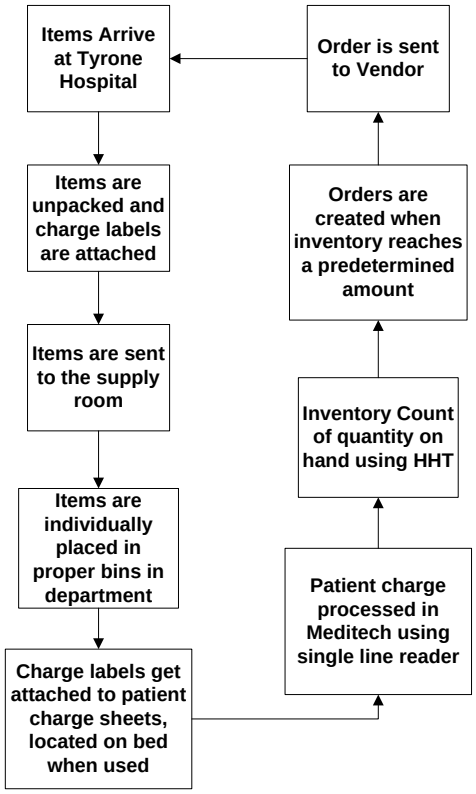

Figure 3: Inventory Flow Diagram

7.0 Special Topics

7.1 Budget and Vendor Purchase Information

The team's $1,000.00 budget dispersion for the Capstone Design Project is in Figure 4. Since there was no direct need for a physical prototype, the fiscal resources available were applied to benefit the hospital. Two Datalogic QD2100 QuickScan scanners, which are single lined item readers, were purchased at $130.00 a piece. These devices will allow Tyrone Hospital to be able to capture patient charges more efficiently and effectively. At present, the team has only incurred expenses that amount to $193.76 related in travel to Tyrone Hospital. Also, taken out of the budget was $53.00, which was the amount for the IE 480W project poster required for the Design Showcase, held on April 29, 2010. The amount that remains in the team's budget is $493.24.

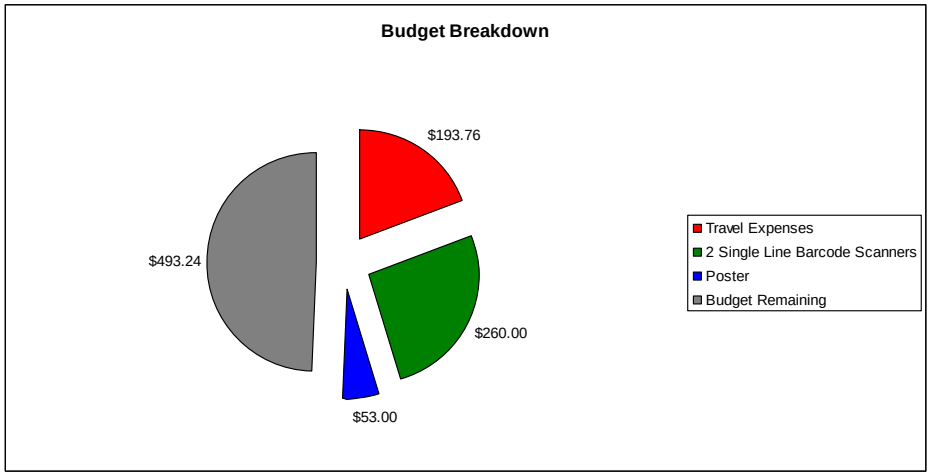

Figure 4: Budget Allocated towards Design Project

7.2 Project Management

Careful management will be imperative for a successful project. There are multiple deadlines that must be met, including those for the proposal, the progress report, and the final report. Also there are multiple important events throughout the semester. These deadlines and events can be seen in the Project Gantt shown in Figure 5.

Collectively, the team is capable of accomplishing the expected goals of the project. Each member's skills and achievements can be viewed in Appendix C. Additionally, they each have access to a number of resources at The Pennsylvania State University. The team will use available resources and skills to bring a high level of professionalism to the project. Presented to Tyrone Hospital will be a direct, applicable solution to organize the hospital supply chain.

During the fifteen week period, the team will develop a detailed and comprehensive plan for implementing a bar coding system to track inventory and streamline operation utilizing Meditech. It will deliver a progress report halfway through the semester and a final report at the end of term. In addition, there will be several presentations to both project sponsors and the project advisor.

Start Date: 2/1/2010 Monday

First Day of Week (Mon=2): 2

WBS	Tasks	Task Lead	Start	End	Duration (Days)	% Complete	Working Days	Days Complete	Days Remaining
1	**Develop Proposal**		2/01/10	2/04/10	3	95%	4	2	1
2	Proposal Due		2/04/10	2/04/10	1	0%	1	0	1
3	Proposal Presentations		2/09/10	2/11/10	3	0%	3	0	3
4	Additional Site Visit		2/22/10	2/26/10	5	0%	5	0	5
5	Agreement Due		2/26/10	2/26/10	1	0%	1	0	1
6	Develop Prog. Report		3/01/10	3/11/10	11	0%	9	0	11
7	P.R. Due		3/11/10	3/11/10	1	0%	1	0	1
8	**P.R. Presentations**		3/16/10	3/18/10	3	0%	3	0	3
9	Develop Final Report		4/01/10	4/15/10	15	0%	11	0	15
10	Final Report Due		4/15/10	4/15/10	1	0%	1	0	1
11	F.R. Presentations		4/20/10	4/22/10	3	0%	3	0	3
12	Project Showcase		4/29/10	4/29/10	1	0%	1	0	1
13	**Deliver Reports**		5/03/10	5/03/10	1	0%	1	0	1
14	Explore Meditech		2/16/10	3/08/10	21	0%	15	0	21
15	Research Meditech Bar Coding		2/18/10	3/07/10	18	0%	12	0	18
16	Buy B.C. Printer/Scanner		3/09/10	3/18/10	10	0%	8	0	10
17	B.C. Inventory/Patient Wristbands		3/22/10	4/02/10	12	0%	10	0	12
18	**B.C. linked to Meditech**		3/22/10	4/02/10	12	0%	10	0	12
19	Demonstration		4/06/10	4/06/10	1	0%	1	0	1
20	Develop JIT plan		3/27/10	4/05/10	10	0%	6	0	10
21	General Development Time		2/09/10	3/30/10	50	0%	36	0	50
22	General Project Disc. & Finishing		4/01/10	4/30/10	30	0%	22	0	30

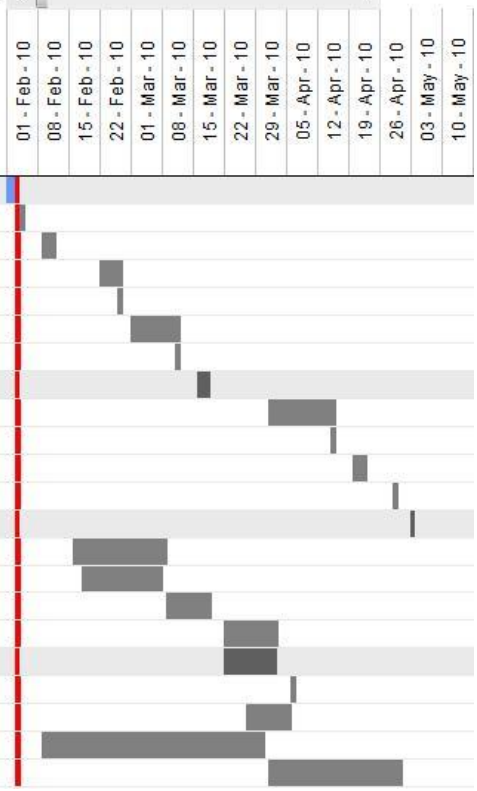

Figure 5: Project Gantt chart

7.3 Risk Plan and Safety

As with any plan, there are bound to be obstacles to overcome. Having a risk plan greatly decreases wasted time associated with project restructuring after a hold-up. Table 2 lists the major risks in the project's duration, with associated risk levels, minimizing actions, and fall back strategies.

Table 2: Risk Plan

Risk	Level	Actions to Minimize	Fall Back Strategy
Sponsor Expectations Differ	Low	- Actively correspond with sponsor - Have requirements clearly written out.	- Deliver at least, a meaningful, utilizable approach to improving efficiency.
Development Delays	Moderate	- Follow Gantt chart - Finish tasks ahead of time if possible - Allow extra time for large tasks	- Have a time buffer - Divide up the work between members
Cost Overrun	High	-Actively seek lowest cost solutions -Ask for sponsorship	- Eliminate costly additions
Inventory Data Insufficient	Moderate	-Search Meditech for data	- Find data from similar rural hospitals to estimate
Primary User Apprehension to Change	High	-Involve nurses in the process -Get input from staff members	- Provide a middle ground - Allow longer time for change

7.4 Ethics Statement

The project team members will hold themselves to the highest professional and ethical standards. As Tyrone Hospital is subject to the industry wide patient confidentiality laws, the team will follow all necessary procedures to ensure those laws are not violated. It will also make sound decisions, and never compromise integrity to achieve goals.

7.5 Communication and Coordination with Sponsor

Interaction between the team and the sponsor consisted of emails, weekly memos, conference calls, site visits, and stakeholder feedback.

