Tri-Wheel Technology Folding Shopping Cart

EDSGN 100: Introduction to Engineering Design
Section 15
Team 3

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Abstract (Alexa)

This report looks at the work of Stacy Arner, Joe Dunleavy, Dan McMahon, and Alexa Refosco as they envisioned, researched, designed, and created a prototype of the Tri-Wheel Technology Folding Shopping Cart. Our report includes any research, data, or drawings completed during the project timeline.

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Introduction (Joe)

Folding shopping carts are a necessity for the modern day consumer. The design for the folding shopping cart allows shoppers without cars to transport their groceries hassle free. Even those with cars can use this product because when you are finished unloading your groceries, the cart just folds up and compactly fits in your trunk space. People who do not have this form of transportation need a cart that is durable, reliable, lightweight, and compact. Luckily these are all of the specifications of the cart that has been designed. The cart even features a spinning three-wheel frame instead of just one wheel per side, making it easy to drag up or down stairs. Our cart drastically improves the lives of consumers without cars or homes nearby.

Design Task

Problem Statement (Stacy)

Many people use cars as an effective way to transport items, such as groceries, to their home. However, not all people have access to cars or the means to park a car near their residency. As a result, many people need an effective way, such as through the usage of shopping carts, to transport items to their home.

Mission Statement (Stacy)

The goal of this project is to develop a shopping cart that is easy to use, storable, cost effective, and durable for customer use.

Design Specifications (Alexa)

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 100 lbs.

Design Approach

Gantt Chart (Stacy)

Table 1. Gantt Chart

Date: / **Ideas:**	**January 27**	**February 3**	**February 10**	**February 17**	**February 24**	**March 3**	**March 17**
Gather Information							
Target Specifications							
Brainstorm							
Design Drawings							
Design Matrix							
Construct Prototype							
Test and Develop							
Prepare Report and Presentation							
Present Project							

Table 2. Gantt Chart Key

Color:	**Meaning:**
	Main Week to Work on Idea
	Extra Week to Work on Idea
	Just In Case Week to Work on Idea

Customer Needs Assessment (Stacy)

-pockets to hold small items

-fold up so it can still be pushed/pulled

-fits in the trunk of a car

-better wheels

-taller

-protective covering

Concept Generation (Stacy)

As a team, we brainstormed different ideas for the cart that we possibly wanted to include in the project by following the given outlines and taking into account the several ideas that we had received from the Customer Needs Assessment. On the following pages are some of our original designs which we thought possible to fit the design requirements.

