Boston Building Resources

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Abstract
Boston Building Resources (BBR) is a non-profit organization that receives and resells donations of new and gently used materials for home improvement to the low-income population in the Boston area. BBR faces an inefficient operational system and facility layout. A consistent bottleneck in the receiving area of the facility creates a backlog of inventory unable to be sold and congestion. The ineffective use of office floor space generates a poor work and shopping environment for both employees and customers. The Capstone Design Project team analyzed alternative operational procedures within BBR, involving a more flexible and dynamic operation system. An Arena simulation of the BBR processing system provides statistical insight to improve task to resource allocation and increase the throughput rate of donations. The proposed multi-purpose office layout redesign enhances the work environment, increasing employee performance and sales potential. All these solutions will be implemented using industrial engineering techniques including human factors, facility planning, time-motion studies and lean principles. Overall, the teams’ successful implementation of 5S methodologies will significantly improve operations and enhance the management culture at BBR. The Capstone Project team hopes to help Boston Building Resources, as a non-profit organization, reach a self-sufficient state.

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The Need for Project

The improvement of BBR’s current state will not only help BBR become self-sufficient and enhance work operations, but will also bring greater value to low income residents in Boston. Boston Building Resources (BBR) is a local social enterprise that focuses on selling home improvement items to low income residents in the city of Boston. They focus on strengthening the community and making sure that their members can afford to improve their lifestyle. A successful outcome of this project will help BBR become self-sufficient and fix both operations and layout designs, while allowing BBR to receive more donations and further help their community. The office redesign and bottleneck analysis will also improve day to day activities by encouraging employee communication, cross-training, and work flow. This will strengthen employee productivity and motivation by improving BBR’s general environment and culture.

The Design Project Objectives and Requirements

Design Objectives

For Boston Building Resources to become self sufficient, they will need to improve operations reduce costs and increase revenue. To achieve this, the office space will be remodeled presenting a new and efficient workplace flow. The new design will have an innovative customer/employee flow within the office and warehouse facility, and improve workspace ergonomics to increase employee performance.

For further impact, the design and development of a flexible multi-tool information system will be implemented. The team must create an adaptable operating system that can change to market demand accordingly. This will help eliminate the bottleneck that limits the maximum potential of sales that could be achieved if materials were processed and moved to display for sale more quickly and intelligently.

Design Requirements

The redesign of the front area will present a more systematic use of space. The front office is a multi-purpose area that includes workstations, a restroom, display cabinets for small donations, checkout area for sales and a customer service area. The current layout presents many areas of improvement where ergonomic and human factor solutions will refine the workspace and environment of BBR staff.
Secondly, the Donation Processing System fails to move incoming donations to display areas efficiently. The main issue with donations coming in is a never-ending bottleneck in the receiving area. The donation throughput potential is not optimized within the receiving area and warehouse. Uncountable donations spend weeks or months without being processed which constrains the space capacity in the receiving area. This congestion of materials further slows the processing pace. Operations are severely understaffed, creating a clutter of donations and heavily affecting processing times. Many of the resources available are not being utilized appropriately and not trained properly to complete operations that would expedite the material flow.

**Design Concepts Considered**

After carefully studying BBR’s systems and processes, mapping out process flows, creating office designs, collecting data samples, and receiving employees’ feedback the team finally reached BBR’s root cause problems. Multiple alternatives solutions were suggested from these findings.

The redesign of the office has been altered dramatically throughout the project. As the team proposed various alternative designs, BBR continued to redefine their requirements and realize what was needed more precisely. At the beginning stage of the project, BBR rejected many of the suggestions and designs the team proposed. After the board members at BBR met to discuss a new approach to solve this issue, it was concluded that a larger expansion of their facility was needed. A larger work area for employees was proposed and BBR decided it would be best to move the customer area out of the office. A check out window connected to the office would allow both customers and employees to have independent areas. With this new vision scoped, new alternative layouts were created for the office. Each layout has its strengths and BBR is expecting to use the layouts in future. This is in response to their request for several detailed layouts as a final product of the analysis and meetings.

The bottleneck found in the receiving area has become a problem for multiple departments. BBR identified causes, but after careful study many other problems started to arise that could be identified as the “real” problems. Focusing on fixing problems simultaneously will not only minimize the bottleneck, but increase productivity in other departments. 5S will be the largest contributor to solving the bottleneck, along with cross-training current employees, effective use of volunteers, creating organizational charts and manuals, standardization of pricing items, and implementation of new
technologies will allow BBR to further improve and minimize bottleneck.

**Recommended Design Concept**

The improved designs will increase customer and employee experience within the office, as the minimized bottleneck will increase processing productivity.

After presenting BBR with alternative layout designs, BBR has decided to have a larger counter outside the office, allowing a more efficient and better service for customers. This will allow BBR to do more transactions at the same time without cluttering the counter and having more space inside the office. Since the counter will be at the windows, there will be a big space in the middle of the office for employees. This will give employees a larger work area and a separation from customers. Also, the bathroom is now accessed from the outside eliminating the extra employee and customer flow into the office. The expansion and new features in the tool room will give employees a needed work area. A dedicated tool cabinet will help BBR organize and have an orderly arrangement. The expansion will also allow employees to perform work in this room, instead of working on the sales floor.

To fix the bottleneck the solution will be a combination of different tools all working together with a common vision to minimize the bottleneck. The most essential tool is 5S. This will be altering BBR’s approach, requiring them to organize and sort donations as they arrive to BBR. This will lower the setup time employees currently have when processing donations. It will also allow donations to be batched and processed simultaneously. Cross training will allow resources to be moved around departments, as they are needed. To successfully cross-train employees, manuals will need to be created to help maximize the learning curve. This will allow employees to teach themselves when they run into different issues instead of asking others for help. This will help BBR increase communication and move resources where they are needed effectively, while 5S creates a standardized work culture between departments.
Financial Issues

The Capstone Design team implemented a 5S Methodology Pilot in the small appliance display area of their facility. A cost analysis for plastic bins from different suppliers was created. This will help reorganize the display of small appliances and introduce 5S concepts to BBR.

The objective is to aid BBR in adopting the 5S culture into their work ethics. After comparing costs from different suppliers (Uline and McMaster Carr) there was no significant difference. Since BBR currently holds business relations with ULINE this became the supplier for the 5S pilot. Three different sizes and colors of bins were chosen for the shelf levels. In addition, BBR saw the potential for using bin dividers to further categorize materials within bins. Eight bin dividers were added to the list for the second shelf level. Finally, labels and markers to properly display these bins are included. The final purchase order amounted to a total of $699.80. The real value of the purchase lies on the proof of 5S methods. Having a physical example of 5S in the facility will enable BBR to keep pushing its employees towards these principles.

Recommended Improvements

5S is a tool that can only work if implemented and applied correctly. As the team will start this implementation, BBR will be responsible for adopting 5S methodologies and change their culture. Detailed documents will be provided to teach BBR employees of the different methodologies and how 5S could be used in all parts of BBR. The team will provide layouts and guides for various areas in BBR, further detailing and outlining this 5S implementation. New office layouts are provided to be used as the other building improvements are completed. The layouts, process improvements and materials regarding 5S implementation will enable BBR to improve their processes, efficiency and potential for self-sufficient operations.