

# Folding Shopping Cart

“X-Folder”

EDSGN 100 INTRODUCTION TO ENGINEERING DESIGN  
SECTION 204 TEAM 2



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## Abstract

This report details the actions and considerations that occurred while designing the “X Folder” foldable shopping cart. Within this report, the description of the design task, the design approach, the final design, the final prototype, the engineering analysis, and the ultimate team conclusion will be revealed.

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## Introduction

This report details the process that team two followed to design the ultimate foldable shopping cart, the “X-Folder”. Assigned by Xinli Wu on June 30 and concluded on July 28, the first step the team reached was conducting research on already existing designs of foldable shopping carts. After that, the team created multiple design concepts that appeared to meet the requirements. Following this, the team narrowed down the prospective designs until one final design was selected. A prototype was built to help the team and others envision how the cart would appear in reality. As the last step, this report was created by the team to explain and review the design process that was used to generate the “X-Folder” and to bring the project to a conclusion.

## Description of Design Task

### **Problem Statement:**

Going and getting groceries is very common for most people. Those who do not have cars have difficulty transporting large quantities of groceries from the store to where they live. These people may have to take multiple trips to the store for all their supplies. Also, those who do not have a garage right next to their kitchen may have to park a large distance from where they live and are forced to carry all their groceries that distance. This may also require the person to make multiple trips to the car to get all of their groceries into their living area.

### **Mission Statement:**

The mission of this project is to design a collapsible shopping cart for those who do not have the benefit of a car or the benefit of parking close to where they live. This shopping cart will enable those who do not have the luxury of a car or close living areas to transport goods with ease. This shopping cart should be durable and easy to use for the consumer. The design should not exceed \$50 in materials and should be able to transport 100 lbs of goods.

### **Design Specifications:**

- The foldable shopping cart should be easy to use
- The foldable shopping cart should be able to transport groceries and other materials
- The foldable shopping cart should be able to fold for storage
- The cost for materials for the foldable shopping cart should not exceed \$50
- The foldable shopping cart should have a weight capacity of 100 lbs.

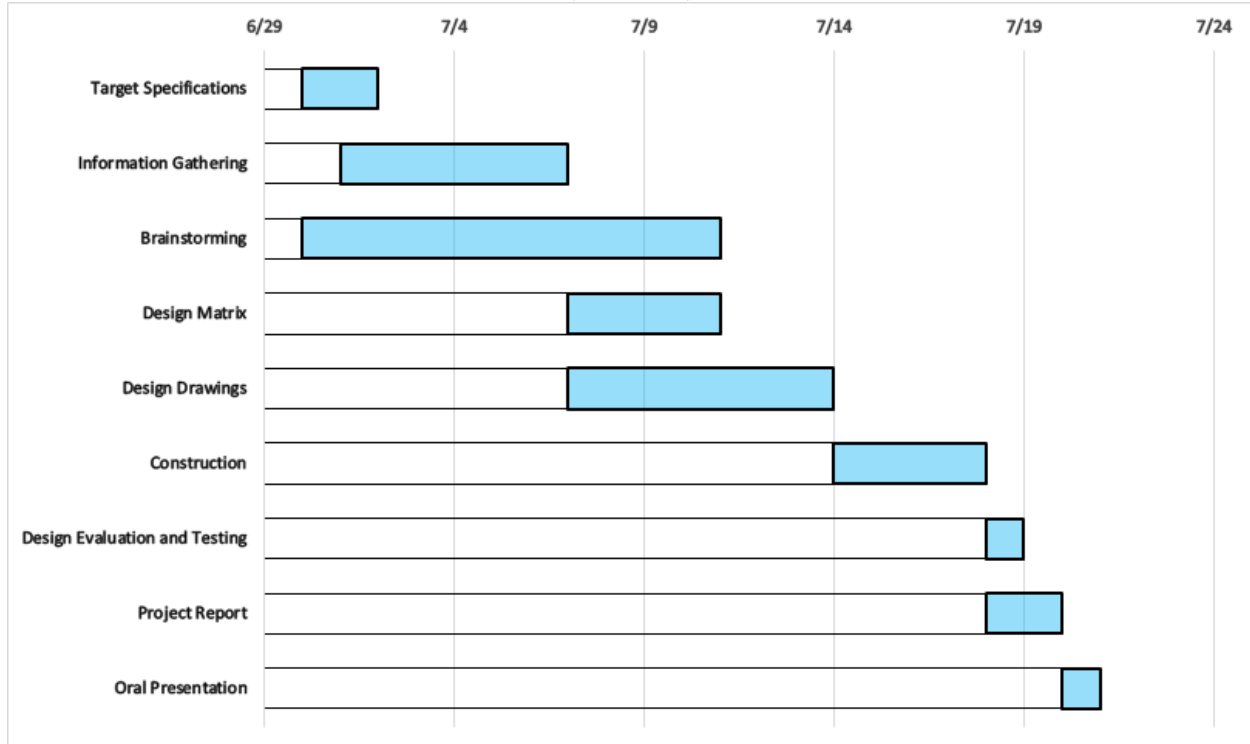
## Design Approach

### Customer Needs Assessment:

(Table I)