8.0 Detailed Design

8.1 Manufacturing Process Plan

A process plan was developed on how to delete obsolete items from the stock dictionary, enter quantities on hand, generate bar codes, tag items with bar codes and link the bar codes to an HHT device. Also discussed will be the methods for determining the methods for generating par levels for ordering.

It is important to note that all changes in Meditech need to be carried out in test mode. When Tyrone Hospital is ready and confident in the test mode, a Meditech representative needs to be contacted to turn the test mode into live mode.

The Meditech software stores all the items' information in the stock dictionary. This is useful for the hospital to keep track of what is being used, and what is needed. However, over longer periods of time, certain items are no longer necessary. They begin to clutter the system, and are unnecessary to have listed in the dictionary, as they can cause confusion when performing orders. We will begin to delete obsolete ICU to streamline the dictionary, and keep everything orderly. In order to accomplish this task, we will work with Michael Zenone, who knows this process. Additionally, the group will utilize the online Meditech manuals to gain a better understanding of the software.

In order to begin tracking data, the Materials Management department must enter the ICU stock quantity on hand into Meditech.

In Meditech, the user utilizes the Physical Inventory routine to enter/edit a quantity on hand inventory count into Meditech. This Physical Inventory routine will do the calculation of the change from the Physical Inventory to the quantity on hand according to the system.

The Inventory Prompt allows the user to indentify the inventory which they want to enter quantity on hand. The user can also select Lookup to the Inventory Dictionary (Lookup: Inventory Dictionary) (Physical Inventory Routine, 2007).

The Physical Quantity prompt will allow the users to enter the physical inventory quantity count.

If there is an existing count, the quantity previously entered appears. However, the user should edit this quantity so it is the correct quantity on hand.

To record the quantity on hand for each department, the user must enter Y at the Use 'Other' Locns? Prompt. This will generate a popup menu that asks the user for the quantity counts at each department. After the user enters the quantity on hand in each of the departments, Meditech sums the entered quantity on hand for each location and enters the total for that item in the Physical Quantity field (Physical Inventory Routine, 2007)

In order to meet customer needs, a comprehensive procedure for bar-coding individual items and their bin location had to be developed. Bar coding decreases the time needed to enter stock numbers, and increases the accuracy of the data entered.

Bin labels are bar codes that contain basic numeric stock information. Attach bin labels to all items in a specific bin location. Meditech also has the capability to print charge labels in barcode format. To charge patients, the charge label information is used. Charge labels typically accompany stock items issued to patients from par level inventories, and are attachable onto a patient's charge sheet for an effective capture of patient item usage.

Several routines can generate and print bar coded bin and charge labels.

The Bin Label routine, on the standard MM inventory menu, prints bin labels for inventory sorted by a user-defined range of stock numbers. These labels are attachable onto inventory bins and shelf locations (Inventory, 2007).

The Bin Label Program Routine selects the bin label format used when printing labels for this inventory. (Lookup: Bin Label Programs on file). This is a required field (Inventory, 2007).

To help Tyrone Hospital to locate items, the MM Module provides a print bin label routines. The Print Bin Labels Routine allows the user to print bin labels for an individual inventory item sorted by a specified range of stock numbers. The printed bin labels are attachable to inventory, bins, and shelf locations.

There are two bin label formats available with bar codes (Inventory, 2007):

1) 4 X 1 1/2 Bin Labels w/Bar Code
2) 2 1/2 X 1 Bin Labels w/Bar Code

In the Inventory Dictionary at the Bin Label Program prompt, the user can specify each inventory's label format. Figure 6 displays an example bin label. This is a required field and a lookup is available. Also note that the format is editable if the user chooses (Inventory, 2007).

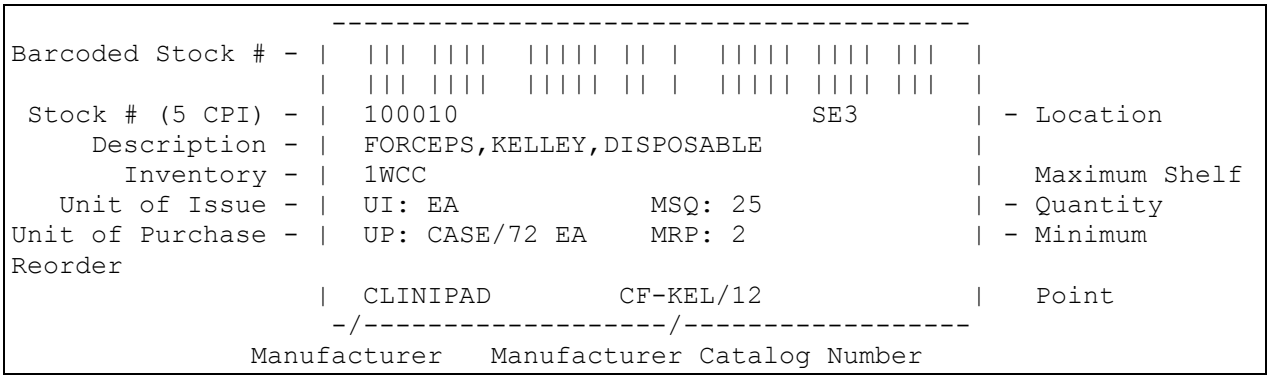

Figure 6: Example Bin Label where the | | | area represents the barcode (Inventory, 2007)

Users can enter the inventory for which labels they want printed. A lookup into the inventory dictionary is available.

The Charge Label routine, also on the standard MM Inventory Menu, produces charge labels to place on the items issued to the patient.

This routine allows you to print sample charge labels showing the length of each label. By printing sample charge labels, the user can decide what label size is appropriate. To print a sample of the labels showing the maximum length of fields, enter Y (Inventory, 2007).

Charge labels contain the barcode of the stock number, the stock number, and the stock description. Figure 7 is an example of a charge label.

To help Tyrone hospital record charges for patient issue items, the MM Module provides a print charge label routines.

The Print Charge Labels routine generates charge labels to place on individual items. When Tyrone Hospital dispenses items to patients, nurses can peel off the printed portion of the label and place it on the appropriate patient charge sheets for an effective capture of patient use.

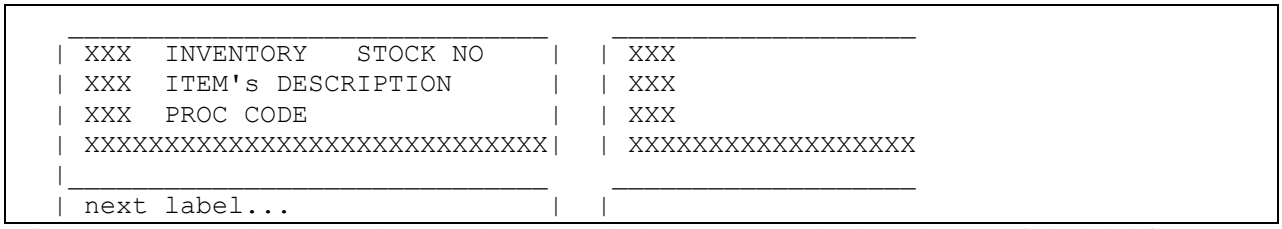

Figure 7: Example Charge Label where the XX area below represents the barcode area of the label (Inventory, 2007)

A lookup of the inventories is available to print the associated charge label. The user can enter the number of labels to print for this item.

For line printers, this routine will print sample charge labels and display the maximum length of each label's fields. This ensures that the user is using the correct size label stock.

After the user defines an output device, the printer, for the label(s), Meditech will display the following prompt: ***Alignment Test?*** (Inventory, 2007).

To print a sample of the labels showing the maximum length of fields, enter Y. Otherwise, enter N (Inventory, 2007).

In order to make the process more efficient, barcodes will be generated for each item, non vendor specific.

HHTs will be used to scan the created barcodes so they can enter and be stored in the Meditech system. Please note that it is necessary to use Meditech's HHT feature in conjunction with a non-Meditech software package for the HHT device. An HHT vendor will provide more detailed instructions for using the HHT to perform tasks (Handheld Terminal, 2007).

Also important to note is that the data entered via an HHT is not checked for validity. For example, if a user captures stock items which are neither stocked at a specified inventory nor actual stock numbers, the HHT still accepts that data. When the data is uploaded to the MM sector of Meditech, errors are identified so that a user may edit them. Still, the users should strive to be as accurate as possible when entering data (Handheld Terminal, 2007).

The HHTs will scan the stock labels and this decreases the time needed to enter stock numbers and increases the accuracy of the data entered. There are two routines that can be easily used to generate bar coded bin and charge labels. First, there are bin labels, which are typically attached to inventory drawers, bins, or shelves. Second, charge labels accompany stock items used to patients from par level inventories, and are eventually peeled and stuck onto the patient's charge sheet or card. There are a multitude of applications that the HHT can be used for to increase efficiency and reduce waste for the hospital.

When a patient chargeable stock item is used to a patient, a hospital personnel will remove the charge label and attach it to the patient's charge sheet or card. To do this with the HHT a user would first sign on to the HHT. From there, he or she can select the HHT Patient Issue routine and then record the issue(s), which includes identifying the inventory, the patient, the stock number, and quantity issued. Finally, he or she will save the information on the HHT (Handheld Terminal, 2007).

