Final Report of E-Dining's New Shipping/Packing Process and Retail Store Layout

Submitted To:

E-Dining, Inc.
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INTRODUCTION

E-Dining is a rapidly growing online catalog dinner kit distributor. Current shipping and packaging processes are crowded and inefficient. To improve these processes and expand in to new markets, management has leased an old hardware store (next to the current office) which increases the company's work space by 1200 square feet. The current layout of E-Dining's offices can be seen in Figure 3 of Appendix A. Management would like to address two main concerns during the expansion. First, they want to improve the efficiency of the packaging and shipping operations, decreasing the time spent packaging/shipping from the current average of 12-16 minutes. Second, they want to open a walk-in store for customers to purchase kits as last-minute meals. For the walk-in store, management wants to minimize customer wait time.

Consultant Experts Inc. has analyzed the current storing, packaging, and shipping operations to determine which factors are accountable for the observed over-crowdedness and inefficiencies. To solve these problems we used a six-sigma DMAIC (a proven problem solving process made up of Define, Measure, Analyze, Improve, and Control) approach. We defined specification limits with management and used these limits to evaluate the stability and capability of the current process. We then redesigned the faulty processes and developed recommendations for shipping/packaging improvements.

This report provides management with two blueprints (one with the dividing wall and one without the dividing wall) of new layouts and a discussion of the advantages and disadvantages of each. Both layouts are flexible enough to grow with the online and in-store businesses. As stated in the approved proposal, our team will return after construction has been completed to evaluate the new processes and determine if E-dining's management is satisfied with the results.

BACKGROUND OF E-DINING

E-Dining is an online catalog business that sells 21 kinds of "dinner kits". Each kit contains a recipe and ingredients to make 4 servings of a meal. When orders are placed, via the online ordering system, E-Dining workers collect each kit's components from the storage facility, assemble the kits, package the kits, and label the kits for shipment to the customer. Workers have recently become very busy, and are struggling to meet customer demand. Online sales have been increasing and current workers will soon fall behind in their work.

The current building and office layout (right half of Figure 1, appendix A) are restricting growth in two ways. First, the packaging and shipping operations have become crowded and inefficient, and second, the current building does not have enough space to allow for the expansion in to a retail storefront. To aid in the expansion, management has rented more office space next to their current offices. E-Dining contracted Consultant Experts Inc. to determine how to best lay out their larger offices while improving the packaging and shipping operations and opening a new store front.

The current kit assembly process followed by employees is: an order is received; the necessary pieces are collected from storage; a kit is assembled; the kit is packaged for assembly; and finally, the packaged kit is labeled (by hand) for shipment. The current process requires each employee to walk 1020 feet and each kit takes between twelve and sixteen minutes to complete. Workers have also complained about over-crowdedness in the work area (people, boxes, inventory, etc.) and sore feet.

DISCUSSION OF PROJECT

Below, is a review of the completed project and its findings.

Review of Project Scope

The consultant team determined problem in the current shipping and packaging processes and how to eliminate these problems in the new process. The team will provide E-Dining with blueprints of the new suggested layouts (one with dividing wall and one without). It is then expected that E-Dining will contract the construction of the new layout themselves and train employees (per the training documentation provided by CEI). Once construction is complete, our team will return to ensure that E-Dining's goals have been met.

Completed Goals and Objectives

Our consultant team has completed the following goals (as stated in the project proposal):

1) Evaluated the storing, packing, and shipping operations to determine which factors contribute to the observed over-crowdedness and lead to the inefficiencies in E-Dining's processes.
2) Developed layouts for the new offices. These layouts, one with the dividing wall and one without, are provided in Appendix A.
3) Tested both layouts with simulation software to ensure that they meet E-Dining's requirements (decrease packaging/shipping time, increase efficiency, minimize customer wait time).
4) Decreased the assembling and packing times from a range of 12-16 minutes to 3-6 minutes while ensuring that all layouts are designed to provide enough space for the new retail store front.

Summary of Data Collection and Analysis

To determine what has caused the shipping and packaging processes inefficiencies, the following data were collected:

Qualitative and quantitative information from E-dining

The qualitative data includes time studies that were performed by workers from October to November 2005 and the qualitative data is from surveys completed by workers in August 2006. Although this data was not used in our analysis, it was used as a guide to create our own data collection methods.