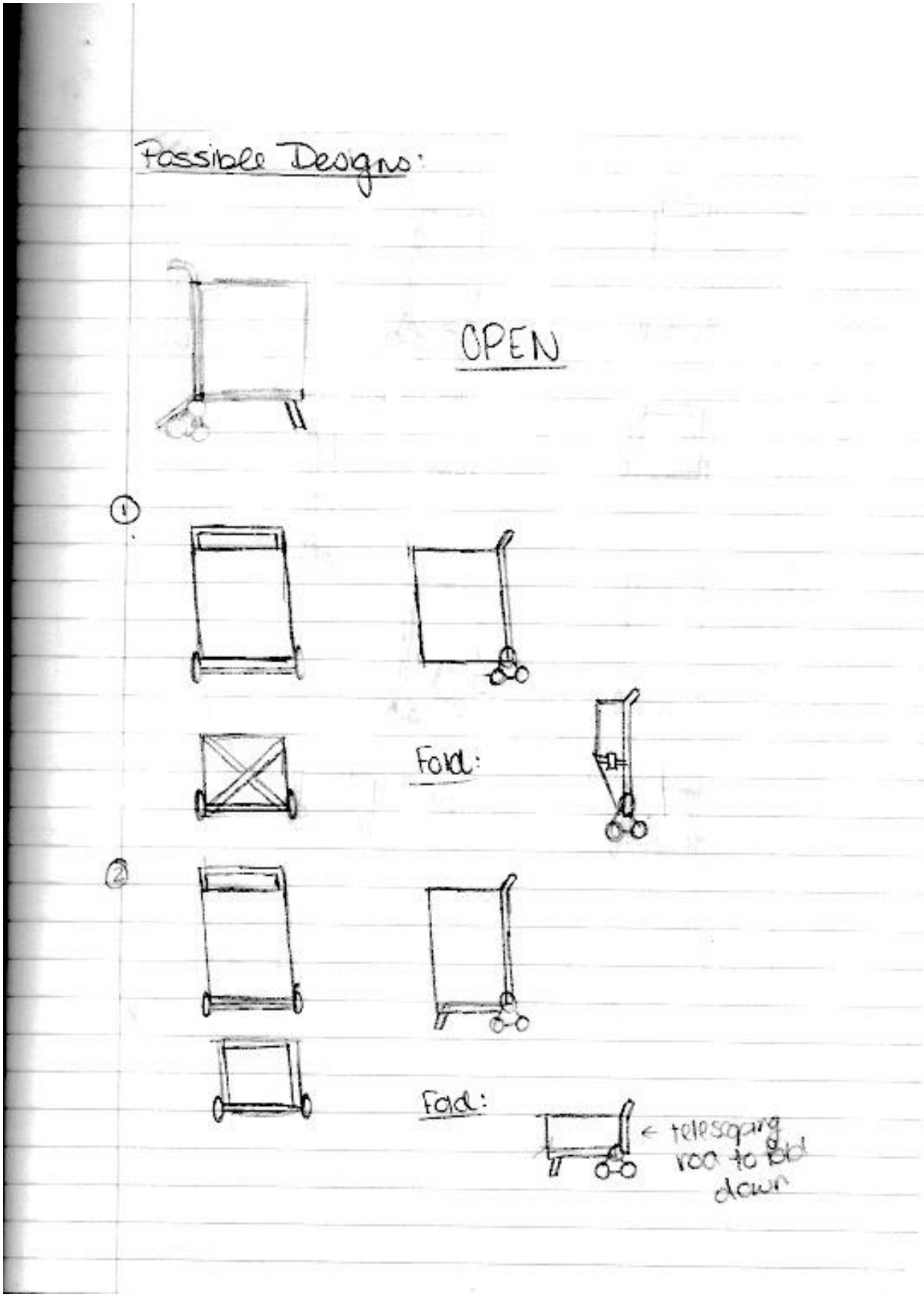


FIG 1. Possible Designs 1 & 2

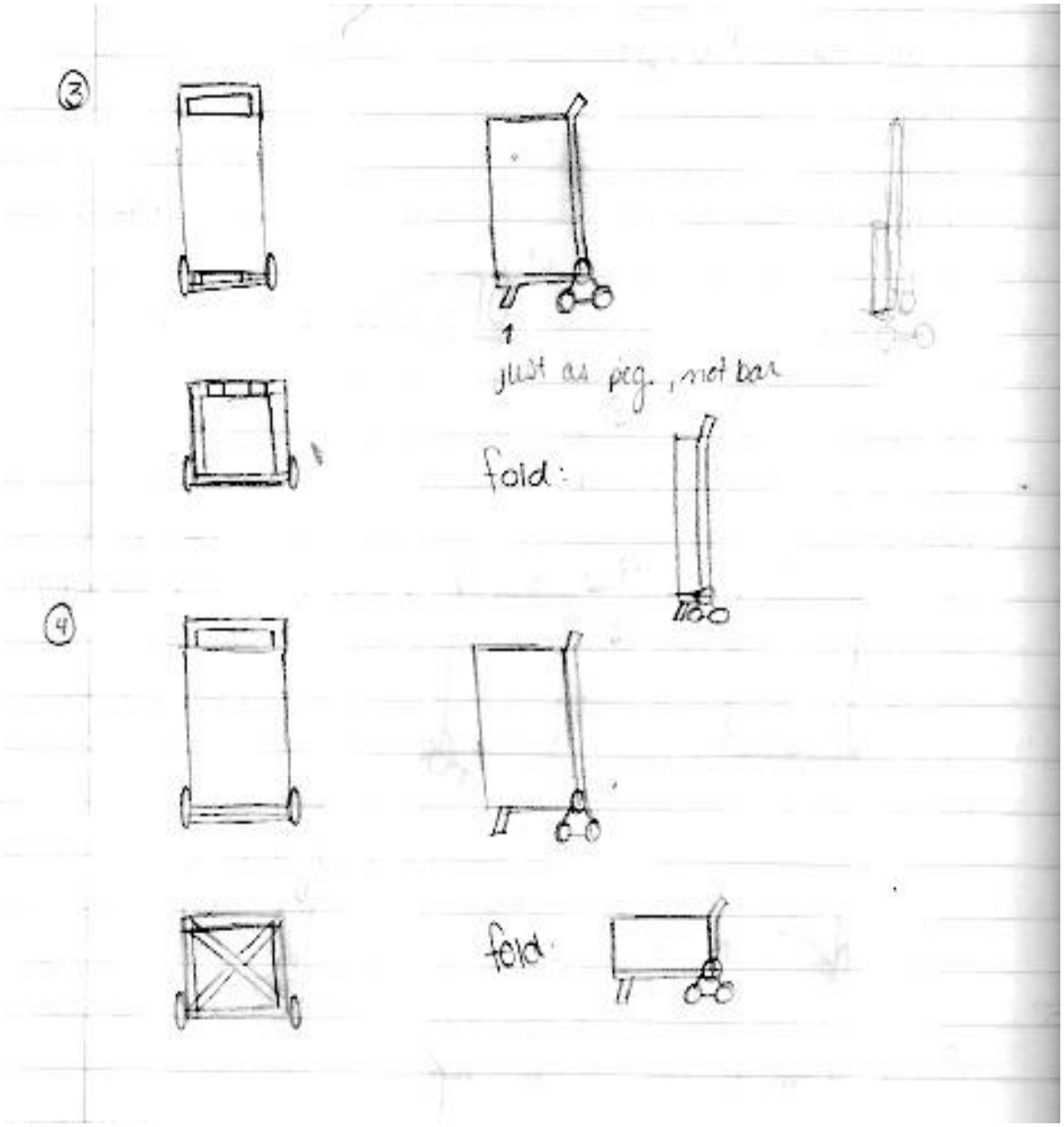


FIG 2. Possible Designs 3 & 4

We then created a design matrix which we used to rank each of our different designs. The design matrix had different criteria that were important according to the outlines of the project, and also for what we wanted our shopping cart to have. Designs were rated on a scale of 1-4, with 1 being the highest, and 4 being the lowest. The designs with the lowest scores were developed further and the designs with the highest scores were dropped.

Design Matrix (Stacy)

Table 3. Design Matrix

Criteria	**Design 1**	**Design 2**	**Design 3**	**Design 4**
Ease of Manufacturing	1	2	4	3
Ease of Use	2	3	4	1
Strength	2	3	4	1
Durability	2	3	4	1
Cost	3	2	1	4
Compact	3	1	4	1
Safe to Use	1	4	2	3
Total:	14	18	23	14

Designs 1 and 4, because they tied as the best designs in Matrix 1, were pursued further and merged into a single design as shown below.