A physical inventory is the manual count of stock items in the hospital's inventories. The HHT can also be used to record a physical inventory. To do this, first sign on to the HHT and select the Physical Inventory routine. Then record the Physical Inventory by identifying the inventory, stock number, and recoding the quantity on hand. Finally, save the information on the HHT (Handheld Terminal, 2007).

Another application of the Hand Held Terminal is the ability to initialize a new stock item in an inventory. This transaction establishes the opening quantity and unit cost of a new stock in an inventory. To use the HHT for the function first, sign on and then select the Initialize Inventory routine. Next, initialize the inventory by identifying the inventory, stock number, and recording the quantity on hand. Finally, save the information on the HHT (Handheld Terminal, 2007).

A HHT can be used to record the direct issue of items from a supplying inventory to a department. The procedure to do so is similar to that of the previous application. First, sign on to the HHT and select Department Issue routine. Then enter the department issue information, which consists of identifying the inventory, the department, stock number, and specifying the quantity to issue. Once again, finish by saving the information to the HHT (Handheld Terminal, 2007).

When coming across the issue of recording the return of an inventory stock from a department, the HHT can perform this feat as well. First, sign on to the HHT and select the Department Return routine. Next, enter the department return information, which consists of the inventory, the department, stock number, and quantity to return. Finally, save the information on the HHT (Handheld Terminal, 2007).

A major feature is the topic of Inventory Restock Requisitions. The HHT can be used to restock a DEPT type inventory by creating an inventory requisition. To do this, first sign on the HHT and select Inventory Restock routine. Then, enter the inventory requisition information, which includes the supplying inventory, receiving inventory, stock number and quantity to issue. Finally, save the information to the HHT (Handheld Terminal, 2007).

To successfully use bar coding through Meditech, it is important to link the two systems: Meditech and the HHT. There is little to be gained by having barcodes if none of the corresponding data is input into Meditech. Therefore, the team is in the process of looking for an appropriate HHT for use in Tyrone Hospital, which will be able to link barcodes with Meditech. This is proving to be a complex issue, as there are numerous scanners, both simple and advanced. Furthermore, there needs to be a way to sort bar code data so it can be used adequately in the system. While researching these issues, the group came across a third-party software called StockTaker. This software is installed directly onto the advanced HHTs which runs operating systems, and has a clean interface making it easy to use.

It seems apparent that the software handles the conversion of barcode data to an appropriate Meditech file. Instead of users having to individually sort through data, the data from the HHT will be formatted and can be easily uploaded to a computer with Meditech software. Any HHT would need some type of software to translate the data into something that is readable in Meditech, and therefore StockTaker is a recommended option.

In order to determine the actual usage of stock items in the hospital, the hospital can utilize the Daily Department Usage Report found within Meditech's materials management functions. This function is capable accessing information for a specified range of dates. The information we will be viewing with this report will be:

- Transaction date and type
- Stock number and description
- Issue quantity
- Unit of measure (issue)
- Dollar value of transaction (Issue Quantity X Unit of Issue Cost)
- Requisition number (for transactions resulting from inventory requisitions)

When running this report it is necessary to specify that the report only draw information for the specified specific department over a select range of dates, otherwise the time to compile the data will be extensive.

The specific steps for accomplishing this were found at Meditech's website at http://www.meditech.com/customerservicehome.htm and are as follows:

(1) To Specify which item data to retrieve
Enter the mnemonic of the inventory whose department usage you wish to track for a range of departments. A lookup into the inventory dictionary is available.

(2) To Specify the Beginning Date
Enter the first date of the range for which you want to print this report. This is a required field. To report for a single date, enter the date here and at the Thru Date prompt.

(3) To Specify the Thru Date
Enter the last date of the range for which you want to print this report. This is a required field. To report for a single date, enter the date here and at the From Date prompt.

(4) To specify the Beginning Department/Departments
BEGINNING appears. To start the report with first department for the identified Inventory, press <Enter>.
To start the report with a specific department, delete BEGINNING and enter its number.

Lookup: MIS GL Component & Summary Values Dictionary

To report a single department, enter its number both here and at the Thru Dept prompt.

(5) To specify the Ending Department/Departments
END appears. To end the report with the last department for the identified Inventory, press <Enter>.
To end the report with a specific department, delete END and enter its number.

Lookup: MIS GL Component and Summary Values Dictionary

(6) To specify which issues to include
Include Dept Issues (D), Pt Issues (P) or Both (B)

To include	Enter
Department issues and returns, and patient issues	B
Department issues and returns	D
Patient issues	P

In order to minimize inventory on-hand, it is imperative that par levels be close to the actual demand. Since Tyrone Hospital currently has no system for generating these pars, the team inputted the initial pars from nurse intuition. This will serve as a starting point. Once the system is in place and the hospital has begun gathering data, an optimize function in Meditech can be run after a period of time to generate the optimal stock levels for stock items.

8.2 Analysis

The team's goal was to help facilitate the restructure process of Materials Management at Tyrone Hospital. The current system was observed to get an understanding of material flow. The team brainstormed a new working model based from the original, to expedite and create efficiency in that flow of materials.

The current system in the hospital includes multiple wings, each, for the most part, managing their own supplies and ordering them from the supply room at will. Furthermore, the general supply room has excess inventory, which is not being turned over quickly enough, thus having less value by having tied up cash.

Order forms are filled out manually, and based off assumed needs, but not calculated needs, as the current Meditech system underutilized. All of these things were noted in the creation of the team's proposed new model.

The new system will rely heavily on bar coding, with each item in stock having its own specific data entry in Meditech. These can then be printed and placed on items, which will be delivered to different parts of the hospital. Prior to being delivered, they will also be given a location code which will designate where they will be used. A HHT will be utilized to scan used items, and its mounted software, possibly StockTaker, will collect this scanned data, format it into a file, and transfer it, either wirelessly or through a cradle, into Meditech.

This system will allow Tyrone Hospital to track how much inventory a particular wing actually needs, and can deliver necessary materials in a timely manner. Furthermore, this will allow items to be ordered more efficiently, with lesser waste than the original.

The proposed process was presented to Tyrone Hospital's stakeholders on multiple occasions. This allowed for bouncing off ideas from one another to ensure that all aspects of a good system design were considered. This approach was effective to help design a process that will cater to the hospital's specific needs and more towards certain department needs.

It is recommended that Tyrone Hospital set up a committee run by a chair, while ongoing implementation.

8.3 Material and Material Selection Process

One of the team's major concerns was the current underutilization of the Meditech software. The team brainstormed different methods for software. The options as far as software were to stick with the Meditech, go with completely new software, or build Excel based software.

An evaluation dealing with each of the software's positives and negatives were compared to come up with a set decision so progress could then be obtained. Some of the attributes that were needed were the ability to print barcodes, produce par levels, and track inventory used and needed. Along with these, the cost, ease of use, and extra capabilities were taken into account.

At first, the group thought it would be best to build simple and easy to use software in Excel. This presented the best ease of use and lowest cost since extra software would not be needed along with other accessories.

However, the team was presented with the fact that Tyrone Hospital wanted to use Meditech modules for additional applications in the hospital. Therefore, it was more sensible to use one software system.

8.4 Component and Component Selection Process

With the software chosen, the components needed to be selected that best matched the capabilities and ease of use of Meditech, but also taking into account cost. The main component was the HHT scanner that will be used to scan inventory items to keep track of how much are in the hospital and how much is needed to match the par levels and safety stock. These scanners will be used mostly by the workers in materials management to keep track of what needs to be restocked in the cabinets and shelves so that the Meditech software can send alerts about when more inventory needs to be ordered. There are multiple scanners that can be used with Meditech and have the same capabilities so only a couple other preferences needed to be chosen. First the ability of having a wireless scanner or one connected directly to the main terminal and computer. The wireless scanners are much more expensive and the team felt it just as easy to have the scanner connected to the main terminal. Since the scanner is unable to go to the patients to scan their wristbands, the idea of having all the patients' barcodes next to the scanner became the best option. This way a user could scan the inventory items, enter the amount in the scanner, and scan the patient's barcode all in one area. The other preference was the users themselves. The team asked workers at Tyrone Hospital which model seemed the most user-friendly since they would be the ones using it themselves. A designated person from the materials management department will be using the HHT.

8.5 Test Procedure

One of the most important metrics of the team's solution is that it is easy to use. After demonstration of the solution, the team will administer a survey to the hospital staff in nursing and materials management. The purpose of this survey will be to determine if the process presented is deemed easy to use by the stakeholders.

9.0 Final Discussion

9.1 Construction Process

Steps that Penn State Industrial Engineering Students Took to help Tyrone Hospital

1) Talked to key stakeholders
2) Reworked current system to start fixing the problems found
3) Configured Meditech to calculate par levels, demands and EOQ
4) Researched how to link bar coding with Meditech
5) Purchased two single line barcode scanners as in Figure 8

Figure 8: Single Line Item Barcode Scanner

6) Entered ICU items into the test module of Meditech by bin location
7) Programmed barcode reader to read charge labels as shown in Figure 9.

