PROJECT FINAL REPORT: SHOE RACK
EGR 100: INTRODUCTION TO ENGINEERING I

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Overall Motivation and Problem Statement

Many college students have large open closets but lack organization to keep their items tidy. We are building a compartment that will be capable of holding typical items, such as shoes, in a small piece of furniture. It will be able to fit in the bottom of a closet or sit freely anywhere in the room. This can keep shoes or other items organized so that it is easier to keep the dorm room clean. This item can that this can be marketed to college students as well as typical households where this product may also be useful. That's a total of 115,227,000 potential buyers[1]. Since a similar product can cost anywhere from $45 to $100 there is a lot of expenses related to this product[2].

We plan to create a new system of storage to optimize closet space and organization that is a cost efficient, compact, aesthetically pleasing closet organizer that can store shoes or other small dorm items.

Project Management and Teamwork

There were several deadlines we had to meet and a set list of what needed to be completed for each deadline. To meet these guidelines, we used a Gantt chart listed in Appendix A. As a group, we set a time schedule with objectives within each deadline in order to keep making progress. We spent the first week identifying a problem and brainstorming solutions. After that we came up with the conceptual designs. This included sketching ideas, determining the minimum criteria and choosing a concept and took six days. We then created our CAD drawings on solid edge, which turned out to be very time consuming as it took us into early November. After submitting our design we made several modifications before fabrication, which together took another three weeks and put us just on schedule for our final deadline.

We met on an as needed basis, usually one to two times per week. Majority of the work was completed during these meetings so that we could communicate and help each other with difficult tasks. There were several times that worked for all members of our group so scheduling time via text was not difficult.

Our group nominated David as the leader even though each group member had an equal says in every decision. Since we each had different ideas it was vital to our group that we communicate our ideas clearly so that we would get along in a productive environment. Because we had excellent communication, there were no leaders assigned for each subcategory. All members were equally responsible for each aspect of the project.

While it would have been ideal if we had accomplished tasks faster, our group worked well together and we were able to create a new useful product.

Proposed Problem and Design Specifications

Our objective was to create a new system of storage to optimize closet space and organization that is a cost efficient, compact, aesthetically pleasing piece of furniture that can store shoes or other small dorm items.

Product Design Specifications include:

- Cost: Must be under $150
- Size: Must fit easily into a dorm closet
- Materials: Must be made primarily out of wood
- Aesthetic: At least 3 out of 5 students find it visually appealing
- Weight: Cannot be more than 50 pounds for portability
- Acceptability: Must be able to become part of everyday life within 3 days.
- Time: Able to be constructed in 1 month
- Efficiency: At least 3 out of 5 students find it easy to use

The most important PDS for our project were cost, size, and weight (Appendix B). If the project is predicted to cost too much, it will be unfavorable and impractical to build. One person will not be able to effectively move the compartment or use it with ease if it is too heavy. Size is also important because the product will be useless if it does not fit inside the closet or is too large to look nice anywhere else in a dorm.

Proposed Concept Generation and Selection

Many students come to college expecting a closet that can accommodate the plethora of college supplies that all students need. Closets are large here so they have the space to do this but lack the organizational tools. A shoe rack would optimize the space available to increase the functionality of the dorm closets.

To decide on the best possible shoe organizer design, each group member sketched his own idea. After viewing the options we decided to come up with a more creative idea. We determined the best idea using a Pugh Table (Appendix D) with our PDS. The least favorable design was David's because it was too complicated and large to construct in only two weeks. Nathan's followed this because of its simplicity and Muntabir's after that because it offered accessibility with minimal space being taken up. The best option ended up being the creative idea of a shoe rack that opens on an axis. It is creative, compact and meets all our PDS.

Recommended Detailed Design and Reflection

The final product we decided upon was the shoe rack. It was designed to hold three rows of shoes that were separated by dividers. This interior part that holds the shoes was held on an axis within an exterior shell so that it could rotate about the axis to allow access to the contents. (Appendix F)

Our design met all of our PDS and was a practical solution to our problem. The two major subcomponents made the design ideal to be split into work for two groups where one works on the external shell while the other focus on the interior door. Thus, our project was selected for reanalysis and construction.

Item	**Quantity**	**Price**
Wood	1 sheet	$49.98
T-nut	2	$1.99
Bolt	2	$1.49
Shop supplies	Screws and glue	$3
Total		$56.46

Chosen Project Component Design

The shoe rack designed by ourselves was selected and we kept the problem statement listed above. After careful analysis and discussion with the group we were assigned to, we made several modifications including removable dividers and angle adjustments for optimal operation.

Of the two components (interior door and exterior shell), our group was nominated to draw the interior as we understood the concept of what it was better than the new group. The PDS remained the same with an added need for the door to fit inside the shell with room to move as necessary to function.

Fabrication Report and Budget

The drawings we received were initially inaccurate and left a large gap in the box. We quickly accounted for this to make sure that we would not have difficulty later during construction. Between both groups there were minimal other changes made but we encountered a small problem when constructing the interior which was minor and therefore ignored.

Our construction went very smoothly, the first day we cut out the pieces of the shell. The second day we screwed everything together. The screws were slightly more difficult as it was necessary to glue the pieces together before drilling holes to prevent the wood from moving. After adding the T-nuts to each side, our section of construction was complete. Total construction time was estimated at about 5 hours.

Our final Budget was $56.46.

Reflection and Assessment

Our components came together very well almost exactly as they were drawn. There was a small gap on the backside where the side should have connected to the top but this is hidden inside the shell and has no effect on the functionality of the system. We were also within all of our PDS as the product was inexpensive, lightweight, and was easily constructed in the given time.

There was one part that could have been dimensioned slightly differently to make the constructors lives easier. With this fix there would have been minimal problems due to our communication and well thought out designs.

References

1. "Country QuickFacts." *USA QuickFacts from the US Census Bureau*. United States Census Bureau, 8 July 2014. Web. 02 Dec. 2014. <http://quickfacts.census.gov/qfd/states/00000.html>.
2. "Shoe Cabinets with 4 Compartments - IKEA." *IKEA US/EN*. N.p., n.d. Web. 03 Dec. 2014. <http://www.ikea.com/us/en/catalog/products/80156120/>.
3. "Home Depot Supplies." *Home Depot*. Home Depot, n.d. Web. 2 Dec. 2014. <http://www.homedepot.com/c/Savings_Center?cj=true&AID=10377473&PID=2798135&SID=homedeopt.com&cm_mmc=CJ-_-2798135-_-10377473>.

Appendices