Improving the food service process and student lines in the school cafeteria

Proposal

Submitted to:
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Submitted by:
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Date submitted: February 27, 2014

Approved by:
Mr. Reed Wright, Principal, Midville Academy
Date
INTRODUCTION

The Midville Academy is a school for grades 9 to 12. Enrollment in the school has been gradually increased. Several changes in the cafeteria have already been made to accommodate the additional enrollment, but the changes then created long lines and overcrowding. Students are complaining that they cannot get food and eat it in the allotted time, and overcrowding might be creating safety hazards. The Principal has expressed concern regarding the food service process and student lines in the school cafeteria, and therefore asked for ideas on how to integrate the adjacent outdoor space enclosed with fencing with the existing space; how to arrange the resulting space; and how to optimize the food service process. He would like to shorten the time the students wait in lines and reduce the confusion that occurs when the lines get mixed up. He also wants to know the difference in student wait time between the current layout and the new layout. The purpose of the project is as follows:

- To make two alternative design concepts for the cafeteria layout and student process, one of which requires minimal changes, and the other requires extensive changes and implement technology
- To give information on the time the students currently spend in line and the time the students will spend in line using the new processes in each new layout
- To recommend which alternative Midville Academy should implement

Consultant Experts, Inc. (CEI) will examine the current layout and process of the cafeteria in Midville Academy and collect data to develop two alternative design concepts. This proposal presents the plan for this project, including a detailed action plan, timeline, and supporting documentation.

BACKGROUND

The cafeteria was originally set up to accommodate 600 students; however, Midville Academy now has 900 students. The current cafeteria (without the available outdoor space) is 4000 square feet and accommodates about 200 students at a time. Midville Academy now has about 225 students in each lunch period, which runs from 10:30 to 10:54 am, 11:00 to 11:24 am, 11:30 to 11:54 am, or 12:00 to 12:24 pm. In the original layout, everyone could get through the food lines quickly and everyone had enough space to sit comfortably. As enrollment increased, Midville Academy added the separate salad bar, more rectangular tables, round tables, and more chairs on the ends of the rectangular tables. The changes were made one by one, but over time they’ve created the problems with overcrowding and long lines.

In the current system, students have been complaining that the lunch process takes too long and they do not have enough time to eat. Students usually wait in lines for 15 minutes and have only about 9 minutes to eat.

There is no technology in the cafeteria, and Midville Academy has two standard cash registers and standard appliances in the kitchen. If students want to buy hot lunch, they line up near the doorway to the outdoor eating area and then walk along in a buffet style line to select their food. They pay at the cash register at the end of the buffet line and then find a place to eat. If students want to eat at the salad bar, they
pay at the cash register near the doorway to the outdoor eating area, walk to the salad bar, show a receipt to the attendant who stands next to the salad bar to get their food and find a place to sit. In warm, dry weather (usually 4 months of the 9-month school year) students can eat in the adjacent outdoor area, but students are not allowed to leave the school for lunch. The outdoor space can seat up to 15 students on the bench, but more students sit on the grass when the outdoor area is open. The problem is the lines for the salad bar cash register and for the buffet line often get mixed up and block the doorway to the outside eating area.

Walking around the tables has become difficult because chairs were added at the ends of the tables. The amount of trash left in the cafeteria has increased. When lunch is over, the tray drop-off area becomes so crowded with students coming and going to drop off dirty trays and silverware that a lot of students leave their dirty trays on the tables for the custodial staff to clean up while the next group of students is arriving.

GOALS AND OBJECTIVES

The primary goal of this project is to improve the food service process and student lines in the cafeteria of Midville Academy. These improvements will, in turn, reduce student wait time and increase students’ safety. To achieve this goal, CEI will address the following objectives:

- Add the technology used in the cafeteria
- Rearrange student wait lines
- Increase the spacing between the table

PROJECT SCOPE

The scope of this project will include food service process, which includes student paying money and student receiving food. This project will also include student wait lines, one of which starts near the doorway to the outdoor eating area and ends near the dirty tray drop-off area, and the other starts from the salad bar register area.