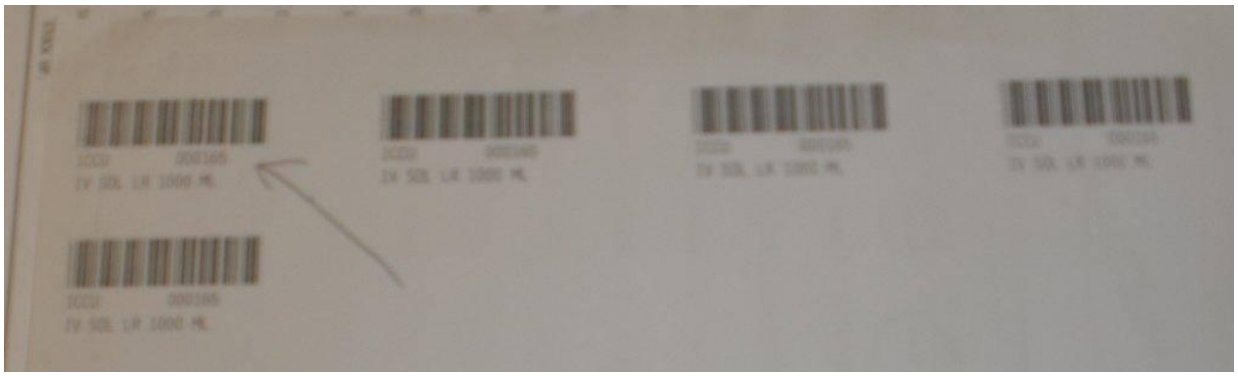

Figure 9: Barcode Charge Labels Generated by Meditech

8) Linked bar codes to Meditech
9) Performed demonstration to Tyrone Hospital stakeholders
10) Developed a comprehensive and detailed plan

The demonstration consisted of detailed steps on how to enter items into Meditech, print bin and charge labels, and capture patient charges.

PROCEDURE FOR ENTERING ITEMS

- Enter Materials Management Module
- Click Dictionaries (100)
- Click Stock Dictionary Option (80)
- Click Enter/Edit (11)
- Within the Inventory Field- Hit F9 for sub and stores options. ICU is a sub.
- Enter the Stock Number you wish and hit Enter.(This may populate some fields automatically if the item already exits)

- Next Populate:
    - Dept. Issue
    - Unit of Issue (EA)
    - Expense Code
    - Patient Issues
    - Unit of Issue (EA)
    - Expense Code
    - Restock (EA)
    - Max Shelf Qty*
    - Min Reorder Point *

      *These entries should be the same

- Yes/No Confirmation (Yes)

PROCESS DESCRIPTION FOR PRINTING LABELS

- Enter Materials Management Module
- Click Inventory (10)
- Click Labels (15)
- Choose either:
    - 1. Print Bin Labels
    - 2. Print Charge Labels

Print Charge Labels

- Click Inventory, and press F9 to pick which sub or store you want

Stocks Field
- Enter stock number. Press F9 to see all items.

Number of Labels
- Enter the number of labels you want printed
- Hit Enter once to enter another item
- Hit Enter twice when finished

Printing

- Select Print On (F9) and choose the printer location
- Select a row to print on, numbered from 1-10. Choose 1 as a default choice.

PROCESS DESCRIPTION FOR CAPTURING PATIENT CHARGES

- Enter Materials Management Module
- Click Process Patient Issue Record (17)
- Under Inventory hit F9 and select ICU
- Enter Record Number
- Enter Record Date (Type "T" for today)
- For PT Detail type "Y" for yes (the B/AR Database should be automatically filled out)
- Leave Revenue Site and Description blank
- Hit enter for Confirmation and Click Yes

A Process patient Window will appear
- Next to Select type "1"
- Next to Single Unit Issue type "Y" for Yes

An Enter/Edit Patient Issue Window will Appear
- Use the Single Item Hand-Held Scanner to capture the patients Account Number from the Patient Charge Sheet
- Enter Patient Service Date ("T" for today)
- Enter the Provider
- Leave Clinical Procedure Name Blank
- Use scanner to capture the patients charged items from the labels on the patient charge sheet
- Confirm the procedure

9.2 Test Results and Discussion

The proposed system will reduce the amount of on-hand inventory in the hospital's supply room. Excess inventory ties up cash that could be used in other areas of the hospital. The goal is to keep inventory at a minimum. This can be achieved by using Meditech to keep track of patient charges and inventory levels.

The team strove to have the stakeholders feel equally represented in the design. A system demonstration of how to enter items into Meditech, print bin/charge labels, and capture patient charges through automation was performed on April 6, 2010. Following, the team surveyed six staff members as a metric to measure the group's success in making the inventory management more efficient and effective for Tyrone Hospital and its patients. The responses to the questions were categorized as either: strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree. Full results from the survey can be found in Table 3 and Figures 17-26 of Appendix D.

Major results pointed towards stakeholders strongly agreeing and agreeing that new system will help hospital staff perform their jobs well, they feel involved in the decision process, and that the new system will be good for overall business. These major results are in Figures 10-12 respectively.

When asked if the new system will help the staff do their job well: 50% answered strongly agree; 33% agreed; and 17% neither agreed nor disagreed. The results of this question are in Figure 10.

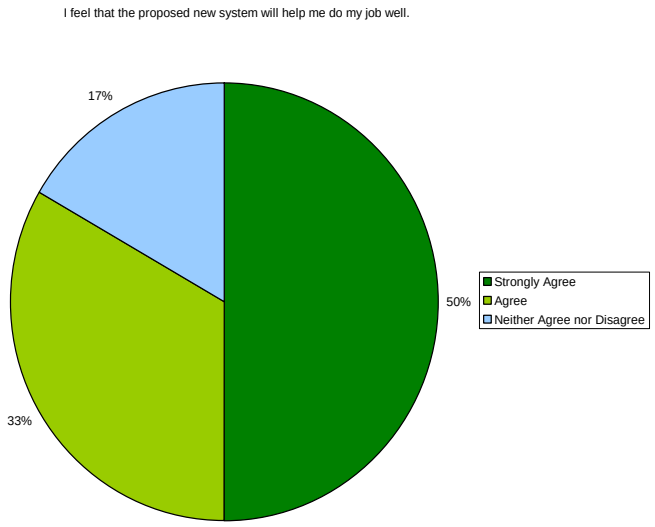

Figure 10. Percentage of Stakeholders that the New System Will Help Them Do Their Job Well

When asked if the employees felt involved in the decision process: 50% strongly agreed; 33% agreed; and 17% neither agreed nor disagreed. This data is in Figure 11.

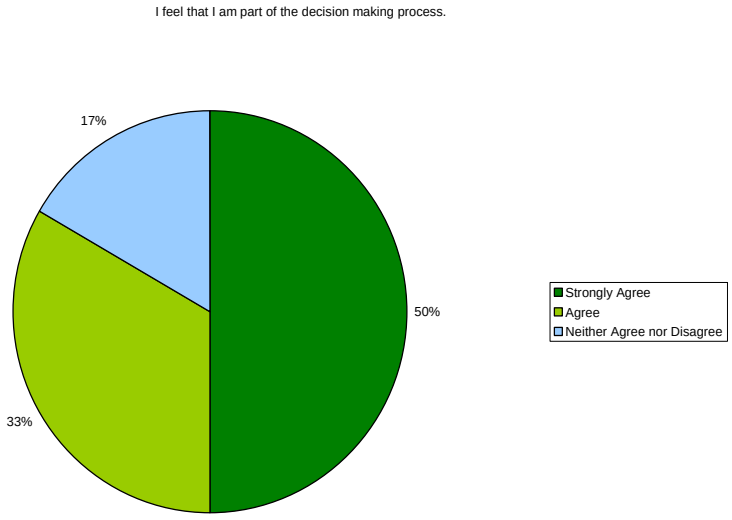

Figure 11. Percentage of Stakeholders Feeling that they are Involved with Decision Process

When asked if the new system would be better for overall business: 50% strongly agreed; and 50% agreed. These results are in Figure 12.

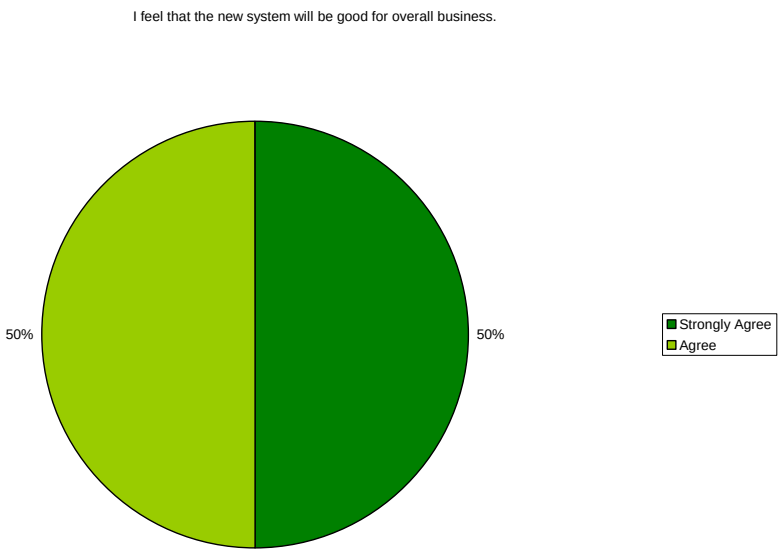

Figure 12. Percentage of Stakeholders that the New System Will be Good for Overall Buisness

10.0 Conclusions and Recommendations

At the start of the project the team observed that the inventory process for the Tyrone Hospital is entirely manual, labor intensive, and difficult to monitor material levels. The goal was to assist the management in facilitating a hospital wide change toward automation of their materials management. To overcome any trepidations the team included stakeholders from varying departments in the design proposal.

