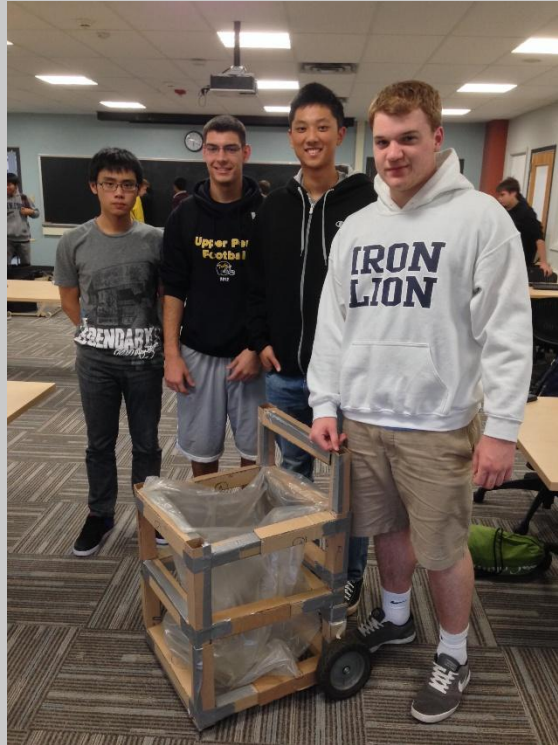


Engineering Design 100 Section 15 Team 6

Foldable Shopping Cart



Submitted by [Charles Wang](#), [Christian Hohl](#), [Tyler Zehr](#), [Zicheng Li](#)

Submitted to: [Xinli Wu](#)



October 28th 2013

http://www.personal.psu.edu/cxw5274/edsgn100_fall13_section15_team6_dp1.pdf

Table of Contents

Cover Page	.....(1)	zvl5131@psu.edu
Table of Contents	.....(2)	tsz5011@psu.edu
Abstract	.....(3)	tsz5011@psu.edu
Introduction	.....(4)	thechosenwang@gmail.com
Description of Design Task	.....(5)	cnhohl32@gmail.com
Design Approach	.....(6)	thechosenwang@gmail.com
Final Design and Prototype	.....(7,8,9)	cnhohl32@gmail.com
Engineering Analysis	.....(10)	cnhohl32@gmail.com
Summary and Conclusions	.....(11)	thechosenwang@gmail.com

Abstract

Our design improves the current designs for a shopping cart, allowing shopping carts to be more portable and more convenient while retaining its strength and safety. Our cart expands and contracts and also folds. This allows a rigid structure along with a smaller and easy-to-store feature.

Introduction

In this design project, students are put into groups to make a foldable shopping cart. Students are to brainstorm ideas and use their customer analysis reports to create a general idea of the type of shopping cart they would have to make. Then, the ideas are singled out and tested on with a design matrix that is able to pinpoint which design to continue. After choosing a final design, students start on their working drawing representations of their design. Then students begin building their prototype and getting ready for their group presentation.

Description of the Design Task

Problem Statement

We need to create a foldable shopping cart that should be easy to use, ideal for transporting groceries, easily foldable for easy storage, shouldn't exceed fifty dollars, and should have a weight capacity of one-hundred pounds.

Mission Statement

We need to be able to create a foldable shopping cart that meets the needs of the customers under a given time. We will be frugal upon our expenses and make our cart as durable and as reliable as possible.

Design Specifications

- The folding shopping cart should be easy to use.
- 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

After asking 10 randomly selected people about which aspect of the design is the most important, the results are as is:

