AwesomeKart:
The Folding Shopping Cart

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Abstract

After countless hours of work, our design team has perfected the model for a portable folding shopping cart. No longer will consumers have to suffer from the overpriced, underwhelming and bulky folding shopping carts that dominate the market. Instead customers can look forward to our lightweight, compact, portable, functional design to fulfil all of their needs. With adjustable handles, accessory pockets, storage space for heavier items and hooks capable of increasing carrying capacity we provide a functional design that costs only $48.90.

Introduction

The Shopping Cart

According to dictionary.com the definition of a shopping cart is: “a four-wheeled cart provided by a supermarket or other retail store for a customer’s use in collecting purchases.” Although this is how we define it now, things were once very different.

It all started in an old style grocery store in st. paul, Minnesota. Walter h. Deubner noticed that customers were limited in what they could purchase; they were only able to buy whatever was convenient to carry home. This led him to create a shopping bag out a paper bag and a cord running down the center for support. Thus, the deubner shopping bag was born. Eventually a few years later, wire shopping baskets were invented. Soon after, convenience stores all across the country were filled with them.

The first shopping cart was invented by, the owner of a local chain of groceries stores called “piggly-wiggly”, Syllban Goldman of Oklahoma City. It was developed in the late 1930’s and patented in 1940. It followed the design of a folding chair and allowed you to transport two baskets at once, while remaining portable. However the folding mechanism was not yet fully developed until 1947 when the telescope two basket cart was invented.
Finally these folding carts gave way to the single solid carts we have today. In 1954 the child seat was introduced into the shopping cart. These new designs allowed many more items to be carried at a time and provided seats for children. (Design Boom Source)

Although these new designs offer more size and storage ability, they lost the original portability they offered customers. There are times when portability and affordability become factors for customers. For people that own their own shopping carts, these new designs offer very little functionality.

**Description of Design Task**

**Problem Statement**

Our design team has been assigned the task of designing and building a prototype of a folding shopping cart for people without cars. The shopping cart should also accommodate people that need to carry groceries from longer distances than from a garage.

**Mission Statement**

Our mission is to infuse functionality, ingenuity and affordability into our products.

**Design Specifications**

The design must meet all of the following conditions:

- 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 100lbs.
Design Approach

Project Management
A Grantt chart was made at the very beginning of the project to track progress and to gauge where the team should be. The Grantt chart tracked the progress, but the team itself assigned different sections of the project to different people, but many of the sections were worked on by all team members such as the prototype.

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<tbody>
<tr>
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<tr>
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<tr>
<td>Cost analysis</td>
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<tr>
<td>Final design Presentation</td>
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</table>

Customer needs assessment
In order to help the users the most, it was necessary to take a step back and first think about what the needs of a user using the shopping cart are. A list was made with any possible factors/functions that a user might want. It was taken into account that the users would most likely be using this cart for a longer distance to take groceries from the store to a home.

- Adjustable height handles
- Triple wheel (going up stairs)
- Additional pockets
- Carrying strap
- Foldable
- Durability
- Modular/parts are replaceable
- Water resistance
- Separate compartments
- Ease of use
- Light reflectors
- Aesthetic

Concept Generation
There were about four concept designs that the team though stood a chance at actually becoming the final design. These designs included a cubicle cart that folded into a single plane that could be worn like a backpack for portability (design a), a low lying wagon type cart that can compress along its width in a scissor fashion (design b), an almost reverse version of design b which folds along its height but has extra storage space underneath (design c), and an extendable approach where the 4 poles holding the
bag are extended out from another pole, slightly thicker, tube (design d). Think of design D as a radio antenna that is able to extend to multiple times the original length. These designs were though up over a weekend by the group members and later discussed together. The 4 preliminary designs were then drawn in more detail shown below.