A benefit of working closely and frequently with the hospital was that they were able to move forward to a change which previously seemed an unreachable target. A main problem was the underutilization of the Meditech software and the underlying cause of this. To address the utilization problem, the team conducted an investigation into the capabilities of the software. This resulted in a demonstration of key procedures within the software for the purpose of implementing automation for materials management. The demonstration concluded with a survey of the hospital's key players opinions about the process. The major results were that, of those surveyed, 50% strongly agree that the new system will help them perform their jobs better, 50% agree that they were part of the decision making process and 50% strongly agree that the new system would be good for the business. Overall the respondents either strongly agreed or agreed with the new system.

Along with our proposed plan, the team was able to provide the hospital with two Datalogic QD2100 QuickScan single line item scanners, which capture patient charges. However, the team was not able to purchase the StockTaker HHT because it was cost prohibited. At the request of the hospital, the process to enter inventory quantity was explained in detail, with the understanding that the hospital will need to acquire one for future implementation.

The team encouraged Tyrone Hospital to make use of their Meditech specialist representative. The utilization of this specialist will be an effective transition from the work done this semester, to autonomous implementation of continuous improvement at Tyrone Hospital.

Recommended Steps for Tyrone Hospital

1) Develop a committee with a chair for project implementation feedback
2) Develop a committee with a chair to talk with visiting doctors and supply use
3) Open lines of communication with a Meditech representative
4) Compose a hospital employee signed agreement for continued Meditech use
5) Assign an allotted amount of time each day for materials management to dedicate towards development
6) Build the remaining departments in the test module
7) Continue to enter inventory for remaining departments into the test module of Meditech
8) Train hospital staff stakeholders
9) Arrange for patients to be entered into Meditech so a barcode can be assigned to them
10) Talk to distributors on how to arrange plans for ordering supplies through Meditech
11) Purchase an HHT with Meditech compatible software on it, possibly from the vendor StockTaker and shown in Figure 27 of Appendix E
12) Print out bin labels for every department with the par level visible as shown in Figure 28 of Appendix E
13) Print out charge labels for items going to certain departments
14) Move test mode to live mode by contacting Meditech representative
15) Start ordering supplies electronically in Meditech
16) Begin to track data through Meditech
17) After a period of time, such as six months, calculate par levels for items and reprint bin labels with the new par level visible
18) Change general supply room to a distribution room to move towards a JIT inventory strategy
19) Arrange plans with distributors such as Cardinal Distribution to have more frequent deliveries

When par level data is calculated and known, Tyrone Hospital can come closer to achieving optimal stock levels to avoid under/over stocking. Improved turnover can lead to increased cash flow. Just in time, or JIT, inventory is the ultimate goal for Tyrone Hospital. With sustained continuous improvements, JIT could be reached over the years by turning the general supply room into a distribution room and receiving more frequent deliveries, such as daily, that coincide with par level inventory.

The future state value stream map of JIT using Meditech and bar coding is show in Figure 13. A symbol key is in Figure 14 in Appendix A. A supermarket pull system with a safety stock in the distribution room will be used. Kanbans, or the par levels that Meditech generates, will be visible to the materials management workers in departments' supply area. The material management workers can intercept the kanbans, if they feel Meditech over or under estimated the patients' item needs for that week. This can level the volume. The material needed based on the intercepted kanbans can be pulled from the distribution room where deliveries are made more frequent.

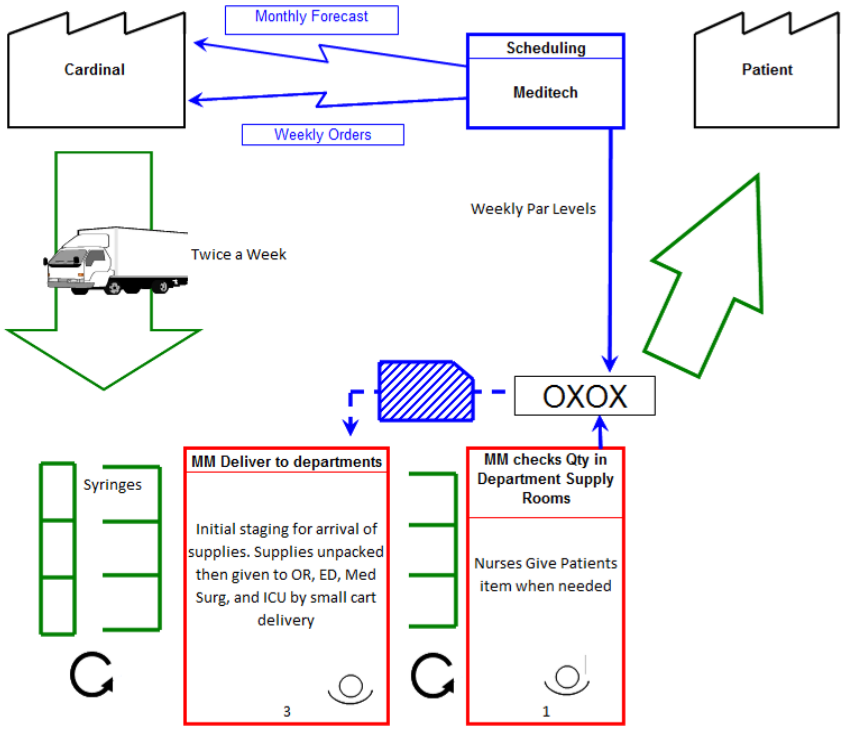

Figure 13: Future State VSM for Tyrone Hospital

The team's self assessment can be found in Appendix F.

References

"Active RFID vs. Passive RFID: A comparison of technology." *Atlas RFID Solutions: RFID consultants for your business*. Web. 02 Feb. 2010. <http://www.atlasrfidsolutions.com/active-vs-passive.asp>.

"Handheld Terminal." *Meditech Online Help Library*. Medical Information Technology, 2007. Web. 27 Feb. 2010. <http://www.meditech.com/Webhelpmagic/help_library_frame.htm>.

"Inventory." *Meditech Online Help Library*. Medical Information Technology, 2007. Web. 27 Feb. 2010. <http://www.meditech.com/Webhelpmagic/help_library_frame.htm>.

"MEDITECH - Materials Management." *MEDITECH - Medical Information Technology, Inc.* Web. 02 Feb. 2010. <http://www.meditech.com/ProductBriefs/pages/ProductBriefsCSMM.htm>.

"Physical Inventory Routine." *Meditech Online Help Library*. Medical Information Technology, 2007. Web. 27 Feb. 2010. <http://www.meditech.com/Webhelpmagic/help_library_frame.htm>.

"RFID vs. Barcode: A comparison of technologies." *Atlas RFID Solutions: RFID consultants for your business*. Web. 02 Feb. 2010. <http://www.atlasrfidsolutions.com/rfid-vs-barcode.asp>.

StockTaker: MEDITECH Handheld Barcode Scanner for Materials Management. Web. 11 Apr. 2010. <http://www.stocktakersoftware.com/>.

"Symbol Technologies MC9000-G RFID Reader at IDAutomation." *Barcode Fonts, Components, Label Software, RFID & Scanners by IDAutomation*. Web. 02 Feb. 2010. <http://www.idautomation.com/rfid_scanners/Symbol_MC9000_RFID.html>.

Tyrone Hospital | Your Health, Our Care. Web. 03 Feb. 2010. <http://www.tyronehospital.org/aboutus.html>.

"QD2100 - Datalogic QD2100 - Datalogic QD2100 QuickScan I Barcode Scanner." *Discount Receipt Printer, POS Hardware, Barcode Equipment - Consumers Choice POS Inc.* Web. 11 Apr. 2010. <http://www.consumerschoicepos.com/datalogic-quickscan-i-barcode-scanner.html>.