Portable: 1 person

Cheap: 4 people

Lightweight: 3 people

Safe: 2 people

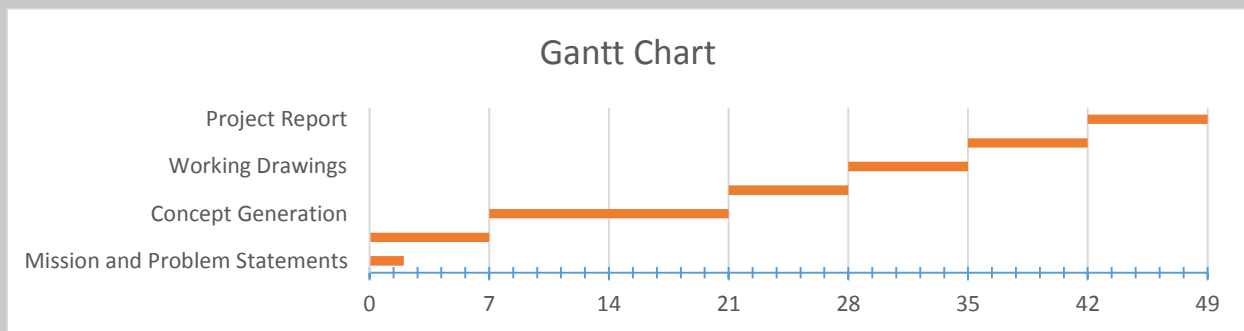
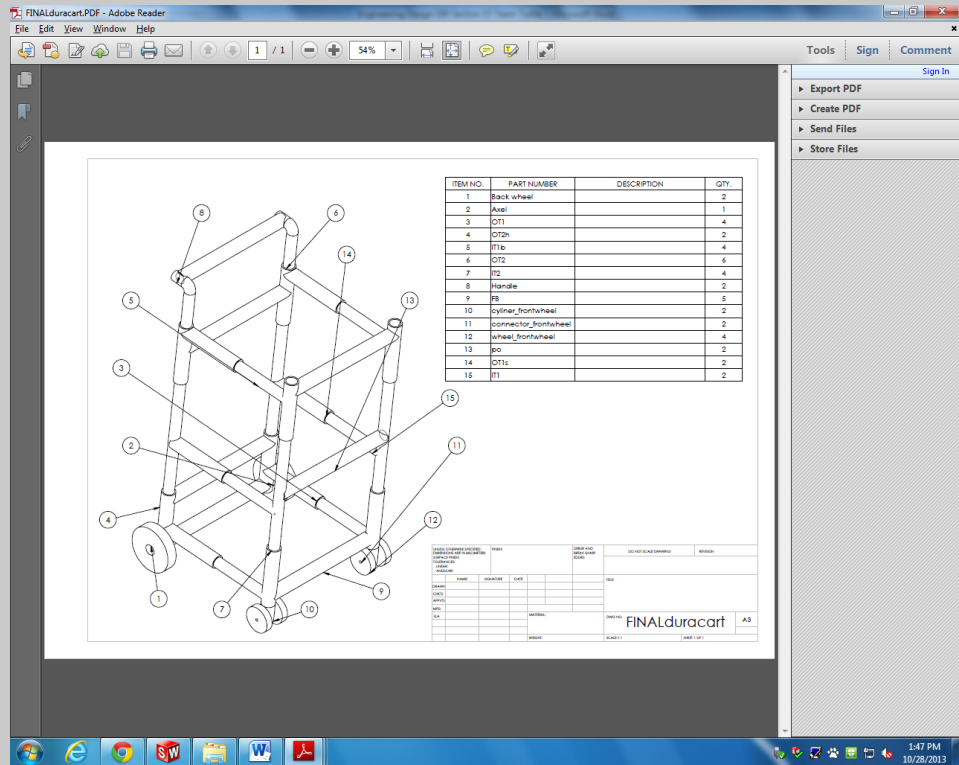