This project will not include calculating implementation costs. This project will also not include studying the weather factors affecting students eating outside.

DATA COLLECTION AND ANALYSIS

To determine where improvements can be made to the food service process and student lines, CEI will collect and analyze quantitative and qualitative data. This data will be collected through literature search, observations, inventory and sales records analysis, work studies and time studies, surveys, interviews, and collected data analysis.

Conducting literature search

CEI will find eight articles from publications on how to improve facility layout, in order to demonstrate that CEI knows the field. The results of literature search will let CEI establish a basis for the methods and a framework for the recommendations, and can add depth and credibility to the argument by showing what CEI is doing in
relation to what has already been done. For example, as stated in the article “Advancing facility planning” [1], Richard Muther’s systematic layout planning (SLP), systematic handling analysis (SHA), and analysis tools within AutoCAD are the basic methods CEI will use to develop the layout.

**Observing current process**

CEI will observe in the cafeteria of Midville five times. Observing current process on-site will give CEI a more direct idea on what and where the problem is, the details of the layout, food service process, and student lines.

**Analyzing inventory and sales records**

CEI will analyze the inventory and sales records that show the number of students who bought hot lunch and salad bar food for the 2011 and 2012. CEI will find out the percentage of students buying each kind of food by using Excel. The records analysis will help CEI determine how to improve the food service process and balance the student wait lines.

**Performing work studies and time studies**

CEI will observe on-site again and collect details about how the food service proceeds, how students wait in lines, how people walk in the cafeteria, and how students drop off dirty trays. With these details, CEI will draw work process diagrams. CEI will also study the time each process costs and figure out an optimized solution to make the process go more efficiently by using timer and standard time study sheets. CEI will do time study for five days with four periods per day. Those 20 groups of data will help CEI to reduce the idle time and to optimize the food service process.

**Surveying students**

CEI will develop a student survey, ask for approval for the student survey and conduct a survey focusing on students, in order to get more information about the food service process, the student lines, and how they want the food service process and student lines to be improved. The survey will be posted online and CEI will need to survey about 100 students to make sure the results reflect the real condition accurately.

**Interviewing employees**

CEI will interview the Assistant Principal, the Athletic Director and the hall monitor face-to-face to get information about their opinions on the food process. The results of the interviews will help CEI know more details about the food process from a different angle.

**Analyzing collected data and performing simulations**

CEI will analyze all the collected data by using Excel and Minitab. CEI will perform linear regression, classification, and ANOVA to find out the bottleneck that costs
most of the time. CEI will also develop two new layouts and the new process based on the analysis, and run a simulation on the computer by applying machine learning with the inventory and sales data of 2011 and 2012. CEI will estimate the expected time using the new process by the results of the simulation. The analysis of all the data collected will help CEI to find out the best solution and to make a final recommendation.

**SCHEDULE**

To complete this project by May 31, 2014 as planned, CEI will perform the following key tasks during the timeframes listed below. See Table 1.

