EDSGN 100

Section 010 Team 1

The Cart and Carry

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Submitted to Xinli Wu

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Abstract:

The purpose of this design project was to design a folding shopping cart that fit the criteria we were given, including price and weight capacity. This design fulfills the criteria and offers several innovative features which include insulated compartments and added maneuverability from caster wheels.

Introduction:

Shopping cart is one of important things in today's society. Can we imagine our life without the cart? Are we strong enough to carry all the things all the times at the mall for example? This time we Team 1, was assigned to design a foldable shopping cart that can facilitate people to transport their goods from the store to their household. During the design process, several qualities of a good shopping cart come to mind. The shopping cart must be able to fold compactly so it can be transported to the grocery store easily. It must be able to be reassembled with ease. It also must be budget friendly especially for the student and old people. Finally the cart should transport the purchased good from the grocery store to the shopper's household. With these qualities in mind, Team 1 proceeded to construct the perfect shopping cart. We call it " The Cart and Carry"

Description of the Design Task

Problem Statement:

People in urban areas need an easy and convenient method for transporting groceries to their homes.

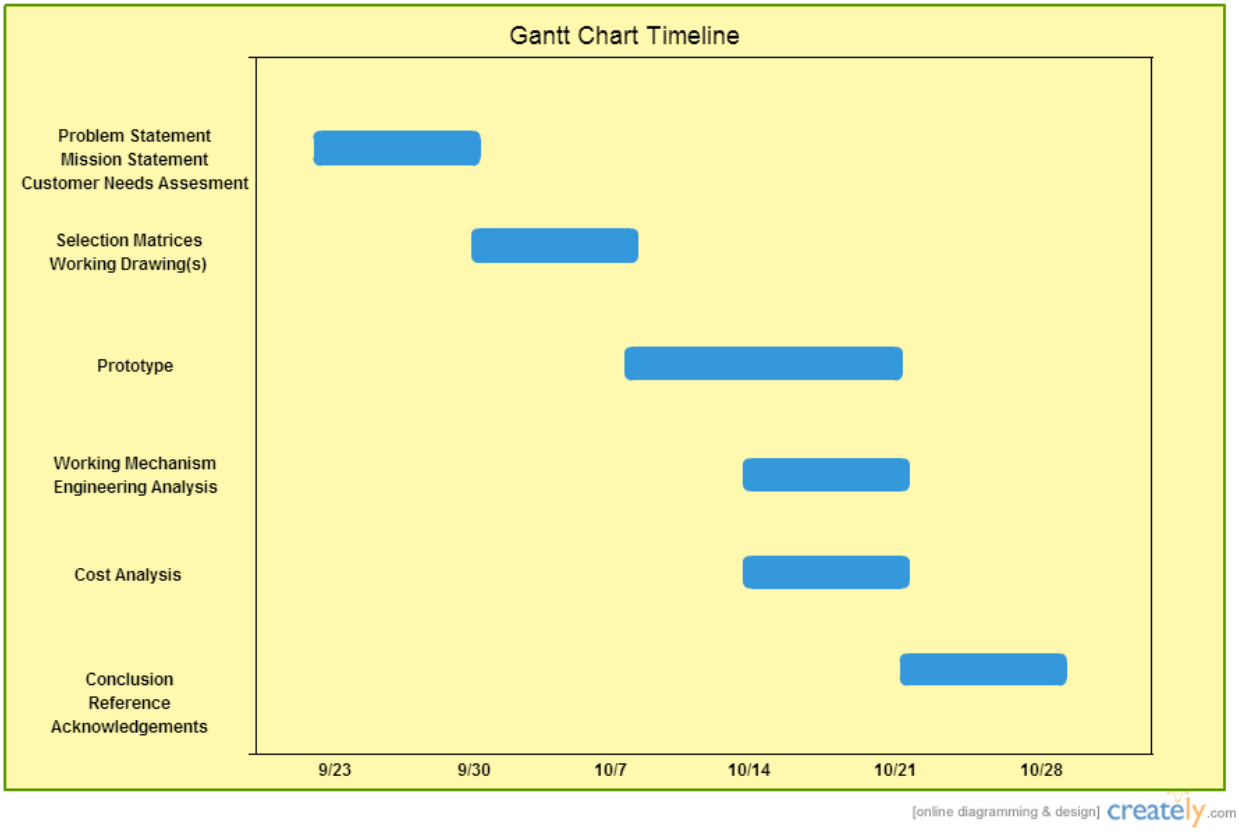
Mission Statement:

To provide a product which allows people to easily transport groceries over short distances without dependence on other means of transportation.