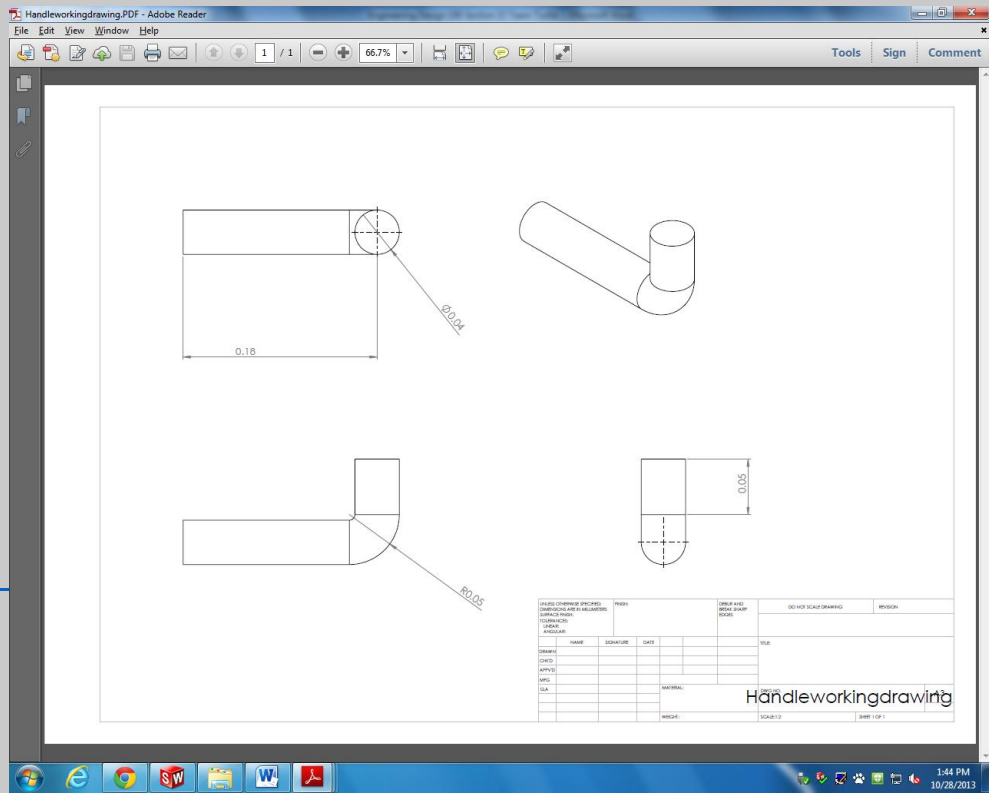
Table. 1. Design Matrix

Selection Criteria	Concepts					
	A	B	C	D	E	F
	Project X	Box Style	Slide Style	L Cart	Compromise Cart	Shopping Cart (Reference)
Ease of assembly	0	-	-	-	+	0
Ease of use	+	-	-	-	+	0
Weight capacity	-	0	0	-	-	0
Storage capacity	-	-	-	-	-	0
Durability	0	0	0	-	0	0
Portability	+	+	+	+	+	0
Weight of cart	+	+	+	+	+	0
Safety	0	0	0	0	0	0
Net Score	1	-1	-1	-3	2	0
Rank	2	4	4	6	1	3
Continue?	yes	combine	combine	no	yes	no