Appendix A

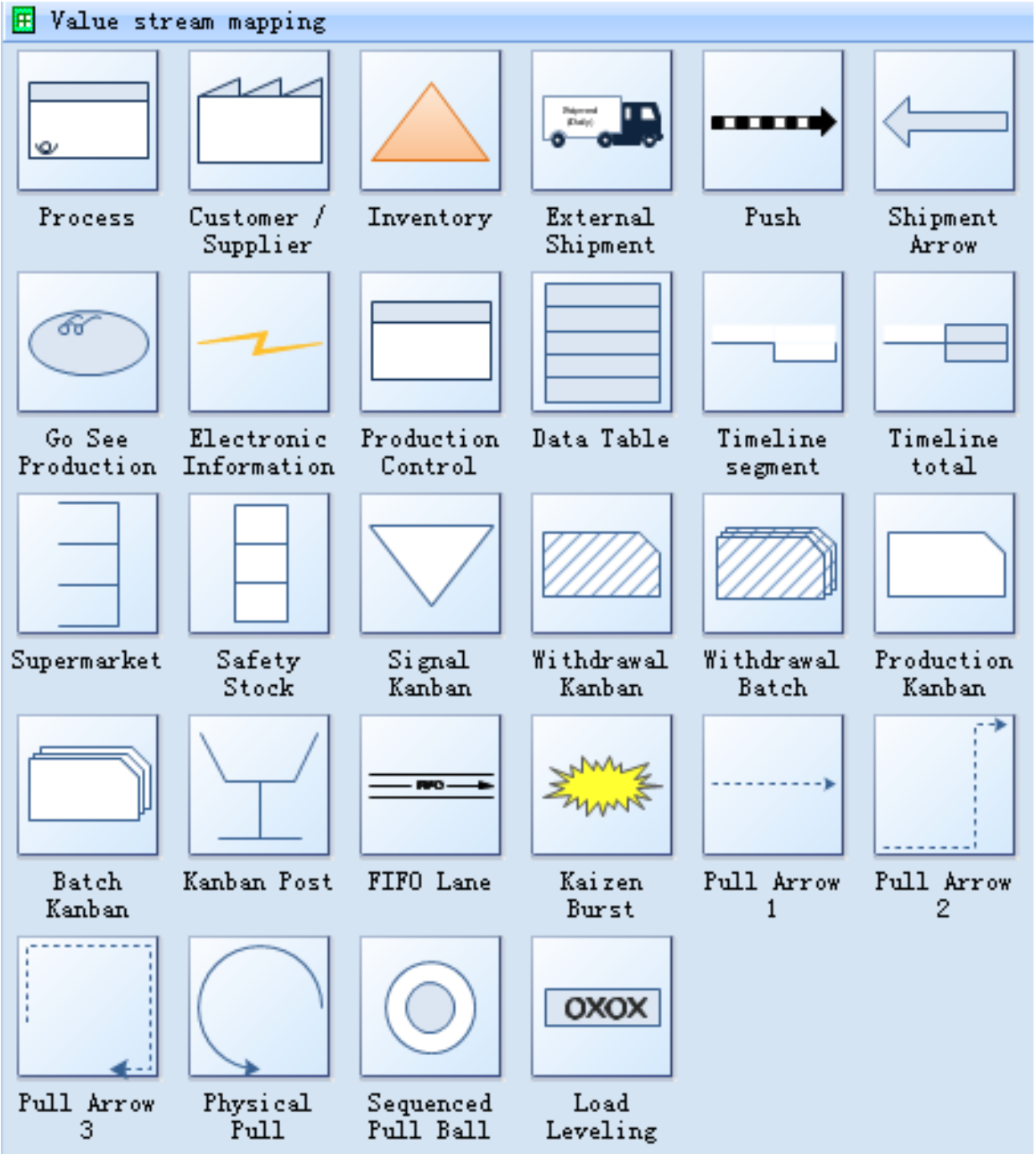

Figure 14: VSM Symbol Key (Taken from: http://www.edrawsoft.com/Value-Added-Flow-Chart.php)

Appendix B

Figure 15: Datalogic QD2100 QuickScan I (Taken from: http://www.consumerschoicepos.com/datalogic-quickscan-i-barcode-scanner.html)

Figure 16: Motorola MC 55 Enterprise Digital Assistant(Taken from:http://www.motorola.com/Business/US-EN/Business+Product+and+Services/Mobile+Computers/Handheld+Computers/MC55_US-EN)

Appendix C

CHRISTINA J. NOLL

cjn5026@psu.edu

Current Address
329 McKee Hall
University Park, PA 16802
(603) 318-6027

Permanent Address
8 Cider Lane
Nashua, NH 03063
(603) 889-1028

EDUCATION

Bachelor of Science in Industrial Engineering, *Expected Graduation: May 2010*
The Pennsylvania State University, University Park, PA
Major GPA: 3.36/4.00
Deans List

RELEVANT EXPERIENCE

Internship, Cobham Defense Electronic Systems, formally Tyco Electronics
Worked in the Aerospace and Defense Business Unit on an engineering design team of the multifunction assemblies group

- Conducted a Kaizen 5S event in the engineering lab
- Received certificate for completion of Six Sigma Lean awareness training
- Utilized concurrent engineering methodology when working with buyers/planners, test, manufacturing, and quality departments to meet customer requirements
- Scheduled multiple project meetings weekly to manage progress and set customer expectations resulting in on time delivery
- Participated in employer programs to develop technical, cultural, global prospective and financial understanding

SKILLS

Expert	Proficient	Basic Understanding
MS Visio	Facility Layout	OSHA Safety Requirements
MS Office	Lean Manufacturing	Global Awareness
Project Management	MS Project	MiniTab
Team Dynamics	Process Flow Diagrams	SAP
Time Studies	SolidWorks	Six Sigma

HONORS & ACTIVITIES

PSU Human Factors & Ergonomic Society, Bad Design Competition
- 2nd Place Best Overall Description

Society of Manufacturing Engineers
- Served as Publicity and Fundraising Co-Chair

Phi Sigma Rho, Sorority for Women Engineers
- Served as Lambda class Treasurer, Recruitment Chair, member of Standards Board and Social Committee

Engineering House, Special Living Option
- Served on PR Committee for The Pennsylvania State University's Dance Marathon (THON) and Social Committee

Society of Women Engineers
- Attended 2008 Region G Conference and annually hosted freshmen recruits

Rahul Panda

601 Vairo Blvd. Apt 638C · State College PA 16803
RWP5021@psu.edu · (484) 354-9435

Education

The Pennsylvania State University, University Park, PA
Bachelor of Science Degree, Industrial Engineering
Expected Graduation: 5/2010

Relevant Coursework

- Differential Equations - Calculus I, II, III
- Optimization Models - Linear Algebra
- Probability and Statistics I, II - Operations Research

Employment

Commons Desk Clerk
The Pennsylvania State University, University Park, PA 10/2007 - Present
Inform 40+ students per shift of university policies.
Distribute 200+ mail items/shift; Handle up to $400/week.

Impact Employee
Hollister Co. 5/2007 – 8/2007
Received and organized shipments of product worth $25,000+.
Interacted with 100+ customers a week to satisfy their requests.

Activities/Community Service

Global Connections, *State College, PA* 8/2008 - Present
Help foreign students improve their English and familiarize the cultures.

Institute of Industrial Engineers, *State College, PA* 8/2008 - Present
Member. Network with professionals. Assist in arranging social events.

Achievements

In-class Design Competition Award Dec. 2006
ED&G100: Industry sponsored project. Lead team of 4 to develop prototypes, CAD models, and a functional website.

Marine Corps 'Semper Fidelis' Music Award May 2006
Directed and mentored 45 students to complete rehearsal tasks efficiently.
Showed advanced knowledge of compositions and marching techniques.

Technical Proficiencies

SolidWorks, LINDO, LINGO, MATLAB, C++, Insight rapid prototyping software.
Microsoft Office: Excel, FrontPage, PowerPoint, Publisher, Visio, Word

Garrett Siewert

1821 Bergey Road
Hatfield, PA 19440
215-350-3834 (mobile)
garrett.siewert@gmail.com

PROFESSIONAL EXPERIENCE

SUPERIOR TUBE COMPANY, Collegeville Pa

I.E. Cost Analyst **December 2009 – January 2010**

- Responsible for recording 2009 year supplies, inventory and other costs bought outside the company to improve the number of inventory turns; saving as much as possible on $8 million and improving the cycle time.
- Recording Steam readings from furnace so a cost analysis could be performed.

Industrial Engineering Intern **June 2008 – August 2009**

- Member of LPA (Layered Processing Auditing) Team.
- Creating/Updating Job Aids and SOP's (Standard Operating Procedures).
- Member of the Yield Loss Discussion Team.
- Modeled new layout to save money and time in process.

QUANTUM CLEAN SERVICES **July 2007 – January 2008**

Office Assistant

- Transferring patents from hard copies into scanned data in the system.
- Working heavily with Microsoft Word and Excel

EDUCATION

The Pennsylvania State University
Bachelor's Degree in Industrial Engineering – June 2010

Lansdale Catholic High School
May 2006; 4.0 GPA

COMPUTER SKILLS

Experience in Microsoft Office; including Excel and Word, Solidworks, Minitab, Matlab, Visual Studio, and Visio.

Extra Curricular Activities

Member of IIE (Institute of Industrial Engineers) at Penn State University.
Participated in Intramural Sports including basketball, volleyball, and football.

Personal Goals

I am a very dedicated, hardworking individual who works until the task at hand is completed to the best degree. My goal is to implement the knowledge I've learned towards a company so as to improve their efficiency and current processes.