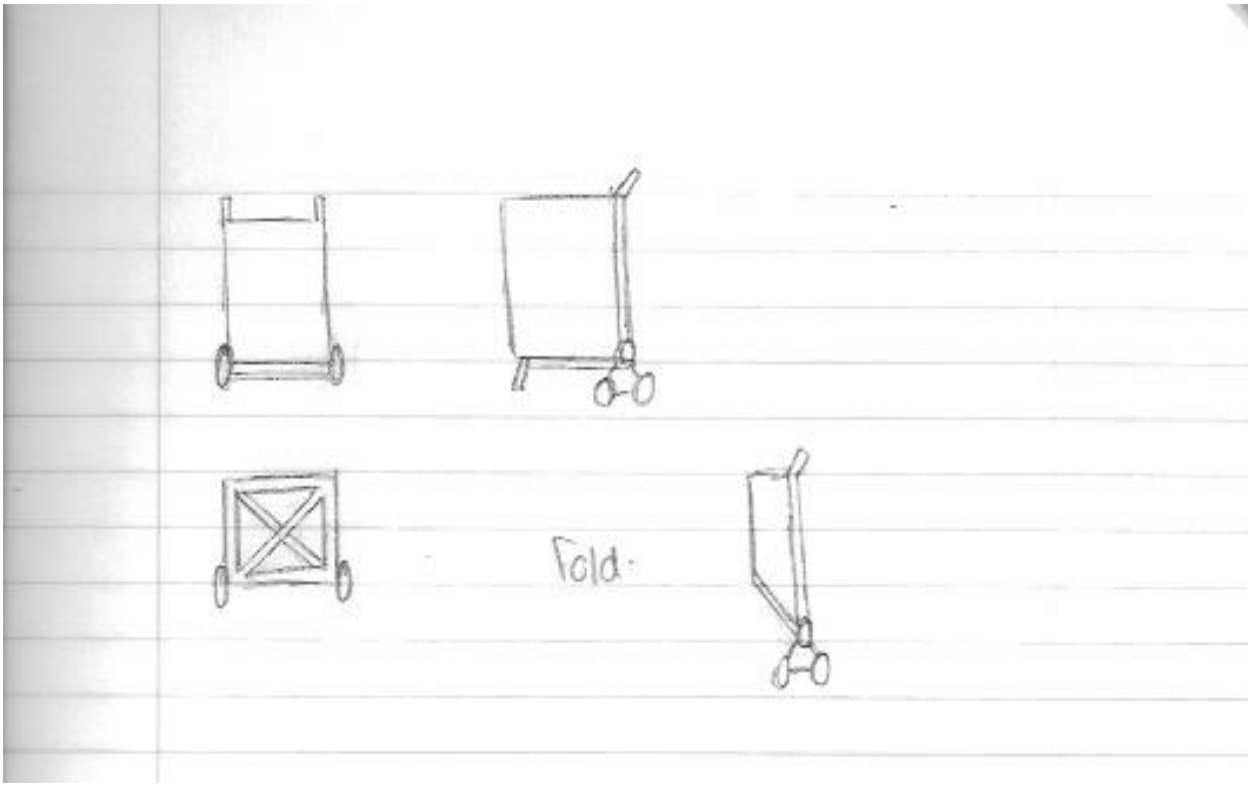


FIG 3. Designs 1 & 4 Combined

As we began to construct our working drawing, and determining the amount of materials needed to construct such a shopping cart, it was found that our budget would not be enough to use this design. As a result, we altered the design to decrease the cost of the shopping cart. This design is our final design and was used to create our working drawing, cost analysis, and prototype.