Observations of the procedures workers follow to assemble/package kits

Consultants spent 3 complete work days observing the processes. During this time, the processes were broken down into their vital steps. These steps were then used as part of the time studies and distance measurements.

Time studies of the time workers spend to assemble/package kits

This data was collected over 3 complete work days. Approximately 200 kits were observed from the start to finish of the packaging and shipping process. These timings were used to determine the "bottlenecks" in the process causing the inefficiencies and crowdedness. The total process was found to take from 12 to 16 minutes.

Interviews with workers

The ten workers at E-Dining were interviewed to better understand the worker's complaints with the current process. The interviews found that workers:

- Have to make too many trips
- Can not carry everything at once, so must make many trips
- Run into each other, unused boxes, and finished boxes
- Have sore feet from walking and standing too much
- Have sloppy hand writing when addressing boxes
- Have trouble finding the right size box

Surveys filled out by workers

All 10 workers were also asked to fill out a survey. A copy of the survey conducted is shown as Exhibit 1 of Appendix A. The surveys found that:

- 50% of workers have worked for E-dining more than 1 year
- Workers would like to work in a relaxed environment
- Workers would like a well-lit break room

Measurements of distances walked by workers to assemble/package kits

After observing the workers it was determined that workers walk an average of 1020 feet per kit.

Alternatives

With the data collected above, two alternative layouts were developed. The alternatives for consideration are the layout with the dividing wall and the layout without the dividing wall. The main change to the new layouts was the inclusion of an assembly line process to package and ship orders. The assembly line process is conducted by four workers, two on either side of the workbench, that are responsible for their own specific pieces of each kit. As kits move towards the labeling system, workers add their assigned pieces and then pass the kit to the next worker. Since specific workers are responsible for specific pieces of each kit, congestion is relieved (everyone is not trying to grab the same pieces and running in to each other) and efficiency improved. Also, the distance walked by workers for each kit is drastically reduced when workers are not responsible for gathering all pieces of a kit. Along with the assembly line process, several other changes have been included in both of the new layouts. These changes and the goals that they meet are shown in Table 1, below:

Table 1: Changes made improve processes and eliminate problems reported by workers

Change Made	**Goal(s) Met**
New walk-in store	Minimizes wait time, displays products, comfortable(tv, seats)
Assembly line	Decreases congestion, time, and walking
Stools for workers	Increases workers comfort, decreases foot pain
Waist-height carts	Increases efficiency - workers can transport many pieces at once
Break room comforts	Well lit, comfortable (tv, seats) area for workers to relax

Layout with the dividing wall

Figure 1 of Appendix A shows the layout with the dividing wall. By not removing the dividing wall, the workbench could not be made in to an L-shape and the non-refrigerated storage could not be moved. Therefore the walking distance and working time to complete a kit are higher than the layout without the dividing wall. All other changes stated above are included in this layout.

Layout without the dividing wall

Figure 2 of Appendix A shows the layout without the wall. By removing the dividing wall, the workbench could be moved and made in to an L-shape. This allowed for the dry storage to be moved and the workbench to be placed between the refrigerated and non-refrigerated storage. With both storage areas next to the workbench, walking distance and working time are less than those of the layout with the dividing wall. All other changes stated above are included in this layout.

Key Findings

Table 1 of Appendix A presents the results of the time study for the current layout and time simulations for the new layouts.

Table 2 of Appendix A shows the distance workers walk when making a kit for each of the layouts.

Table 3 of Appendix A provides the construction costs for the two new layouts that were developed.

CONCLUSIONS

Based on our key findings we conclude that the layout without the wall is most efficient. To package and ship a “dinner kit” in the wall-less layout will take an average of 3.5 minutes, a reduction of over eleven minutes from E-Dining’s current layout. Using the layout with the current dividing wall, it will take an average of five and a half minutes to complete a “dinner kit.” This is a reduction of around nine minutes per kit packaged and shipped at E-Dining.

The existing layout at E-Dining requires workers to walk, on average, 1020 feet per kit assembled. In Layout 2, the workers walk only 100 feet, and in Layout 1, workers walk only 150 feet. The reduction in walking distances in Layout 1 and 2 from the current layout at E-Dining will reduce the stress and strain on workers and the number of problems caused from this excessive walking.