Question:	Survey taker #1	Survey taker #2	Survey Taker #3
Do you have stairs or elevators where you live?	Stairs	Elevator	Stairs
Do you go shopping at least once a week?	Once a week	Once every two weeks	One-two times a week
Are the sidewalks/roads rough from your house to the grocery store?	No	Semi but no massive pot holes	No
Where would you plan to store your foldable shopping cart?	Under the bed	Hall closet	In hall closet
Would you prefer the shopping cart have wheels or to carry it?	Both	Wheels	wheels

The customer needs assessment shown above in **Table I** exemplified what the customer really wanted in this product. The results were; the customers would be going up stairs, shop weekly at the grocery store, wanted it to roll on wheels and for it to be easily stored under a bed or in a hall closet.

**Gantt Chart:****(Table II)****Concept Generations:**

Five basic designs were created and one reference design was used. The “Truck” and “Wagon” were both lengthy and could hold at least 120lbs but were not very easy to fold. The “bookbag” design allowed the customer to be hands free, it had straps for carrying on one’s back and wheels to drag it like a suitcase. The “multiview” design was very easy to use and durable but was not very easy to assemble and did not fit into the fifty dollar budget. The “folding” design worked similar to a baby-stroller and had cross hatches on the sides which allowed it to fold upwards and be easily stored, it also was designed with big wheels in the back and small wheels in the front so it could maneuver over steps and rough sidewalks more easily.

**Table III**

Selection	A	B	C	D	E	F
Concepts	reference	truck	folding	multiview	wagon	bookbag
Ease of Use	0	-	+	+	-	-
Storage	0	-	0	-	-	+
Durability	0	-	+	+	0	0
Ease of Manufacturing	0	0	+	-	0	-
Assembly	0	-	+	-	+	+
Cost	0	-	0	-	-	0
Capacity	0	+	+	+	+	-
#+	0	1	5	3	2	2
#-	0	5	0	4	3	3
Total	0	-4	5	-1	-1	-1

**Results of Design Matrix:**

Proven by **Table III**, Design C was the most ideal for this project and proved to be the best choice to pursue.