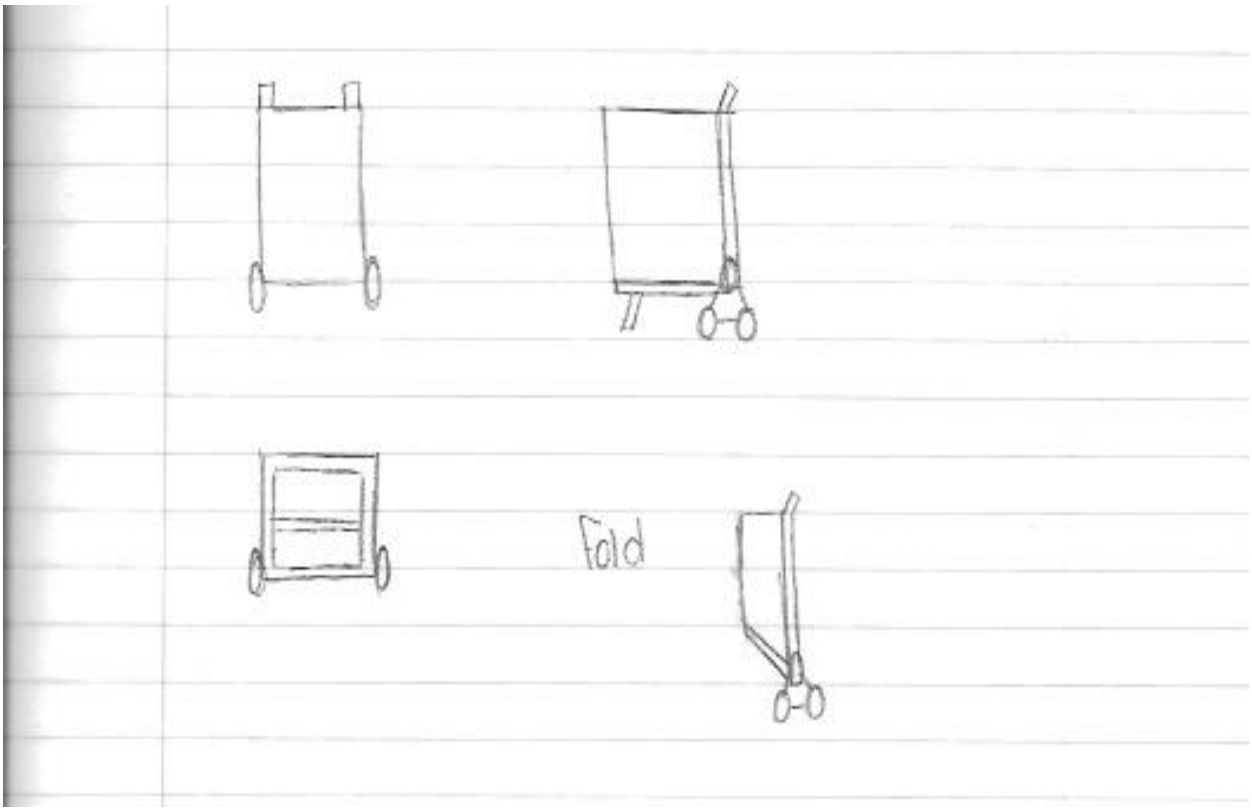


FIG 4. Final Design

Final Design

Working Drawings (Dan)