Design Selection Matrices

<table>
<thead>
<tr>
<th>Factors/Criteria</th>
<th>Designs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>backpack</td>
</tr>
<tr>
<td>Portability</td>
<td>+</td>
</tr>
<tr>
<td>Structural integrity</td>
<td>+</td>
</tr>
<tr>
<td>Cost</td>
<td>-</td>
</tr>
<tr>
<td>Carrying capacity</td>
<td>0</td>
</tr>
<tr>
<td>Extra compartments</td>
<td>+</td>
</tr>
<tr>
<td>Adjustable height</td>
<td>+</td>
</tr>
<tr>
<td>Total Score</td>
<td>3</td>
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</table>

From this matrix, the choices were able to be limited to the “backpack” approach (design A) with 3 points and the “extend” approach (design D) also with 3 points. At this point, a second decision matrix was made which now incorporated the weighted style of scoring. Each factor was given a specific weight and each design was rated from 1 to 5 for each factor. The sums of the weighted ratings were
compared. The backpack approach obtained a score of 3.6 while the extend approach obtained a score of 2.85, leaving the backpack approach the clear winner.

<table>
<thead>
<tr>
<th>Factors/Criteria</th>
<th>Weight</th>
<th>Designs</th>
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<tbody>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>backpack</td>
</tr>
<tr>
<td>Portability</td>
<td>20%</td>
<td>5</td>
</tr>
<tr>
<td>Structural integrity</td>
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<td>3</td>
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<tr>
<td>Cost</td>
<td>15%</td>
<td>4</td>
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<tr>
<td>Carrying capacity</td>
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<td>2</td>
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<tr>
<td>Extra compartments</td>
<td>5%</td>
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<tr>
<td>Adjustable height</td>
<td>10%</td>
<td>5</td>
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<tr>
<td>Total Score</td>
<td>100%</td>
<td>3.6</td>
</tr>
</tbody>
</table>
The Final Design and its Prototype
A complete Set of working drawings of your final design
Detail drawings

Steel Bar

Flat Steel Bar

Straps

Wheel
Prototype scale and digital image(s) of your prototype

**Scale**

1:10 (Prototype)

1:20 (Real life)
Assembly drawing

Prototype: Folded and Unfolded.
Prototype at the stage between fully folded and not fully folded.

View of the net on the bottom of the kart.

**Design Features**

Our design is equipped with the following features:

- Lightweight
- Folds easily
- Carries over 100 pounds
- Adjustable handles
- Has a bottom net to carry drinks
- Contains a pocket for small items.
- Bag is removable
- Can carry like a backpack.

**Operation Instructions**

In order to unfold the shopping kart, the user must simply unconnected the squares until they are in a box formation. The kart should change to the standard kart position. From there, the user can put the bag in and start shopping. It is advised that the user place their case drinks in the net first before
putting the bag in the kart. To fold, the user must push the top left corner towards the bottom right corner. Then the user must fold the two squares together until the user hears a click sound. Once its unfolded, the user can carry the kart, as it was a backpack. Once the kart is folded completely, the user can just store or hang the kart anywhere.

Engineering Analysis

Working Mechanism

The shopping kart has adjustable handles, so it can be used by anyone. The user can simply pull up or push down the handles when needed. The bag is removable. That way the user can place drinks on the bottom net. The net is not too tight to rip but not too loose to interfere with the wheels. The kart can easily hold more than 100 pounds. The prototype could hold 55 pounds and the prototype is at a 1:2 scale. Once the kart is folded, the user can easily carry it on their back or simply store it inside a closet. Our 2 main features for the kart is the adjustable handles and the backpack straps

Cost Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
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<tbody>
<tr>
<td>Metal Frame</td>
<td>Steel</td>
<td>$5</td>
<td>4</td>
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<tr>
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<td>$5</td>
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<tr>
<td>Wheels</td>
<td>Rubber</td>
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<td>4 (pack)</td>
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<td>Straps</td>
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<tr>
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<td>Steel</td>
<td>$3.77</td>
<td>1 (Pack)</td>
<td>$3.77</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
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<td>$49.80</td>
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Summary and Conclusions

In conclusion, team 4 was successful in completing project 1, while following all of the specifications. With customer needs favoring portability and ease of use, a design was built with those in mind. The Awsomekart features adjustable handles, a removable bag, and pouch pocket, all for a respectable price of $49.80. Also, it has a relatively easy way of folding, making it easily, convenient for storage. In all, we feel the project reflects our hard work and we can walk away knowing this was a good learning experience.

References

Sources


Personal Sites
Shoan Joseph
http://sites.psu.edu/shoanjoseph/eportfolio/

Mike Sanders
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Daniel Wright
http://www.personal.psu.edu/diw5233/EDSGN100/