Design Specifications:

- Shopping cart that is easy to assemble and use
- Shopping cart that does not exceed $50 in cost unless justified by designers
- Shopping cart which has a weight capacity of 100 lbs.
- Shopping cart can fold to be more compact for storage

Design Approach



<u>Customer Needs Assessment:</u>

Through our interviews, brainstorming, and the criteria set forth in the project guidelines, we determined that our shopping cart design should include the following features:

- easy to carry when not in use
- easy assembly/operation
- lightweight

- sturdy
- low cost
- smooth rolling
- easy/compact storage

Concept Generation:

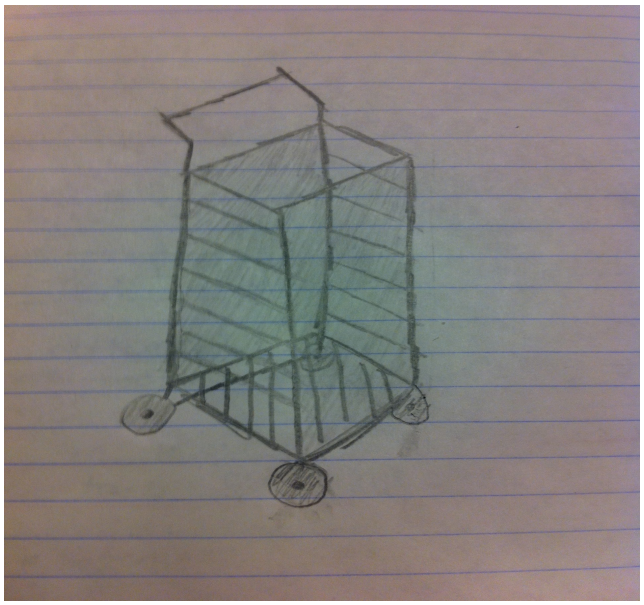
We used a standard, wire-frame, four fixed-wheel, folding shopping cart as the basis for our design and as the reference cart in our design matrices. We brainstormed potential ways to improve the cart design and functionality and used influences from our interviews to create several concept designs. We used design matrices to compare concept designs and select the design that best fit our criteria.

Design Matrices:

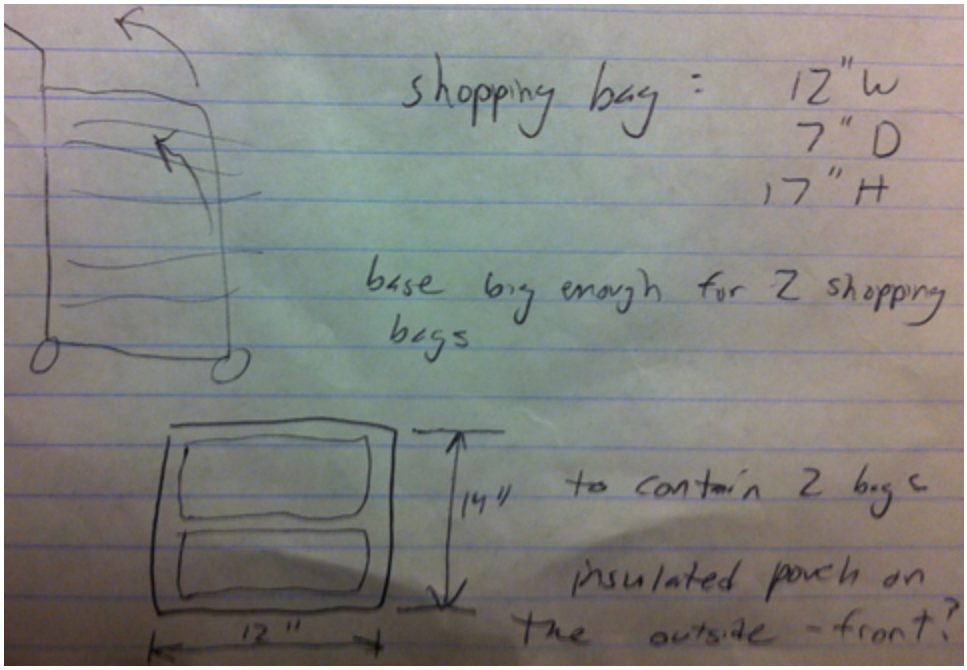
Selection Criteria	A - Hinged Fold	B - Cross Fold	C - Fold Up Wire Mesh (4 Wheel)	D - Fold Up Wire Mesh (2 Wheels)	Walmart Base Design
Durability	-	0	+	+	0
Cost	+	-	0	+	0
Ease of Folding	-	+	0	0	0
Carrying Capacity	-	+	0	0	0
Ease of Movement	0	+	+	-	0
Appearance	0	-	+	+	0
Sum of +'s	1	3	3	3	0
Sum of 0's	2	1	3	2	6
Sum of -'s	3	2	0	1	0
Net Score	-2	1	3	2	0
Rank	5	3	**1**	2	4

