Abstract

In the early 2000’s, VA Medical decided to decentralize their inventory distribution centers and allocate one to each facility. While this decision might have helped reduce cost at the time, it resulted in other issues. One of primary issues was the lack of inventory data visibility for VA management resulting in an average error of 65% in data visibility at the Jamaica Plain hospital. The Capstone Team identified the root cause to be the lack of any technology and standardized process to track inventory items and collect data. Hence, the team proposed a process flow that would use technology such as Universal Product Code (UPC) scanning to ensure accurate item tracking and an easy-to-understand simulation of Maximo, an inventory data storage software. The goal of the simulation would be to educate the VA staff about the benefits of using software to dictate ordering policy. This simulation would also prove to them that with the application of inventory models such as Economic Order Quantity (EOQ) and Safety Stock on the collected data, a 15% cost savings could be achieved.
The Need for Project

The VA Medical Hospital suffers from lack of data visibility resulting in their inability to use cost-saving tools to their advantage. The VA Medical capstone team was assigned the project of minimizing the cost for the inventory at the VA hospitals in New England. The goal was to ensure that an appropriate process was in place and that data was representing ground realities.

VA Medical New England’s Network Material Manager, Lisa Newell, receives reports from hospitals all across the region on the status of the inventory, from every department. However, these reports contain erroneous data due to the lack of accurate data collection processes. Having conducted manual data counts at the Jamaica Plain branch and compared it to the data provided by the manager, the team found a 65% error in data. The realization quickly dawned on the members that it would not be possible to conduct process improvement activities with such inaccurate data. Hence, in order to get an accurate picture of where and how much of the inventory is at the individual hospitals, it is imperative that Lisa has correct data to look at.

Since the project goal is to minimize cost, the team wanted to use inventory models extensively to establish effective ordering policies. However, this could only be possible if better data visibility exists so that the models can be based on reliable data. This would allow upper management to establish a baseline and implement process improvement initiatives based on the reliable data. To this end, the team set out to come up with solutions to improve the accuracy of the data so that further analysis could be conducted.

The Design Project Objectives and Requirements

The objective is to establish and simulate an inventory tracking process using IT solutions so that inventory models can be used to save costs

**Design Objectives:**

1. Establish an inventory ordering process to prevent the existing method of ordering which does not use inventory-modeling software and lacks structure.
2. Create a tool to train VA employees to understand the criticality of data accuracy, visibility and costs. This tool would be developed in excel and would employ a Graphical User Interface (GUI) that would take human factors issues into account. It will be designed so that it is readable and follows the pattern of reading that humans follow.
3. Integrate the use of technology so that the incoming and outgoing inventory items are logged into their system without the need for manual data entry.

**Design requirements:**

The goal would be to establish a process that provides comprehensive data to use inventory models on. These inventory models would be used to calculate appropriate reorder points targeting a 15% savings annually. This would be possible through a combination of EOQ and Safety Stock model usage depending on what works best.
Design Concepts considered

Different inventory tracking processes were considered but barcode scanning was found to be the best fit for this project.

There were several solutions considered for the given problem. While the multiple solutions could have worked, there were several constraints such as cost, ease of implementation as well as ability to integrate with existing methods. The different systems considered were using Vending Machine for Dental items, Radio Frequency Identification tags (RFID), Par-Level Bin Visual Systems and Barcode Scanning Systems. After taking all the abovementioned factors into consideration and doing a cost-benefit analysis, it was concluded that the Barcode Scanning system would provide the team with reliable data to use for inventory modeling. This idea is much more cost effective since it costs approximately $5000 which is about 5% of the cost of implementing RFID, its competitor. The barcode system would work as follows:

It would involve using the existing Universal Product Code (UPC) barcodes that all manufacturers place on their items to the hospital’s advantage. Scanners would be placed in the Dental Inventory room and every time an item would come in, the inventory manager would use the scanner to scan the barcode printed on the packaging. This would then be outputted into an IT system in place, like the hospital’s internal software called Maximo. This software would be ideal since it is the hospital inventory management software that calculates reordering points based on complex models programmed into the system. However, its complexity has prevented it from being a completely integral part of the workflow for the VA staff.

Recommended Design Concept

An improved process flow was recommended using a tailor-made excel template to calculate cost savings using the appropriate inventory models.

The team came up with an inventory process flow for the Dental department at the VA Medical hospitals as seen below in Figure 1. This would establish a standard workflow and integrate IT technology with the physical inventory movement to ensure high data accuracy and visibility.

![Figure 1](Image)

Due to the lack of support for Maximo internally, an excel template will be used at first to simulate the functions of Maximo so as to educate the staff on the benefits of adopting the use of Maximo as part of the daily workflow.

After considering numerous alternatives, the team decided the ideal IT solution to track the inventory would be to use UPC scanners. The process would flow in the following manner:
1. The doctors would first place an order through an excel template which could be shared on a public virtual drive.
2. The inventory manager would then open the shared excel template to view the orders placed by doctors and then place the order with the supplier.
3. Once the item is received at the hospital, the inventory manager would then scan the item using the Universal Product Code (UPC) on the packaging. This would be scanned into the excel template as seen in Figure 2. This would ensure that the item is logged into the system as soon as it enters the hospital and could be located at any given point of time.

![Figure 2](image1)

4. After having collected this data, the excel template would use inventory models like EOQ and Safety Stock to calculate the reordering points for specific items as seen in Figure 3. This would be done by importing the excel data into the Inventory Model Tutorial. Par levels, that is, the lower limit below which the inventory would need to be replenished, would be set so that there is unnecessary and haphazard ordering.

![Figure 3](image2)

**Analytical & Experimental Investigations:**
We conducted multiple tests to ensure that our inventory models template in Figure 3 was robust. Based on the quantity of items scanned, the final template will compare the different inventory models on the basis of savings. This provides a dashboard for management to review and see where opportunities exist to minimize unnecessary expenditure.

**Key Advantages:**

There are several key advantages to the process flow that is being recommended which integrates the use of barcode scanning and inventory models. They are as follows:

1. All incoming inventory gets scanned and registered through the system. This prevents any ambiguities with regards to what inventory is in storage.
2. Easy installation and integration. Targeted time to install, integrate and establish a baseline for current inventory: 20 hours.
3. Extremely cost efficient compared to cost alternatives. Total costs of about $5000.
4. UPC Barcodes are already imprinted on the item boxes so inventory manager only needs to scan them instead of installing tags or codes on every item himself.
5. No dedicated training required with minimum setup cost and time.
6. Inventory Models will prevent excess inventory and allow for optimum quantity of goods ordered.

**Financial Issues**

Financial implications were minimized with the use of cost-efficient solutions resulting in total cost of $5000.

The hospital would incur a cost of about $5000 in purchasing, implementing the scanners and providing guidance on the system. There were no other major costs to implement the system since any other materials such as computers could be sourced in-house. The project sponsor clearly stated that financing this cost would not be an issue.

**Recommended Improvements**

The team would like to be able to see how this system could be integrated and applied to different departments of the hospital with the ultimate goal of rolling it across the various hospitals in New England. The presence of reliable data would allow for more shared-services opportunities between the different hospitals.