Sean Patrick Fisher

8 South Mann Avenue ● Yeagertown, PA 17099 ● (717) 242-0415 ● sfisher369@gmail.com

Targeting Manufacturing Engineering Position

- Upcoming Pennsylvania State University graduate offering a strong academic background and strong, diverse work experience
- Consistently promoted to leadership positions based on communication and motivational skills
- Quick to learn and master new technology; equally successful in both team and self-directed settings; proficient in a range of computer systems, languages, tools and testing methodologies

EDUCATION

The Pennsylvania State University--University Park, PA Degree expected May,2010
Bachelor of Science, Industrial Engineering
Major GPA 3.11/4.0
Coursework

- Six Sigma Methodology
- Optimization Modeling and Methods
- Simulation Modeling for Decision Support
- Statistical Methods in Engineering
- Manufacturing System Design and Analysis
- Work Design-Productivity and Safety

Pennsylvania College of Technology--Williamsport, PA Graduated May 2002
Associate of Applied Science, Building Construction
Dean's List: Fall 2000, Spring 2001
Cumulative GPA 3.59/4.0

Research Analyst August 2009 to Present
Industrial Engineering Department
The Pennsylvania State University
University Park, PA

- Successfully designed and implemented experiments based on customer input resulting in statistical verification of product performance
- Analyzed, interpreted and summarized technical data for presentation of results to the customer

EXPERIENCE

Assistant General Manager/Cook 1995 to 2002
Happy Valley Restaurant Co. August 2007 to Present
State College, PA

- Designed and implemented cost controls resulting in a food cost reduction from 39% to 33%
- Designed and implemented training programs resulting in increased customer throughput
- Analyzed and interpreted profit/loss statements for presentation to shareholders

Bricklayer/ Stonemason 2002 to 2007
Bricklayers and Allied Craft Workers Local 5
Harrisburg, PA

- Directed layout crews resulting in completion of construction stages prior to project deadlines
- Implemented just in time principals for materials management in accordance with a strict schedule

AVAILABLE FOR TRAVEL

Appendix D

Table 3. Opinion Survey Results from Six Stakeholders at Tyrone Hospital

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I feel that the proposed new system will help me do my job well.	3	2	1		
I am happy with the proposed new system.	1	5			
I feel the new system will help things run smoothly.	2	4			
I feel that I am part of the decision making process.	3	2	1		
I feel that my thoughts and ideas were taken seriously.	3	1	2		
I am encouraged to get involved and offer suggestions for improvement.	2	4			
I feel that the new system is good for my career growth.		3	3		
I feel that the new system will be good for overall business.	3	3			
I agree that positive change will result with the new system.	2	4			
The changes will help me do my job effectively.	2	3	1		
I feel the changes will be good for the patient.	1	2	3		
I feel the proposed system will help the hospital save money.	2	3	1		
I have confidence in the new system.	1	5			

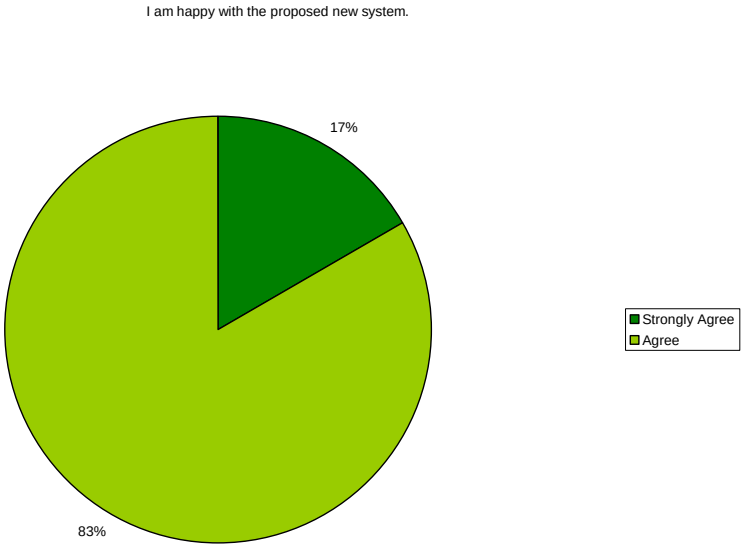

Figure 17. Perccentage of Stakeholders Feeling that they are Happy with the New System

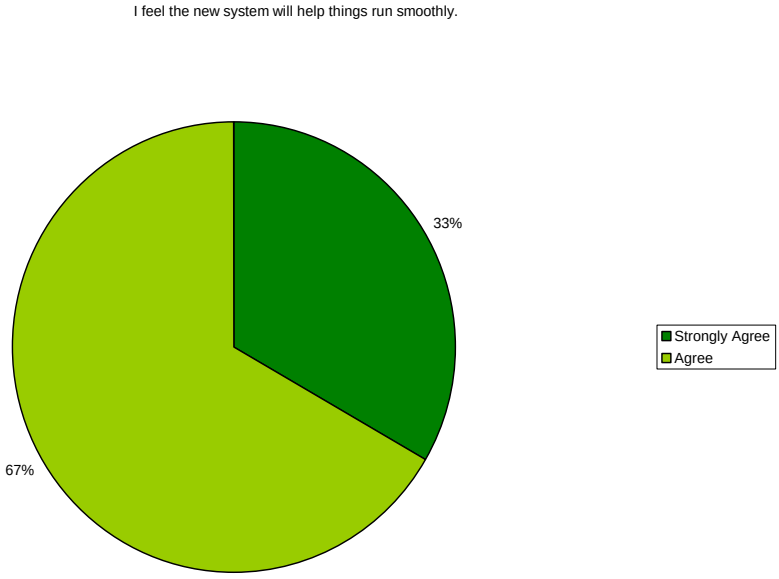

Figure 18. Percentage of Stakeholders Feeling that the New System will Help Things Run Smoothly

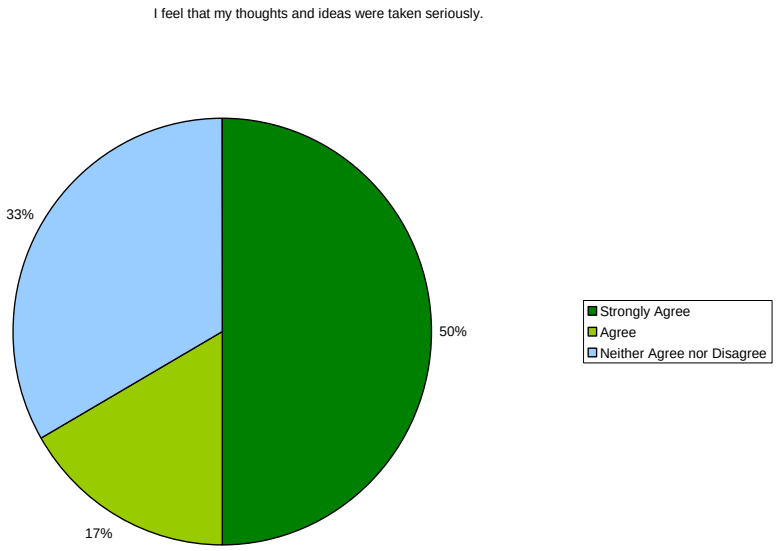

Figure 19. Percentage of Stakeholders Feeling that their Ideas were Taken Seriously

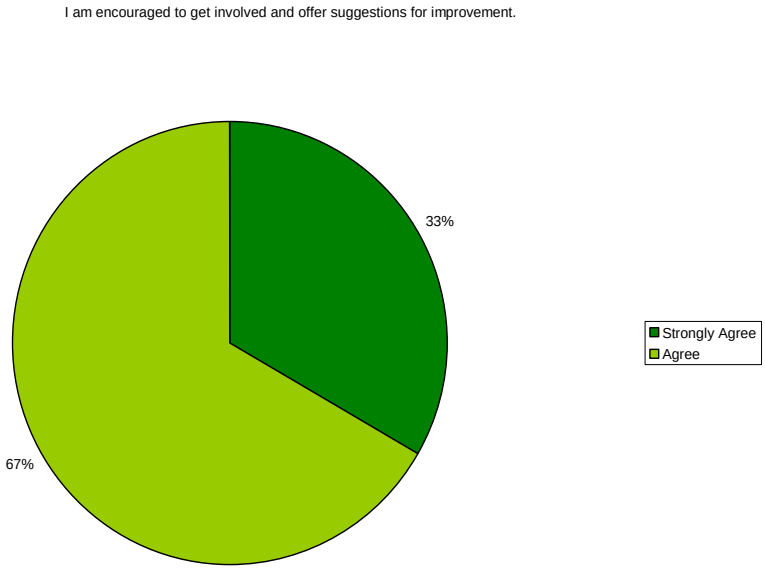

Figure 20. Percentage of Stakeholders Feeling that their Involvement is Encouraged

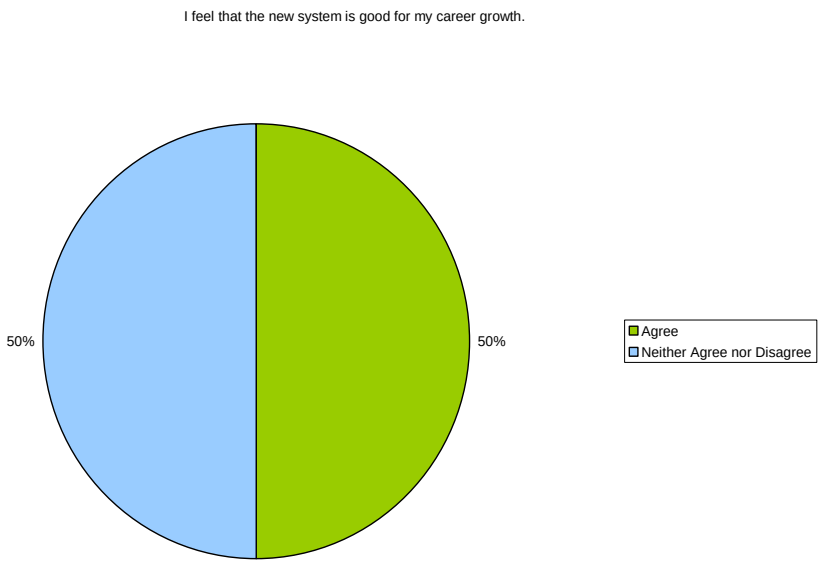

Figure 21. Percentage of Stakeholders Feeling that the New System will Help Career Growth