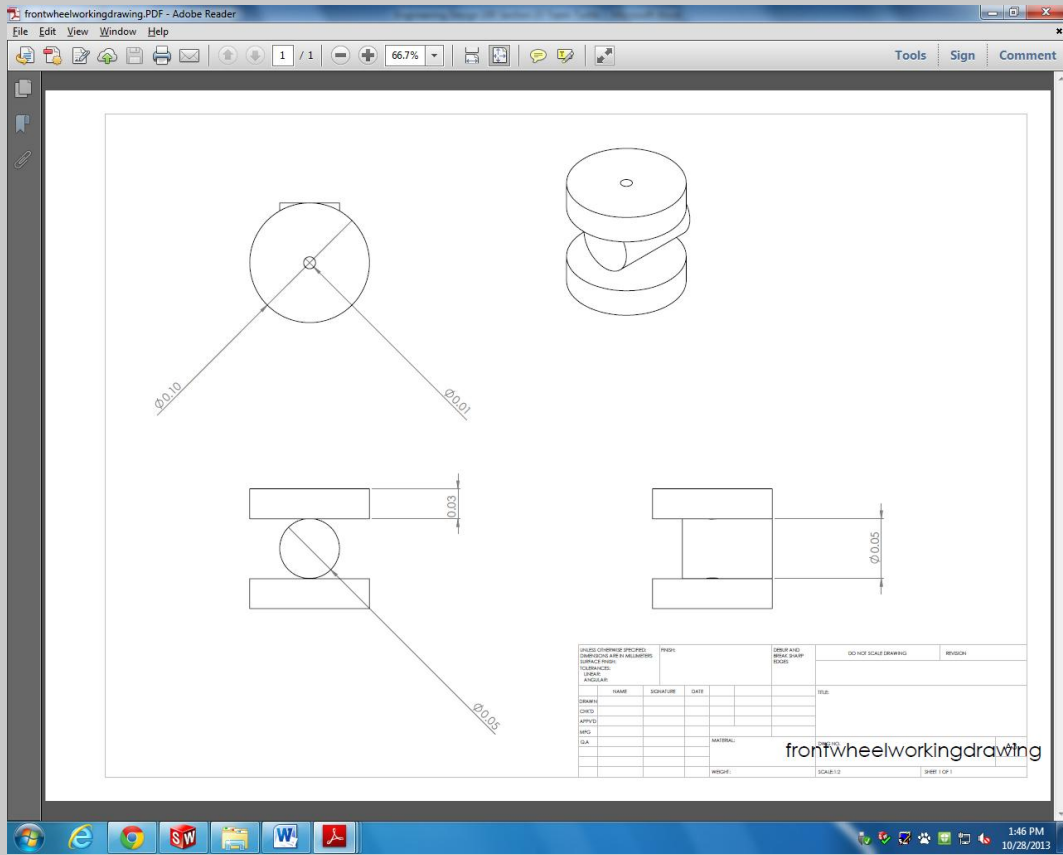
Final Project Assembly Drawing



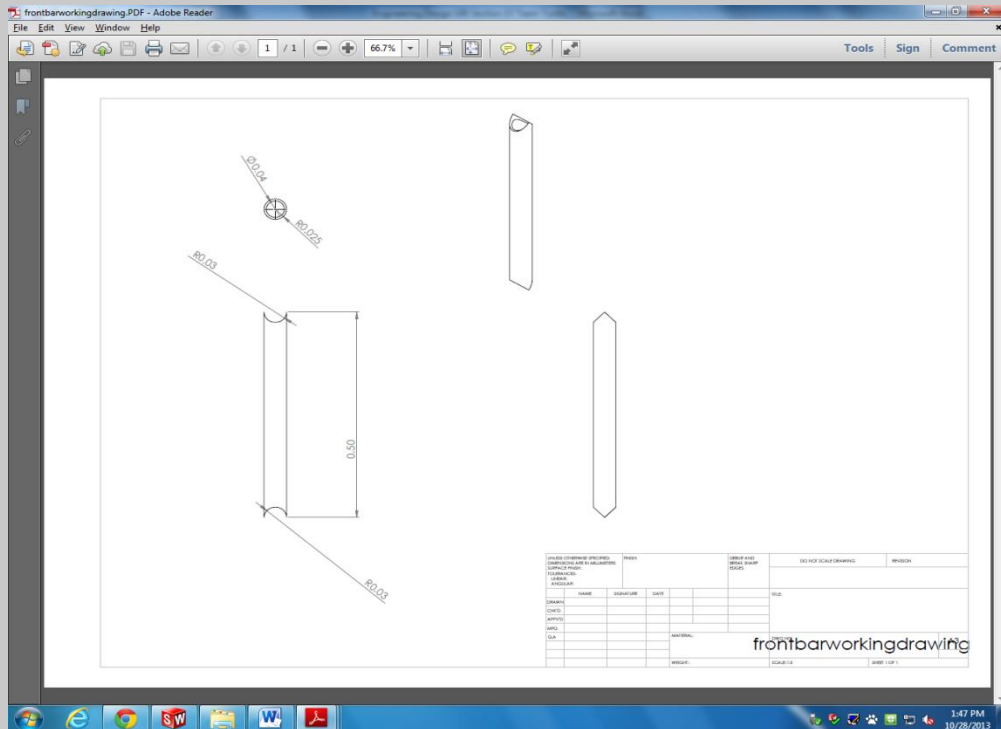
Handle Working Drawing



Front Wheel Working Drawing



Front Bar Working Drawing



Final Design and Prototype

Compressed and expanded scale:

The prototype was built according to a **1:1** with the exception of the outward expansion which, due to building constraints, was made to a **2:1** ratio.

FIG. 1. Prototype before expansion



FIG. 2. Prototype after expansion



Design Features:

We incorporated a crutch-lock system that is able to hold the expanded position. Also, the expandable side of the cart allows the user to maximize space for various types of shopping. The front wheels allow for 360 degree rotation.

Operation Instructions:

In the collapsed version, the tubes are already pushed in all the way. In order to expand the cart, the side tubes are pulled out on both sides and that allows the entire front of the cart to expand. Then, pull on the 4 vertical tubes to the wanted height and lock with the crutch system.

Engineering Analysis

The 4 vertical tubes can expand up and down in order to increase the size of the cart.

The 6 horizontal tubes can expand in and out in order to increase the size of the cart.

The flat base fold up to the back of the cart and can fold down to the bottom to create the base.

The straps on the back can hook and unhook for personal use.

The nylon bag can be expanded and pulled down to fit the inside of the cart.

Materials	Cost
10.5 meters of PVC piping	\$12.00
Drum Liners (bag)	\$7.42
.4m x.45m wooden board	\$6.25
2 inch polypropylene wheel (2)	\$2.98 each, \$5.96 total
Power Care 8 inch wheel (2)	\$5.65 each, \$11.30
Everbilt 25lb. screw-in bicycle hook (4)	\$0.78 each, \$1.56 total

Table 2. Cost Analysis Table

Sources for Cost Analysis

<http://www.homedepot.com/s/hooks?NCNI-5>

<http://www.mcmaster.com/#open-top-bags/=p4k4g3>

<http://www.usplastic.com/catalog/item.aspx?itemid=101632&catid=727>

<http://www.lowes.com/Search=wheels?storeId=10151&langId=-1&catalogId=10051&N=0&newSearch=true&Ntt=wheels#!>

<http://www.homedepot.com/s/wheels?NCNI-5>

Summary and Conclusions

The cart that we built has its strengths and weaknesses. One of the strengths is that this cart is very rigid and safe. This allows for sturdy use and a heavy load capacity. One of the weaknesses is that this cart's collapsed size is not that small.

The materials that we used were not the materials that we intended to use due to constraints on expenses. Also, some of the parts of the cart could not be incorporated due to time constraint team communication.

The cart's design is meant for people who do not have a personal source of transportation.