Cubi-Cart Shopping Cart

Engineering Design 100

Section 202 Team 5

Submitted by: Ryan Little, Alex Yuan, Alec O’Connor, and Colin Coates

Submitted to: Xinli Wu

Summer Semester 2014
Abstract

This report reveals the steps that were taken into account when designing the Cubi-Cart shopping cart. Included in this report is a description of the design task, the design approach, the final design and prototype, the engineering analysis, and the team’s conclusions.
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Introduction

This report follows the process that the team used to design the Cubi-Cart. Xinli Wu assigned this project on July 3rd, 2014, and the project was concluded on July 31st, 2014. The first step that the team took was to research proven shopping cart designs. After, the team came up with several different concepts; they were then narrowed down to the final design. Then the team constructed a functioning prototype to help others envision the shopping cart. Lastly, this report was put together by the team to review the design process that was used to create the Cubi-Cart and to conclude the project.
Description of the Design Task

Problem Statement:
Most people make trips to the grocery store at least once a week to purchase food which is a necessity in life. These people need a way to carry groceries and other items from the store to their cars, distant houses, or apartments. A foldable shopping cart should be designed to make the groceries easier to carry over long distances. The shopping cart needs to fold, cost less than 50 dollars per unit, and hold at least 100 pounds.

Mission Statement:
The mission of the project was to design a light weight, strong, foldable, and innovative shopping cart that everyday people could use to carry their groceries to their cars or homes. The design would need to cost less than 50 dollars, fold, and hold at least 100 pounds.

Design Specifications:
- The folding shopping cart should be easy to use (and assemble, if required).
- The folding shopping cart should be ideal for transporting groceries and some other materials.
- The folding shopping cart should fold compactly for easy storage.
- The material cost for the folding shopping cart should not exceed $50 unless it can be justified.
- The folding shopping cart should have a weight capacity of 100 lbs.
Design Approach

Customer Needs Assessment:

The team interviewed a number of individuals who agreed that a folding shopping cart would be helpful to get them from the grocery store to their cars or homes. After the interviews were concluded it became evident that the individuals desired the following characteristics in a shopping cart:

- Lightweight
- Durable
- Foldability
- Easy to Use
- Compactability
- Cost
- Appearance
Concepts:

- Concept A

  - 4 wheels
  - Pull front to fold flat
  - Steel rods

- Concept B

  - 4 wheels
  - Fabric
  - Folds in middle

- Concept C

  - Fabric
  - 4 wheels
  - Folds flat on right side
• Concept D

- dolly with hamper
- 4 wheels
- steel + fabric

• Concept E

- 2 wheels
- T-handle
- fold flat
- plastic

• Concept F
### Design Matrix:

#### Concepts

<table>
<thead>
<tr>
<th>Selection Criteria</th>
<th>A Basic Cart (ref)</th>
<th>B Grocery Stretcher</th>
<th>C Flat Cart</th>
<th>D Hamper Cart</th>
<th>E Cubi-Cart</th>
<th>F Tall Cart</th>
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</thead>
<tbody>
<tr>
<td>Ease of handling</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ease of use</td>
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<td>0</td>
<td>-</td>
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<td>+</td>
<td>0</td>
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<tr>
<td>Appearance/style</td>
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<tr>
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<tr>
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</tr>
<tr>
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<td>+</td>
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<td>+</td>
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<tr>
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<tr>
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<td>-</td>
<td>-</td>
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<td>0</td>
</tr>
<tr>
<td>Compactness</td>
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<td>0</td>
<td>-</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

| Sum +'s      | 0 | 4 | 4 | 3 | 6 | 3 |
| Sum 0's      | 10| 3 | 5 | 3 | 1 | 1 |
| Sum -'s      | 0 | 3 | 5 | 3 | 1 | 1 |

| Net Score | 0 | 1 | -1 | 0 | 5 | 2 |

### Weighted Design Matrix:

#### Concepts

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<tr>
<th>Selection Criteria</th>
<th>Weight</th>
<th>A Tall Cart (ref)</th>
<th>B Cubi-Cart</th>
<th>C Hamper Cart</th>
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</thead>
<tbody>
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<td>0.3</td>
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<td>Appearance/style</td>
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<td>Durability</td>
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<tr>
<td>Sturdiness</td>
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<td>0.3</td>
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<tr>
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</tbody>
</table>

| Total Score | 3 | 3.475 | 3.05 |
| Rank        | 3 | 1     | 2    |

- Continue? No Yes No Yes Yes Yes
Final Design and Prototype
Design features:

- Cost effective
- Compact
- Telescoping handle; stores easily and adjustable to user’s height
- Modular folding crates
- Lightweight
- Simple design
- Large storage capacity
- Durable

Operation instructions:

1. Extend box
2. Fold down floor of box
3. Extend and fold down floor of second box if needed
4. Extend telescoping handle
5. Hook on second box
6. Load groceries

To disassemble, follow instructions backwards.
Working Drawings:
Other Views:

Rear View

Base without Boxes
Box with Hooks

- Modular crates. Note the hooks to attach to telescoping handle while in use, and to the first box during storage.
Engineering Analysis

Working Mechanism:

The Cubi-Cart is a simple and modular shopping cart for those who need a compact and effective method of transportation for groceries. The Cubi-Cart features modular crates. These crates are identical, and can be stacked. The crates are 2’x2’x1.8’, and can fold up to be less than 5 inches in thickness. The bottom of the crates fold up, and the sides of the crates fold in in the middle. The crates also have a hook on one side to attach to the handle. For storage, one of the crates can hook on the edge of the other. The base of the shopping cart is very simple. It features a telescoping handle to adjust to the user’s height and can collapse down to the height of a box. The total size of the cart when collapsed is no more than 2’x1.8’x1’. When collapsed, it can still be transported by extending the handle and pushing/pulling it on the wheels. The wheels are 4 inches in diameter, which is not too large for storage, yet not too small to overcome simple obstacles.

The crates will be made of plastic, so its weight will be less than 3 pounds. The base will be constructed of aluminum, and will weigh about 5 pounds. Thus, overall, the Cubi-Cart will weigh 11 pounds.

Cost Analysis:

<table>
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<tr>
<th>Item #</th>
<th>Part Name</th>
<th>QTY.</th>
<th>Material</th>
<th>Manufacturer</th>
<th>Price</th>
<th>Cost</th>
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<tbody>
<tr>
<td>1</td>
<td>Crate</td>
<td>2</td>
<td>ABS</td>
<td>AliExpress</td>
<td>$11</td>
<td>$22</td>
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<td>2</td>
<td>Wheels</td>
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<td>Plastic</td>
<td>McMaster</td>
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<td>3</td>
<td>Handle Assm.</td>
<td>1</td>
<td>Aluminum</td>
<td>McMaster</td>
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<tr>
<td>4</td>
<td>Base</td>
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<td>Aluminum</td>
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<td>Total</td>
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</tr>
</tbody>
</table>
Summary and Conclusions

The team presents this innovative shopping cart design, and is confident that it will perform up to its specifications. The workshop and a 3D printer were utilized to construct prototypes. This project was successful in teaching the team purposeful and effective design procedures. Overall, the team would be proud to see this product sold to the public.
**Acknowledgements**

SolidWorks help: Nick Petrunyak

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Prototype critique: Xinli Wu

Page numbering: Alex Yuan