## Final Design and Prototype

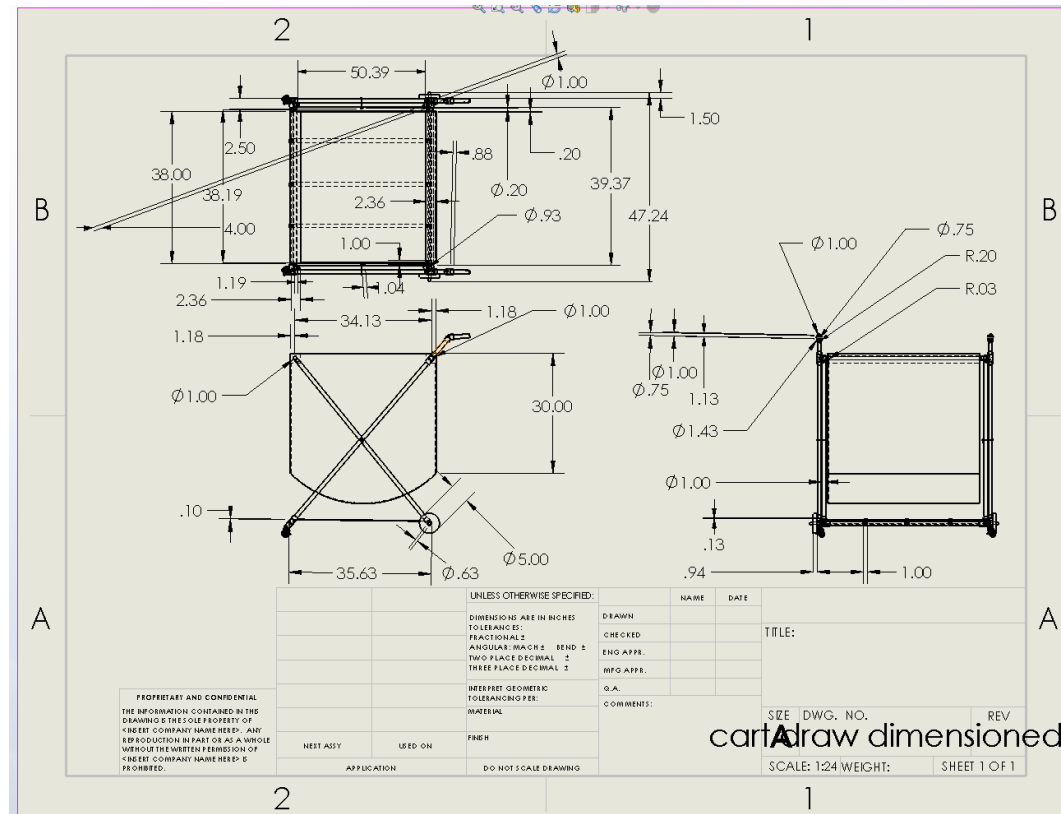
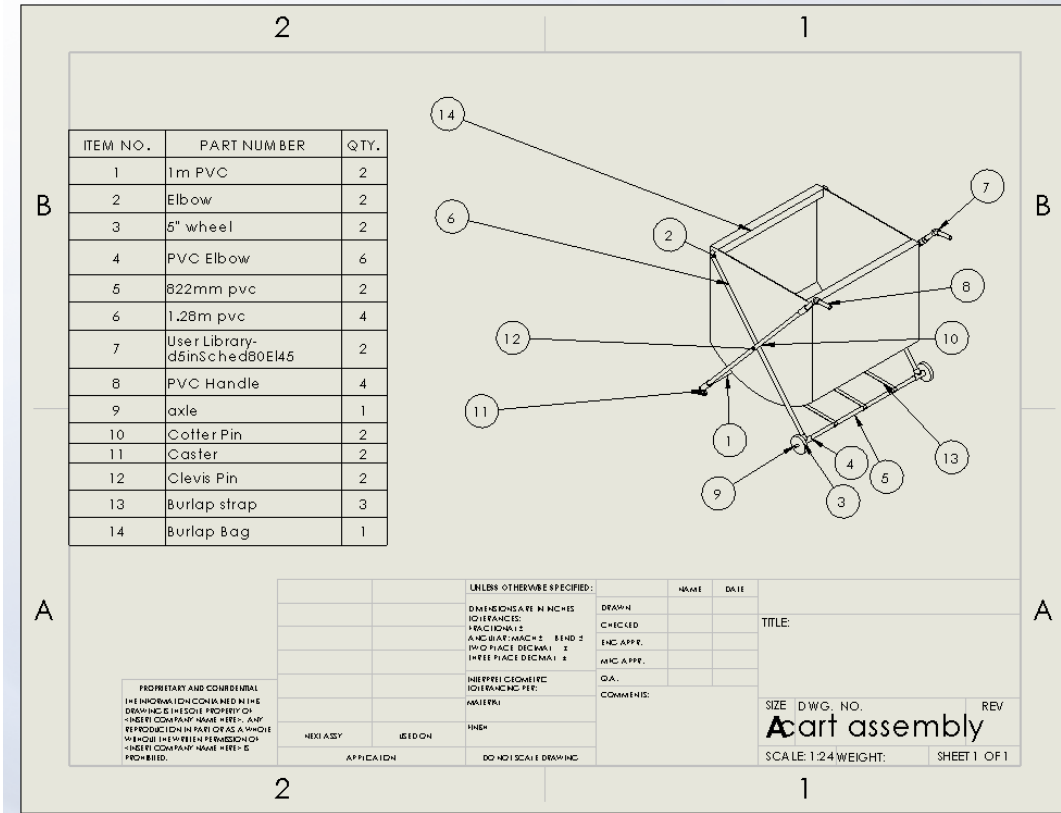
### Design Features:

- Foldable frame
- Large rear wheels
- Swiveling front caster wheels
- Tough burlap bag
- Lightweight
- Compact

### Operation Instructions:

1. Hold frame perpendicular to ground
2. Put one hand on each horizontal cross section
3. Pull apart until burlap strap is taught
4. Load with groceries





## Engineering Analysis

### Working Mechanism:

The X-Folder is a foldable shopping cart designed to be able to effectively carry groceries from store to home and be stored compactly when not in use. The main design feature is the same as in a pair of scissors. Simply put the cart is comprised of two rectangles made of PVC tubing that are connected on either side by a hinge. To limit the degree of motion of the folding sections there are straps of burlap that span the distance of the bottom sections. The bag is made from tear-resistant burlap and attaches at on two sides to the top sections of tubing. The PVC pipe and burlap fabric will keep the weight down so that the cart is easy to carry up stairs. The rear wheels are 5" in diameter and made of rubber to resist wear and easily roll over small objects and potholes. The front wheels are 2" caster wheels to make turning easier.

### Cost Analysis:

Item #	Item Description	Quantity	Cost
1	3/4" x 20' PVC pipe	1	\$7.00
2	2" x 15/16" Caster Wheels	2	\$2.17
3	5" x 15/16" Rubber Wheels	2	\$3.72
4	Formufit Inserts 1.25"	1	\$5.91
5	Burlap fabric 12ft <sup>2</sup>	1	\$3.98
6	Cotter Pin	2	\$0.53
7	4ft x 5/8" 6061 Alum. Rod	1	\$9.64
8	Aluminum Washer	2	\$0.06
9	Clevis Pin	2	\$1.29
10	Assorted PVC fittings	1	\$8.96
		Total	\$49.74

## Conclusion:

The overall purpose of the folding shopping cart was to make life easier by providing a shopping cart for people who have long walks back from the grocery store, have steps up into their homes, or their kitchen is not easily accessible through a garage. This shopping cart does just that, the big wheels in the back and small wheels in the front make walking it up the steps and on rough sidewalks much easier, and the folding cart is extremely easy to fold up and store under a bed or in a closet. The cart also features a removable, machine wash safe burlap bag making this product even better.