Final Design and Prototype

Working Drawings of the Final Design:



Prototype Scale and Digital Image of Prototype:



Design Features:

Our design includes these unique features:

-insulated pouches

-four caster wheels

-carrying handle

-lightweight design

Operation Instructions:

--> Since this cart is user friendly, the operational instructions is easy as pie.

To Expand for U

Remove the lock at the handle first. Then, just push the front cardboard forward until it fully extended. Put the plastic bags at the hook given at the front and back of the cart. Then the cart is ready to use.

To Collapse for Storage/Transportation:

Just pull the front cart backward until you can lock it with the handle. Then, you are good to go.

Engineering analysis

Working mechanism

Before we finalized our final design project, we were thinking about the working mechanisms needed that can enhance the quality of the cart.

First of all, the stability of the cart is one of the most important aspect that we needed to focus on. Next, we found that the four wheels cart is more stabilized compare to three wheels cart. This is because in equilibrium position, the weight of the shopping cart is equal to the summation reactions of the wheels. Basically, the reaction force on the wheel of the four wheels cart is less than the wheel of the three wheels cart. In other words, the wheel on the four cart wheels experienced less force on itself, so that the wheels are safe from any damages at a certain time. Other than that, we also built the base of the cart with a strong wide cardboard so that the cart can support more weight without breaking it down. The strength of a certain material is proportional to the supported weight. Other than the stability aspect, the four wheels also can make the cart movement smooth and easy.

Next, we make the cart from the cardboard so that the strong cart can fold easily. Thus, the cart can be bring everywhere because of the small size. Then, we also make the handler of cart in an appropriate height (certain height). We didn't make a very tall handler cart because we want to prevent the cart from flip over. If distance between top handler and a point of handler connected to the cart is significant, the cart can be easily to flip over due to moment (torque) created by force exerted perpendicular multiplied by the distance. In other words, if we keep force to the handler same, the distance between handler and the

point of handler connected to cart is proportional to the moment created.

Cost

Material	Quantity	Cost per unit ($)	Final Cost ($)
Aluminum Rod	2	2.00	4.00
Caster wheel	4	1.00	4.00
Canvas (1’6”x2’x3’)	2	3.00	6.00
Wood panel (1’6”x2’x1”)	1	6.36	6.36
Mounting Card Board (2’x2’x0.12’)	2	1.00	1.00
Plastic Rod	1	1.00	1.00
Large Hinge	4	1.00	4.00
Small Hinge	10	0.50	5.00
Linen tape((1 yard long)	1	1.50	1.50
Bolt	6	1.00	6.00
Screw	12	2.87 (6 pack)	5.74
		Total cost ($)	44.6

*all prices are estimated from google shopping and home depot

Summary and Conclusion

This year, in Engineering Design class, section 10, was asked to build a foldable shopping cart. The design need to fulfill certain criteria and specifications given -:

- The folding cart can be fold small enough so that it can be easily stored, assemble and disassemble
- The cart should have a wheel at least to ease the movement of the cart
- The construct budget cost must be below 65 US dollar (if possible)

At first, through the use of engineering concepts, we (Team 1) came up with several ideas that match certain aspects of specifications. Then, after brainstorming for a long time, we finally selected our best final design for the prototype.

Our prototype folding portable cart allows for it to be easy to store and to bring everywhere. We didn't use any complex mechanism that sometimes can cause inevitable problems for the consumer. Other than the good of its working mechanism, this cart also is extremely cost efficient as the total cost of making it is around 44.60 US dollar. In other words, this cart is affordable on any budget especially for student and old man/lady that have budget constraints.

After completing the project, the team became familiar with the design process and how to build and construct a website and lab report. They learned about teamwork and cooperation. These are all aspects that will be helpful in the future for the team.

After completing the project, many things we learned about the teamwork and cooperation.

These aspects are very important for a group to have in order to be a successful group.

Acknowledgments

Team #1 would like to extend a million thanks to Professor Xinli, P.E. and the TA's, Benjamin Szoch and Thomas Antoniak who taught and give us advices on how to do well in this project.

References

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