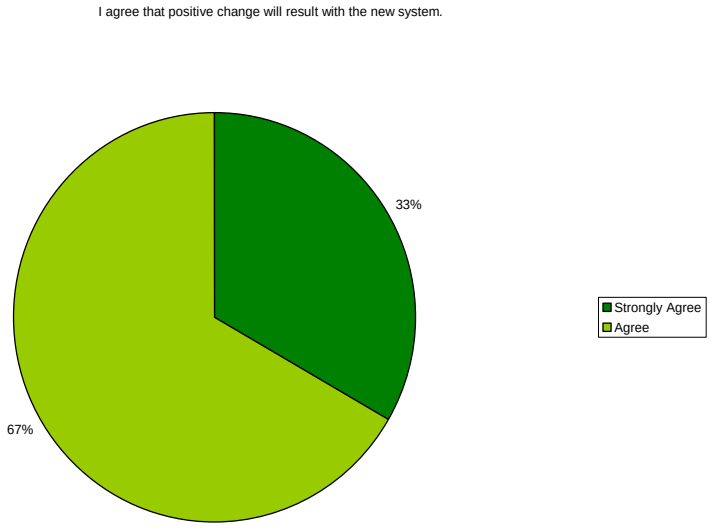

Figure 22. Percentage of Stakeholders Feeling that the New System will be a Positive Change

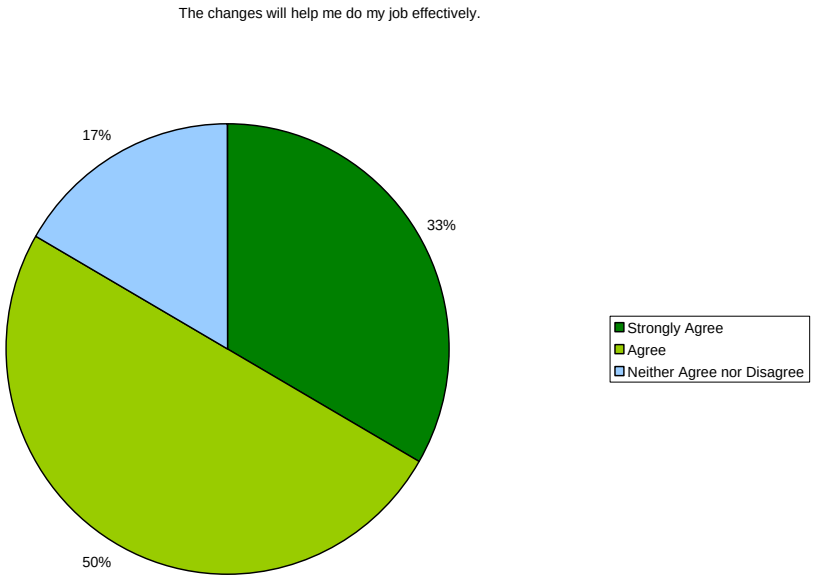

Figure 23. Percentage of Stakeholders Feeling that the New System will Help Staff do their Job Effectively

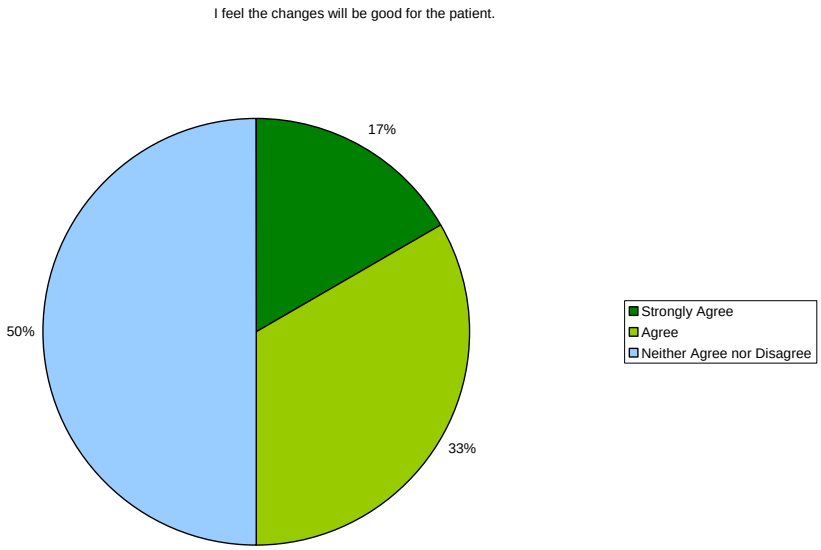

Figure 24. Percentage of Stakeholders Feeling that the New System will Help the Patient

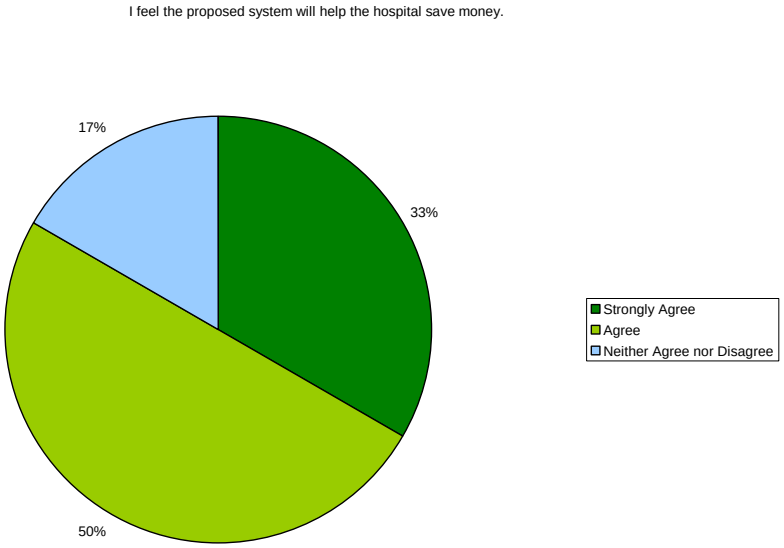

Figure 25. Percentage of Stakeholders Feeling that the New System will Help Tyrone Hospital Save Money

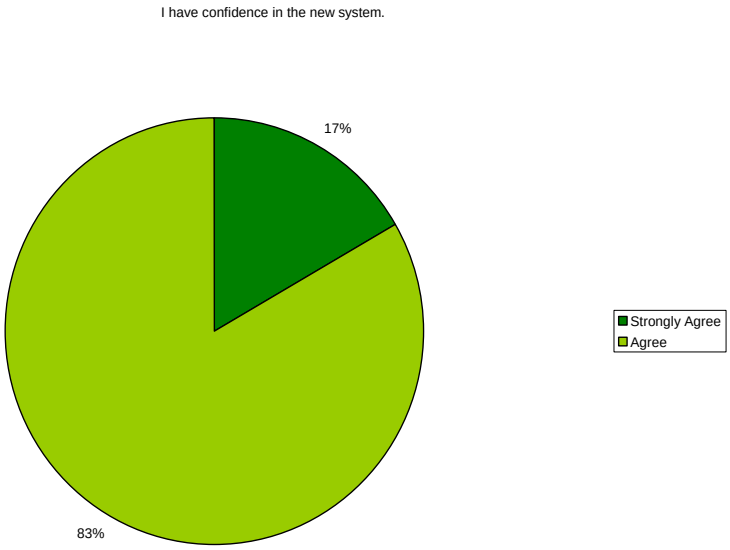

Figure 26. Percentage of Stakeholders Feeling that they have Confidence in the New System

Appendix E

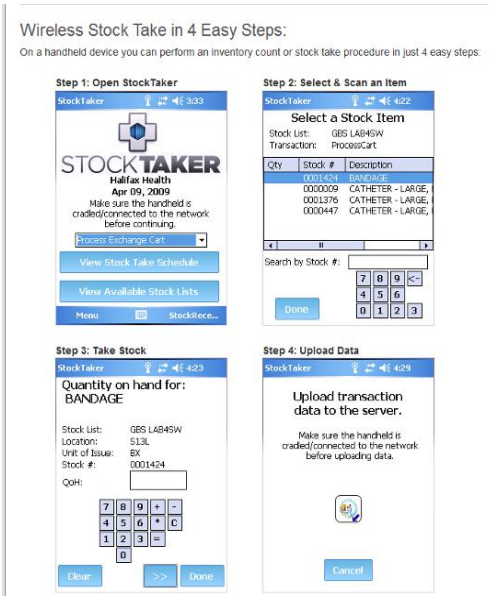

Figure 27. How to Use the Software StockTaker on tan HHT to Enter Inventory Quantities (Taken from: http://www.stocktakersoftware.com/overview.php)

Figure 28. Visible Par Levels on Bin Labels Generated by Meditech at J.C. Blair Memorial Hospital

Appendix F

Rating on meeting the customer's needs = 9.

Although the foci of the sponsor were technical in nature, the group was quick to realize that a pivotal issue was the motivation of the staff. Through this identification the team was able to assess which areas would be fundamental for moving toward automation. Based on this and consultation with the materials manager, three key procedures were documented and presented to demonstrate the ease of use of the new system.

The team was able to assist in the acquisition of a key component of the new system for the sponsor. The decision to allocate a portion of the budget to this purchase was in response to the financial constraints of the sponsor.

Rating with regard to global and societal needs =7

The plan will improve the hospital's ability to financially sustain itself. With a secure financial base, the hospital is better capable of interacting with the community to assess and provide their needs.