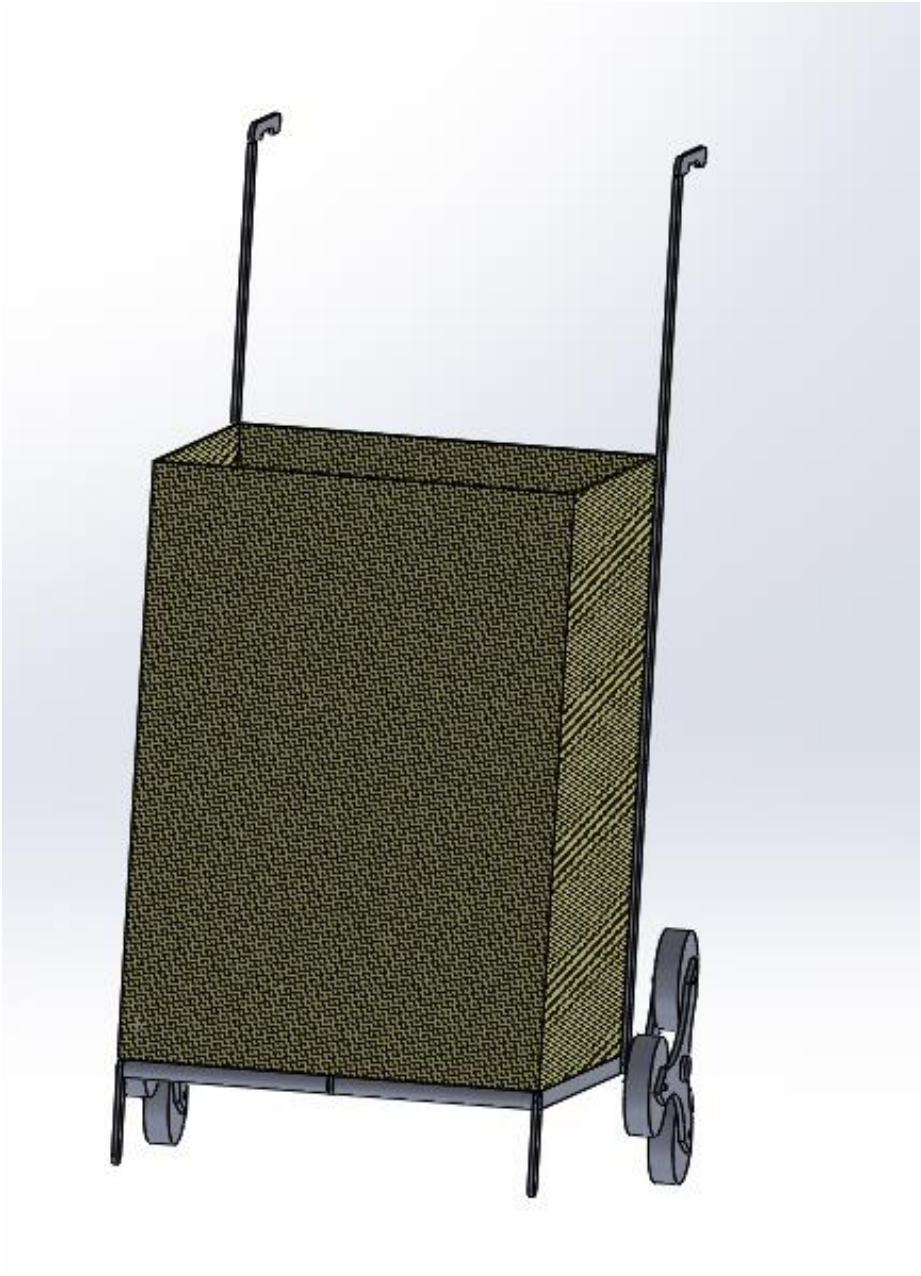


FIG 5. Tri-Wheel Technology Folding Shopping Cart

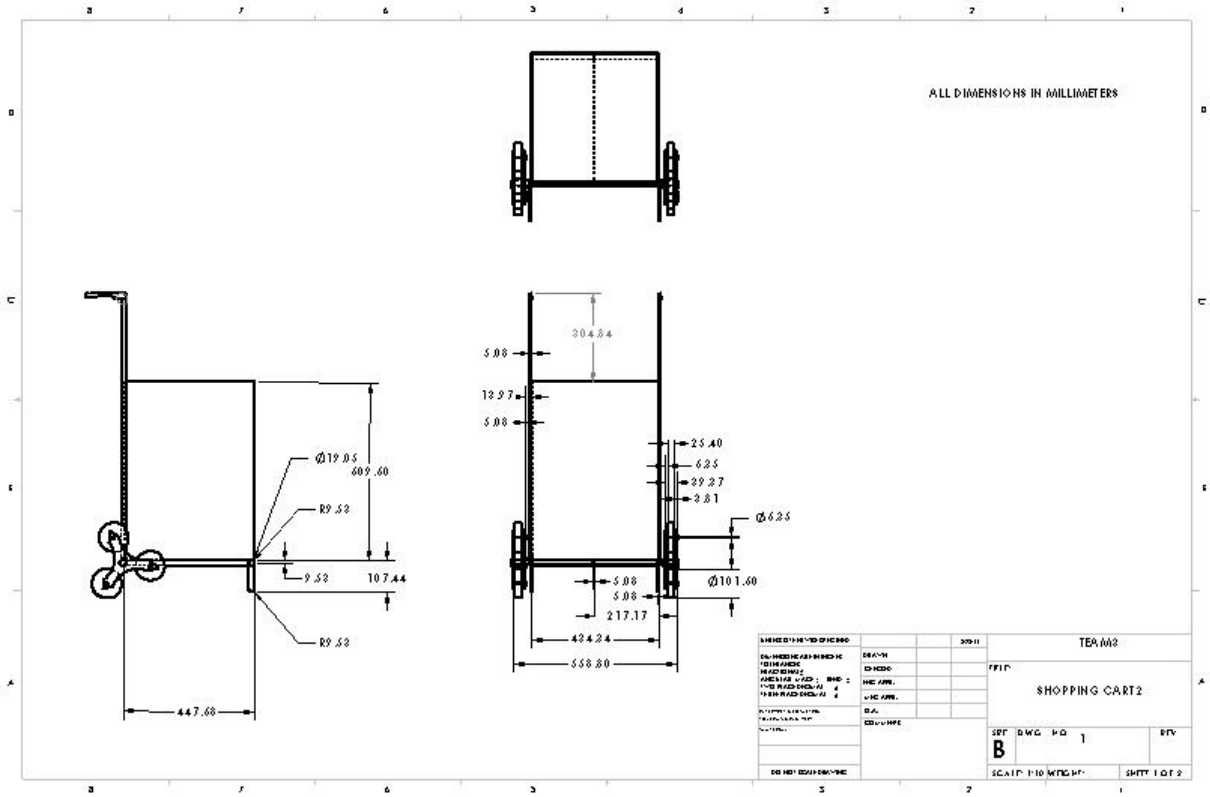


