The X-Cart

EDSGN 100 – Introduction to Engineering Design

Section Number – 010

Team Number – 4

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Abstract

This report represents our entire thought process that went into creating the X-Cart, and coming up with the idea of a backpack. We have built a prototype with PVC and Aluminum metal. In reality, we will be using steel tubing to develop a model that fits all the required criteria.

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Introduction

In today's modern world, shopping for groceries has become a necessity. And in this fast paced world, everyone is moving a great momentum to finish his or her tasks and compete in a race. When it comes down to groceries, they want it to be as quick as it can be, while still being easy. This is where X-Cart comes in; X-Cart is the perfect shopping cart for this fast paced world. With it's crossing design and backpack capabilities, portability and convenience has never been easier. It is the perfect combination of storage and portability to give the user the best experience when shopping.

Description of Design Task

Problem Statement – Many people living in urban areas and on campuses around the world have the inconvenience of parking far from their home. This creates a problem for them when they have bags of groceries to carry from their car to their apartment. They need a better way to transport them from point A to point B.

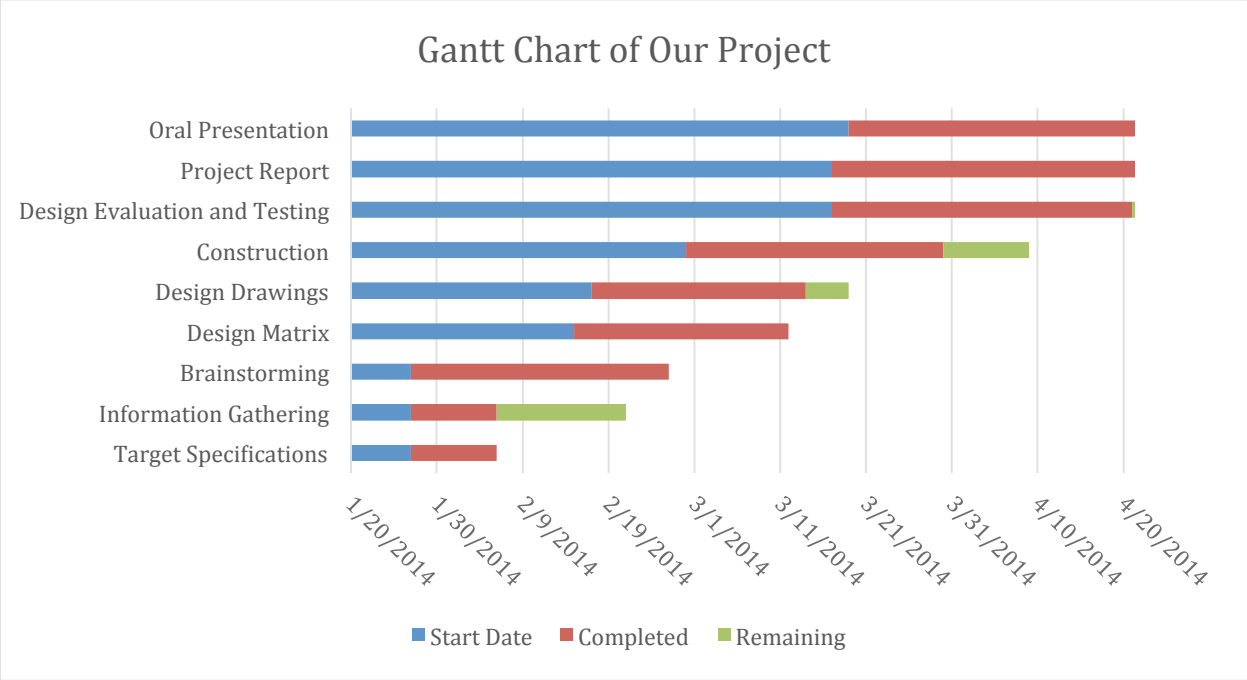
Mission Statement – Our group aims to create a folding shopping cart that can fold flat for easy storage in a car's trunk. When it is then ready to be used a person can get it from there trunk and unfold so that it can be used to carry groceries from their car to their apartment or home. We also plan to add some backpack straps onto the cart so that someone that can easily walk to the store can put it onto their back and carry it to the store easily, then can take it off their back and use for carrying the groceries.