Both layouts 1 and 2 have the same layout for the new walk-in store. This was done because it was found that this layout is the most efficient regardless of the packaging and shipping operations. It provides customers with a display case to see what a "dinner kit" includes, as well as the full menu they can order from. There is a table and chairs where customers can wait for their kit to be assembled and brought to them. In addition to the table and chairs there is a big screen television for customers to watch while they are waiting.

The cost to construct the layout without the dividing wall is $35,000. This cost includes the destruction of the wall and the purchase of new equipment. The layout with the dividing wall however, requires an initial cost of only $20,000. This cost includes everything that the layout without the dividing wall does, but is significantly cheaper because there is no cost for deconstructing the dividing wall.

RECOMMENDATIONS

After analyzing all data from the time studies, surveys, and both layout designs, CEI recommends the construction of the layout without the dividing wall. This layout provides the most efficient packaging and shipping operations for E-Dining. The packaging and shipping time of a kit will be decreased by over eleven minutes from the current processes. This layout also allows workers to only walk 100 feet per kit assembled, which is a decrease of over 900 feet per kit. The layout without the dividing wall does require a greater initial cost of $15,000, but we expect this extra cost to be recouped in less than a year due to higher profits from increased efficiency in the packaging and shipping operations.

Appendix A

Figure 1 – E-Dining Facility Layout With Dividing Wall

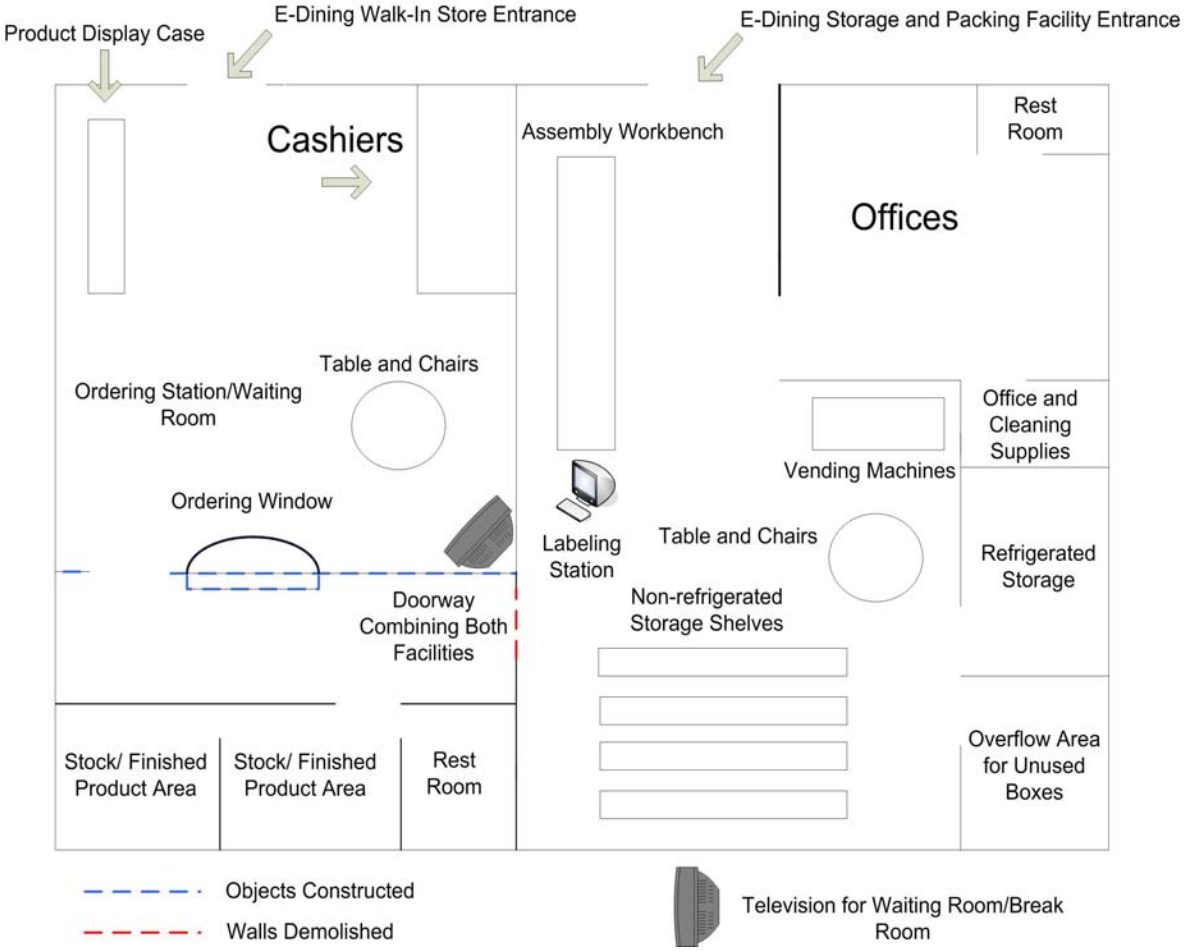

Figure 2 – E-Dining Facilities Layout Without Dividing Wall

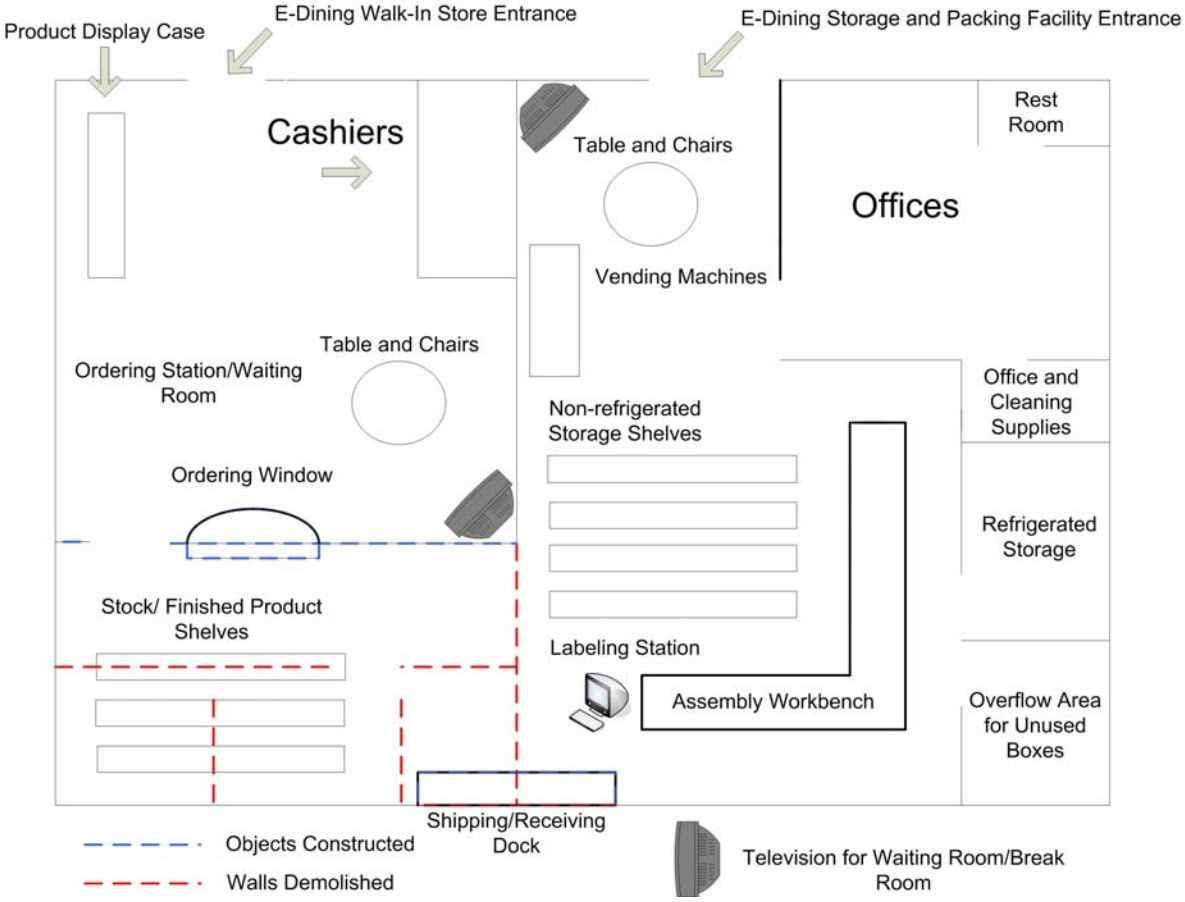

Figure 3 - Current Office Layout is Restricting Growth

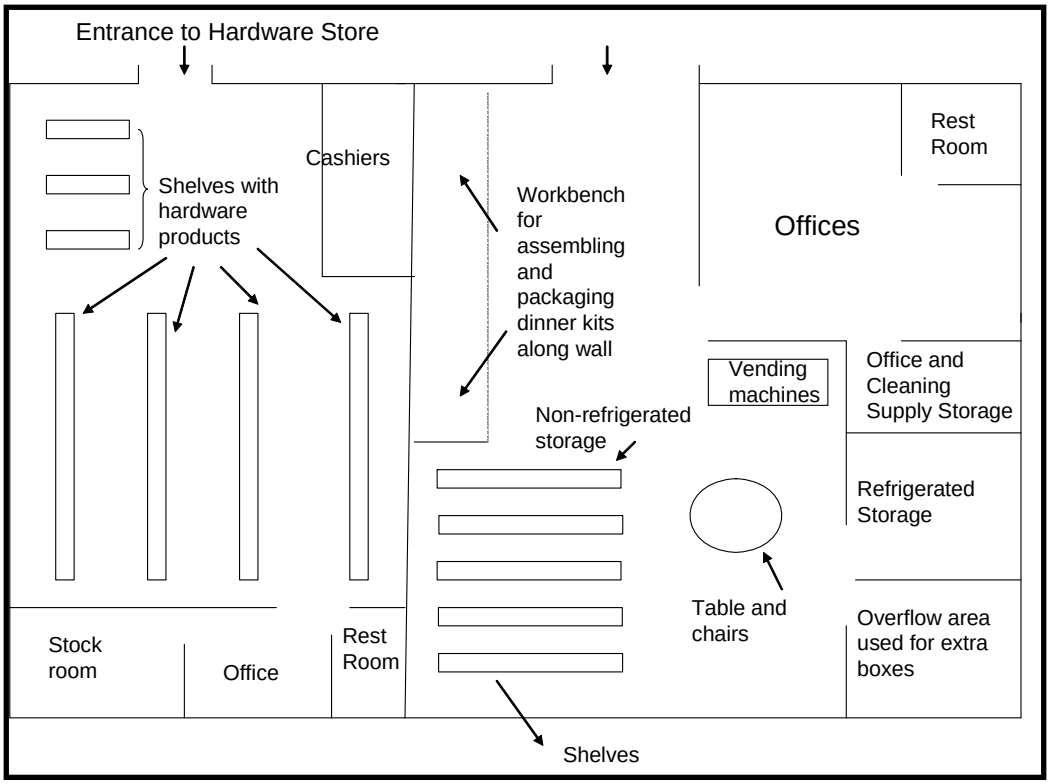

Table 1- The layout without the wall has the shortest process time

Task	Time to Complete Task (s)		
	Old Layout	Without Wall	With Wall
Retrieve items from storage	283 ± 18	60 ± 5	100 ± 5
Assemble components for kit	167 ± 37	60 ± 10	100 ± 10
Pack kits into boxes	220 ± 24	75 ± 5	115 ± 7
Time to label boxes for shipping	80 ± 15	5	5
Time to store for shipping	139 ± 23	10 ± 2	15 ± 3
Total Time in Seconds	**889 ± 117**	**210 ± 22**	**335 ± 25**

Table 2 – The layout without the wall has the shortest walking time per kit made

Walking Distance to Produce 1 Kit		
Old Layout	Without Wall	With Wall
1020 ft.	100 ft.	150 ft.

Table 3 – The layout with the wall has the smaller construction cost

Exhibit 1 – Copy of Survey as Developed and Distributed by CEI

Dear *E-Dining* Worker:

As part of the expansion project at E-Dining, we are planning to improve the E-Dining floor layout and, as a result, improve the process to assemble and package the dinner kits for shipping. To ensure the effectiveness of these changes, we would like your input. Can you please take a minute to answer the following questions by circling your response or providing a written response where needed?

How long have you worked at E-Dining?
Less than 3 months? 3 months to 6 months? 6 months to 1 year? More than 1yr?

How likely are you to recommend that your friends work at E-Dining?
Not likely 1 2 3 4 5 Very likely

To what extent do the following factors affect your decision to work at E-Dining? Please circle the most appropriate number, where 1 = has no effect and 5 = has a strong effect:

The opportunity to work in a relaxed environment?
No effect 1 2 3 4 5 Strong effect

The opportunity to move around while performing your job?
No effect 1 2 3 4 5 Strong effect

What types of changes would improve your work at E-Dining?

What ideas do you have to make the new walk-in facility efficient?