<table>
<thead>
<tr>
<th>Task</th>
<th>Timeframe</th>
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<tbody>
<tr>
<td>Receive project approval</td>
<td>By March 1</td>
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<tr>
<td>Conduct literature search</td>
<td>March 2 - March 4</td>
</tr>
<tr>
<td>Observe current process</td>
<td>March 5 - March 13</td>
</tr>
<tr>
<td>Analyze inventory and sales records</td>
<td>March 14 - March 21</td>
</tr>
<tr>
<td>Perform work studies and time studies for the current condition and compare to students’ estimation</td>
<td>March 22 - March 28</td>
</tr>
<tr>
<td>Develop a student survey</td>
<td>March 22 - March 25</td>
</tr>
<tr>
<td>Receive approval for the student survey</td>
<td>By March 28</td>
</tr>
<tr>
<td>Survey students</td>
<td>March 29 - April 3</td>
</tr>
<tr>
<td>Interview employees</td>
<td>April 4 - April 10</td>
</tr>
<tr>
<td>Analyze collected data</td>
<td>April 11 - April 18</td>
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<tr>
<td>Develop the layout requiring minimal changes</td>
<td>April 19 - April 27</td>
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<tr>
<td>Develop the layout requiring extensive changes and technologies</td>
<td>April 28 - May 3</td>
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<tr>
<td>Develop the new process</td>
<td>May 4 - May 11</td>
</tr>
<tr>
<td>Perform simulations of recommended changes</td>
<td>May 12 - May 19</td>
</tr>
<tr>
<td>Estimate the expected time using the new process and layout</td>
<td>May 20 - May 24</td>
</tr>
<tr>
<td>Deliver final report and presentation, including procedures, layout, and final recommendations</td>
<td>May 25 - May 31</td>
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**DELIVERABLES**

On project completion, Midville Academy will receive the following tools to make the food service process more efficient and to reduce student wait time, thus improving students’ satisfaction.

- A new cafeteria layout requiring minimal changes
- A new cafeteria layout requiring extensive changes
- A list of technology needed to implement and short explanation on how technology can help improve efficiency
- Written procedures for the improved food service processes for both layout
- A written report detailing the recommended changes and discussing how much time these improvements will eliminate from student wait times,
including current student wait times and expected times using the new process and layout

QUALIFICATIONS

CEI has experience in process analysis, facility planning, simulation, and statistical analysis. CEI has worked for Un-named Laboratory to standardize the blood draw process, has increased efficiency of related clerical processes and has received a great success. CEI has also designed a layout for the cafeteria of University of Michigan and has optimized the food service process there, which saved students there 20 minutes per student per lunch.

INVESTMENT CONSIDERATIONS

CEI will perform the project described in this proposal for $45,000 payable according to the following schedule:

- $3,000 due on project approval
- $5,000 due on survey approval
- $17,000 due on completion of on-site data collection
- $20,000 due on project completion

How CEI will use the fund is listed as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>$8,000</td>
</tr>
<tr>
<td>Data Collection</td>
<td>$17,000</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

If at any time during the project, Midville Academy requests changes to the project scope or deliverables, Midville Academy and CEI will discuss how these changes might impact the project fees. If changes occur, CEI will document them for Midville Academy’s approval.

CONCLUSION

Midville Academy would like to make the food service process in the cafeteria more efficient, and therefore reduce student wait times. Therefore, CEI will collect and analyze data from Midville Academy, make two new layouts and develop new processes, compare the time differences between old process and new process and develop recommendations for choosing which layout from the two new ones. On project completion, Midville Academy will receive a written report detailing the recommended changes and discussing how much time these improvements will eliminate from student wait times. Implementing the recommendations that CEI develops will improve the food service processes and, as a result, will reduce student wait times and increase students’ satisfaction.
REFERENCE


ATTACHMENT

LOW OPERATING COSTS HAVE DRIVEN MUCH OF GLOBAL MANUFACTURING TO ASIA. MANY INDUSTRIAL ENGINEERING POSITIONS HAVE MOVED THERE AS WELL. BUT HOW COMPETITIVE ARE THE INDUSTRIAL ENGINEERS IN THE FAR EAST? FROM A FACILITIES PLANNING PERSPECTIVE, IES IN ASIA ARE BEHIND THE CURVE. FACILITY LAYOUT IES TYPICALLY AREN’T AWARE OF COMMERCIAL FACILITY LAYOUT PACKAGES AND, AS A RESULT, PRIMARILY DEPEND ON THE AUTOCAD DRAFTING TOOL TO DO THEIR WORK.