Design Specifications: -

- Easy to use
- Ideal for transporting groceries and other materials
- Compactly fold for easy storage
- Cost should not exceed $50
- Weight capacity of 100 lbs.

Design Approach

Project Management – Gantt Chart



Customer Needs Assessment

After much research it was found that there were many requirements that needed to be addressed to fit the customers' needs in the folding shopping cart market. One such customer complained that the shopping carts frame was less sturdy then they wished for. To address this need the group analyzed their original design and decided to utilize thicker tubing as well as to use steel instead of the original aluminum in the final design. Another customer's complaint was about mobility so in the final design we simplified the structure and added backpack straps in order to fur fill this need. A final concern that was recognized, was size, in order to make sure the design was small enough but maximized space we went with the X cross design in order to fit this need.

Concept Generation

The students came up with multiple designs in order to fit the customer satisfaction.

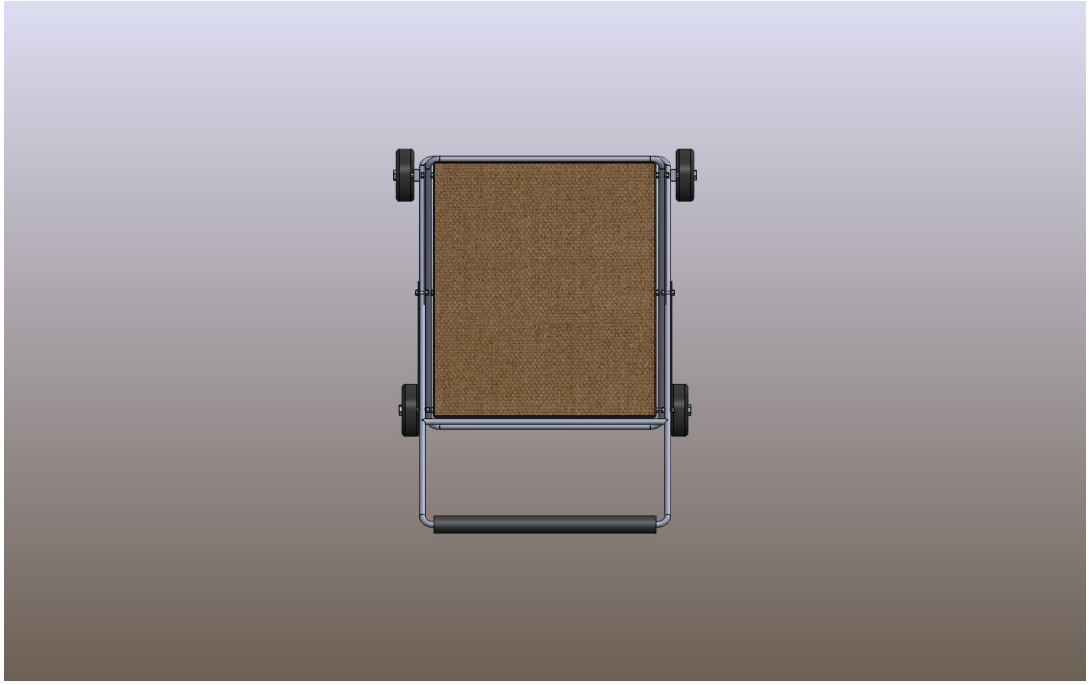
- **Design A**: Test design. The group used the model in the shop to rate the others against
- **Design B**: The second pick was the backpack design which featured an X cross design as well as straps to hold up the bag for transit
- **Design C**: This was a trolley design that went with a pushing mechanism. It was ultimately scrapped because for it what it made up in durability it lacked in mobility and portability. It was large in size and could not be carried around easily.
- **Design D**: This design incorporated a pull behind mechanism that allowed the customer to pull the trolley instead of the normal push behavior. This was ultimately discarded due to the inconvenience it would cause and durability.
- **Design E**: This design consists of a folding bottom that results in a bottom that folds up in order to make the trolley foldable. We eventually rejected this idea because the bottom was not only weak but also relatively unstable compared to other designs.