FIG 6. Tri-Wheel Technology Folding Shopping Cart Dimensioned Drawing

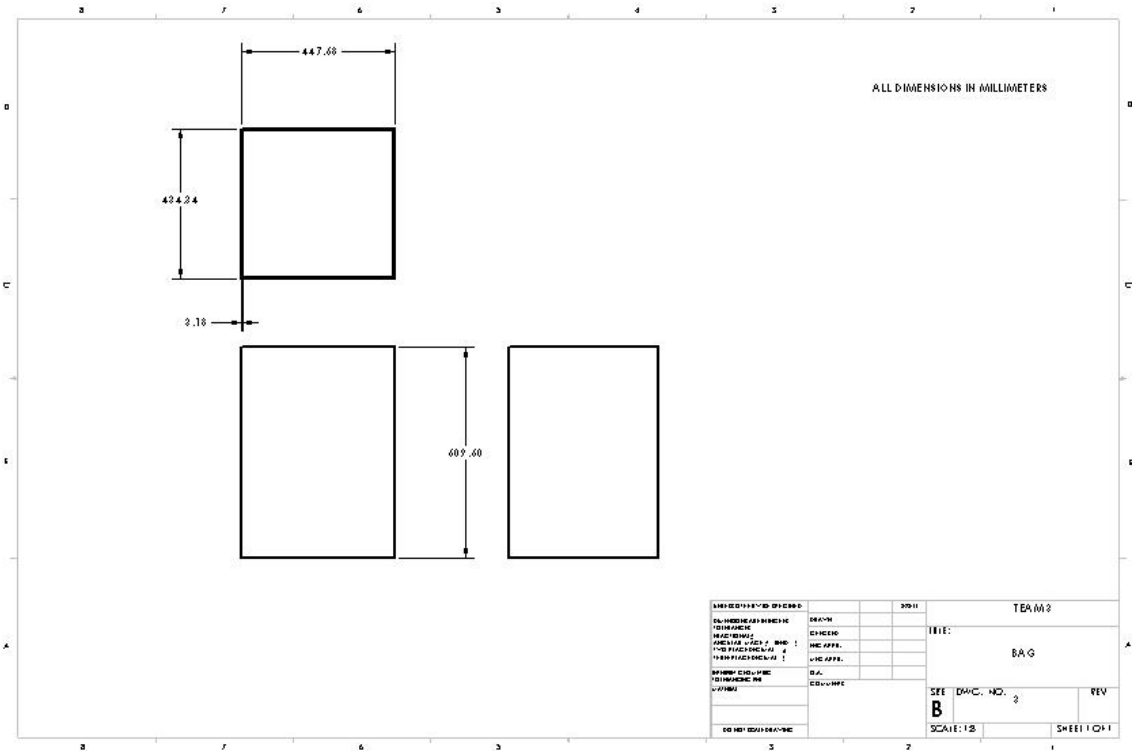