FOR EXAMPLE, ONE SEMICONDUCTOR FIRM IN THE PHILIPPINES SPENT $2.4 MILLION OVER A FIVE-YEAR PERIOD ON FACTORY LAYOUTS, ALL WITHOUT USING INDUSTRIAL ENGINEERING TOOLS TO MEASURE AND COMPARE DIFFERENT LAYOUT ALTERNATIVES. LAYOUT IES OFTEN BECOME MORE DRAFTSMAN THAN ENGINEER. THIS IS THE NORMAL STATE OF FACILITY LAYOUT IN ASIA.

YOUNG IES ARE EXPECTED TO BE AWARE OF THE LATEST TECHNOLOGY. FACILITY LAYOUT TEXTBOOKS DON’T DO ENOUGH TO COMMUNICATE THE EXISTING INDUSTRIAL ENGINEERING SOFTWARE TOOLS ON THE MARKET. FURTHERMORE, THE FACILITY LAYOUT TECHNOLOGIES TAUGHT IN MANY UNIVERSITIES ARE IMPractical ALGORITHMS THAT HAVE LITTLE APPLICATION IN INDUSTRY.

BECAUSE OF THIS PERCEIVED LACK OF TECHNOLOGY, COMPANIES SPEND MILLIONS OF DOLLARS EVERY YEAR ON RE-LAYOUT PROJECTS WITHOUT THE USE OF INDUSTRIAL ENGINEERING SOFTWARE.

THE FACT IS THAT USEFUL FACILITY LAYOUT TECHNOLOGY DOES EXIST. THESE TOOLS PERFORM RICHARD MARBER’S SYSTEMATIC LAYOUT PLANNING (SLP) AND SYSTEMATIC HANDLING ANALYSIS (SHA) METHODS, AND ADD ANALYSIS TOOLS WITHIN AUTOCAD THAT IES NEED. COMMUNICATION ABOUT THESE TOOLS IN ASIA HAS NOT BEEN EFFECTIVE OR SUFFICIENT. THIS YIELDS LOWER SKILLED IES AND LESS REALIZATION OF THE VALUE OF THE IE PROFESSION.

SCHOLARLY DISSOCIATION

THERE IS A SIGNIFICANT DISCONNECT IN ASIAN SCHOOLS BETWEEN FACILITY LAYOUT EDUCATION AND ACTUAL PRACTICE. PERHAPS THE MOST POPULAR FACILITY LAYOUT TEXTBOOK IS *FACILITIES PLANNING* BY JAMES A. TOMPKINS, JOHN A. WHITE, YAUZ A. BAXTER AND J.M.A. TANCHOO. IN THE FOURTH EDITION, RELEASED LAST YEAR, 6 PERCENT OF THE BOOK (42 OUT OF 834 PAGES) IS DEDICATED TO IMPractical ALGORITHMIC APPROACHES. THESE COMPUTER ALGORITHMS INCLUDE CRAFT, BLOCPLAN, LOGIC, SABLE AND MULTIPLE. IN THE MOST POPULAR FACILITIES PLANNING TEXTBOOK, THE AUTHORS STATE THAT “COMMERCIAL VERSIONS FOR THESE ALGORITHMS DO NOT EXIST, OR MUST BE OBTAINED BY THE ORIGINAL AUTHOR.”

WHILE THESE COMPUTER ALGORITHMS FOCUS ON APPROPRIATE LAYOUT ASPECTS LIKE RELATIONSHIPS AND MATERIAL FLOW, THEY ARE NOT USED IN INDUSTRY BECAUSE OF THEIR LIMITATIONS, WHICH INCLUDE UNREALISTIC ASSUMPTIONS, DEPARTMENT SHAPES, CONSIDERATION OF BUILDING ASPECTS LIKE UTILITIES AND COLUMNS, AND QUALITATIVE FACTORS. MORE IMPORTANTLY, THEY DON’T ADDRESS THE PROBLEMS FACED BY LAYOUT IES.