Design Matrix Shopping Cart					
	In Class (reference) **(A)**	Backpack **(B)**	Folding Bottom **(E)**	Pull Behind **(B)**	Hand Trolley **(C)**
Ease of Handling	0	0	0	-	0
Durability	0	+	-	0	+
Portability	0	+	0	0	-
Ease of Manufacturing	0	0	0	0	0
Cost	0	0	0	+	-
Ease of Control	0	0	0	-	+
Volume	0	0	0	-	+
Weight of Cart	0	+	0	+	-
Total	0	3	-1	-1	0

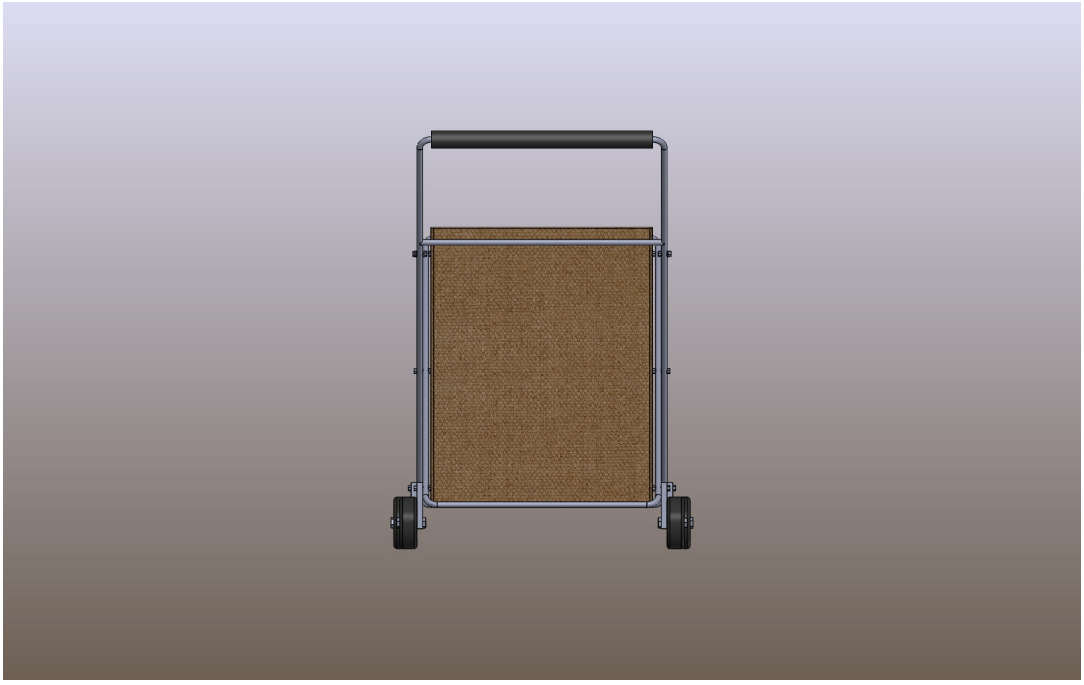
The Final Design and its Prototype

Solidwork Drawings

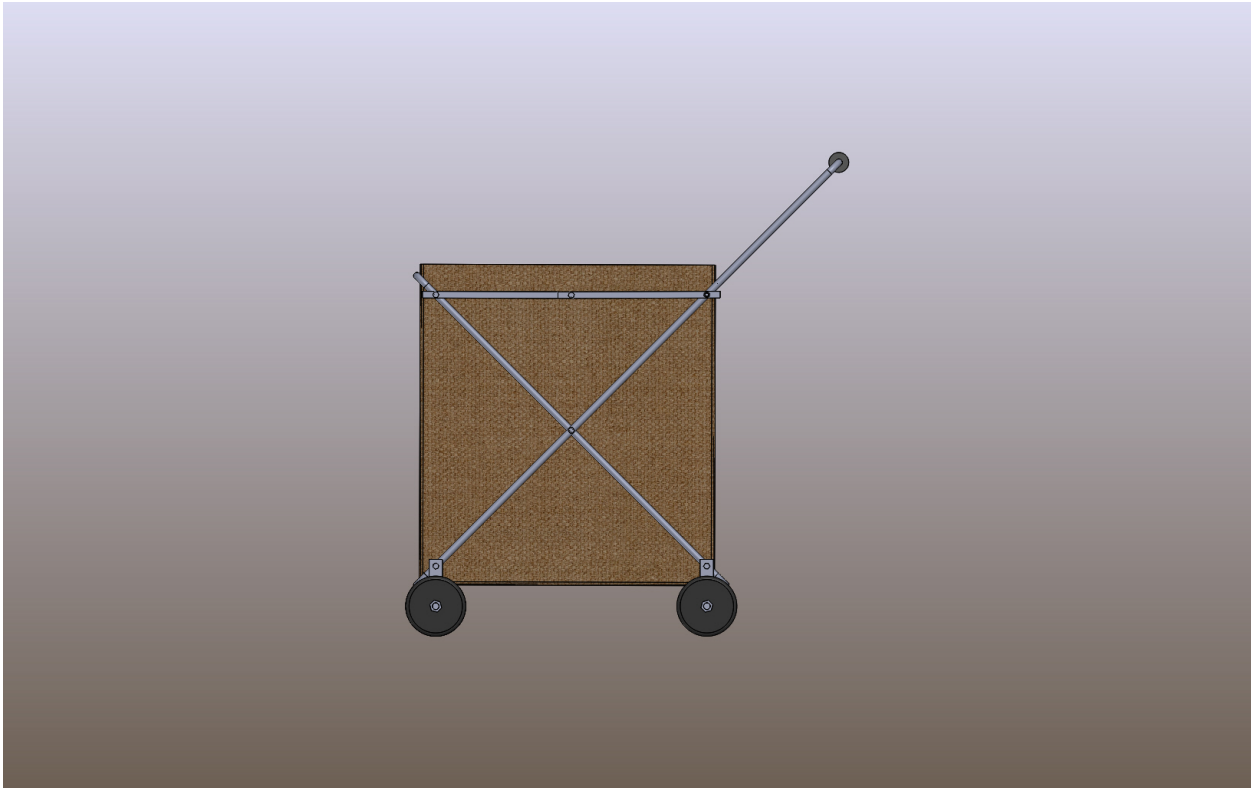
Top View



Front View



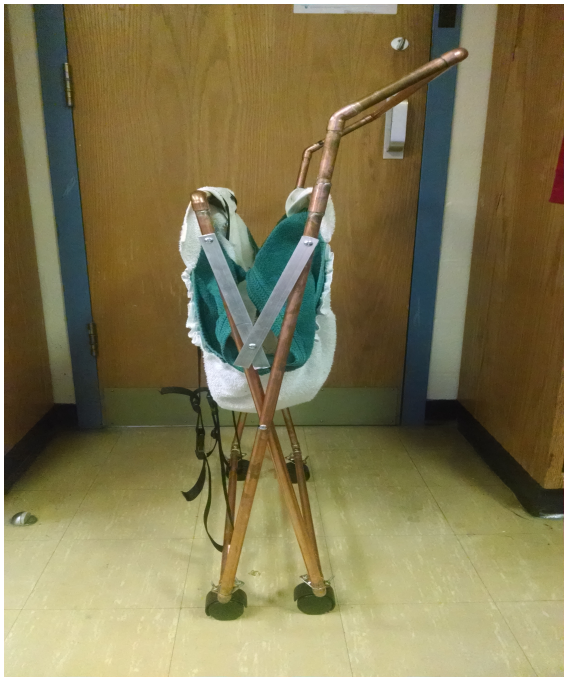
Side View



Isometric View

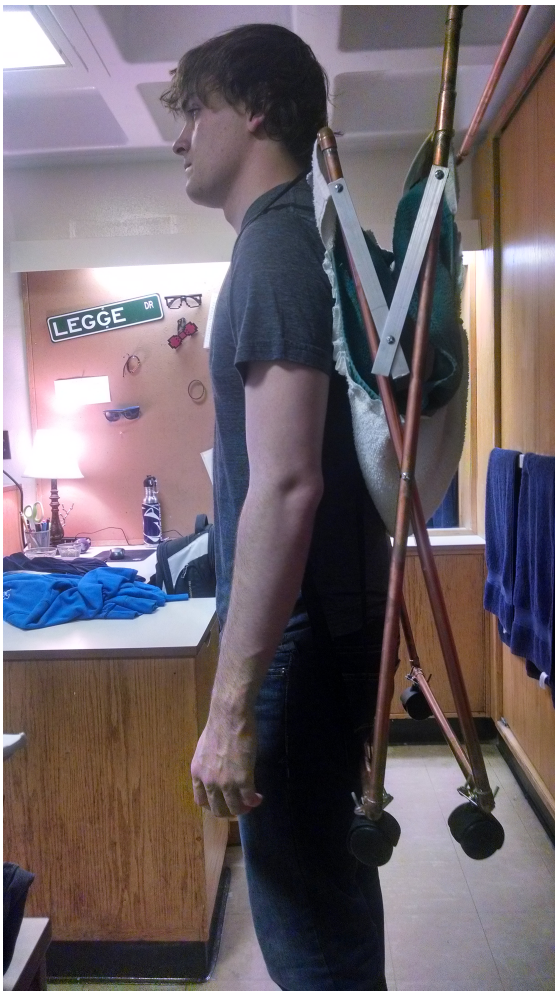
Digital Images

Cart Folded



Cart Opened

As a Backpack



Prototype Scale

The prototype scale is 1:1

Design Features

- Sturdy steel tubing that will hold more than 100 pounds of groceries
- Large canvas bag that boasts a much larger grocery space than most other folding shopping carts
- Large 5 inch diameter wheels that can easily go over cracks and bumps faced on sidewalks
- Backpack straps that keep the folded cart on your back that can be used for easy carrying to the grocery store
- A plastic covered top that can be placed on top of the bag to keep any rain or snow from getting to your groceries
- The canvas bag can be removed from the frame so it can be washed and easily placed back on to the frame
- Nice rubber grip that gives a comfortable handhold when pushing the cart

Operation Instructions

To Fold

1. Pull front and back bars together
2. Use the lock bar to lock the cart together securely
3. Put onto back or place into trunk for easy carry or storage

To Wash the Bag

1. Remove both backpack strips with the easy to clip parts
2. Remove both the front and back of the canvas bag
3. Wash and dry in a washer and dryer
4. Easily place the canvas bag back on as well as the backpack straps

Engineering and Analysis

The design is for a rectangular folding shopping cart with four 5 inch wheels and backpack straps that allow for not only easy storage but easily to be carried. The shopping cart according to the design will be made out high quality but light steel that will prevent rusting. The light and strong durability of steel will allow for easy carrying and transport. The medium size wheels that are 5 inches in diameter allow for easy mobility. The front of the cart collapses into the back making the cart easily stored. There is a lock on the side that allows the consumer to keep the cart folded or open without any hassle. The weatherproof bag allows for a high volume of groceries to be stored and be protected from inclement weather. The bag also has a flap to cover the top of the cart if it were to be raining or anything else. Overall the cart was designed with consumer in mind.

Item	*Amount*	*Cost per Unit*	*Total Cost*
1/2" steel tubing	10 Ft	$1.42 a foot	$14.20
5" Wheels	4	$2.00 a wheel	$22.20
Back pack Straps	4 Ft	$1.25 a foot	$27.20
Canvas	10ft	$1.78 a foot	$45.00
Rubber Coating	4 Ft	$1.07 a foot	$49.28
			Final Cost: $49.28

Table 1. Cost Analysis

Summary and Conclusions

In conclusion, this report introduced a consumer-friendly design for a shopping cart. The design allowed for a shopping cart that was very mobile, light, strong, large volume, weatherproof, low in cost, foldable, and easily able to be carried. The shopping cart was designed with the consumer in mind. The design is ideal for carrying groceries or other goods easily and comfortably. The sturdy, but light, frame allows for easy transportation and durability. The backpack straps are also another feature that allowed for easy transportation.

Acknowledgements

1. Lorie Boyer for the help of sowing the prototypes bag.
2. Shawn Legge showing Tyler how to solder to build the prototype.