FIG 7. Bag Dimensioned Drawing

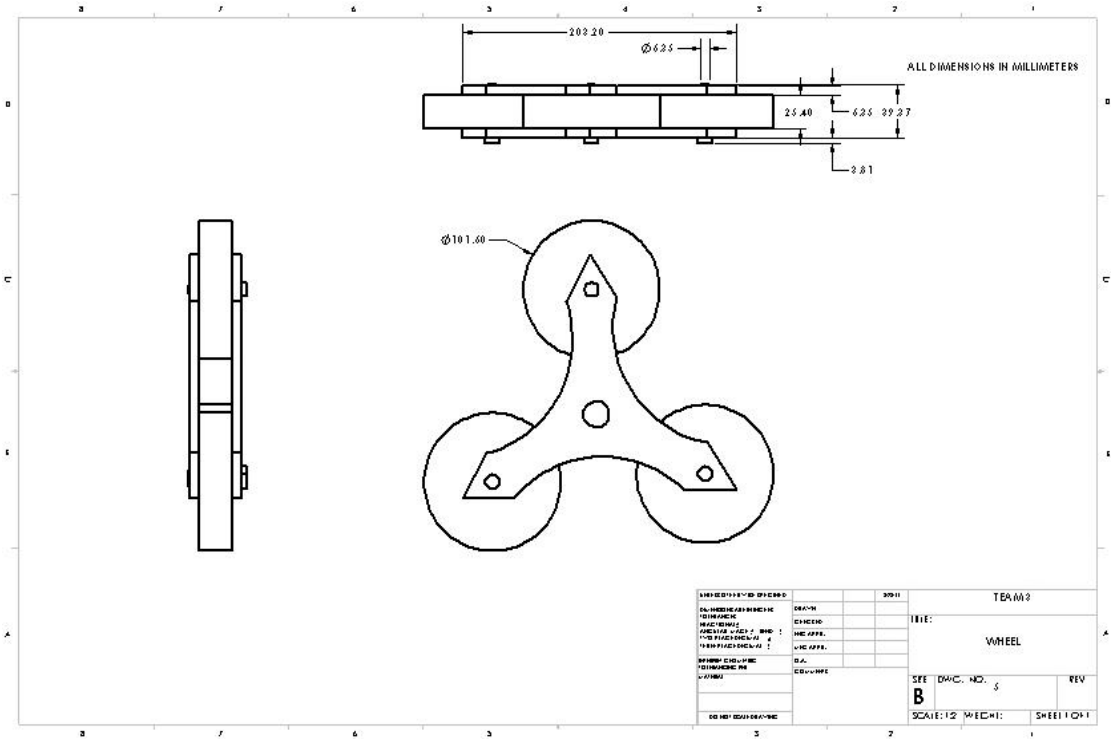


FIG 8. Tri-Wheel Dimensioned Drawing

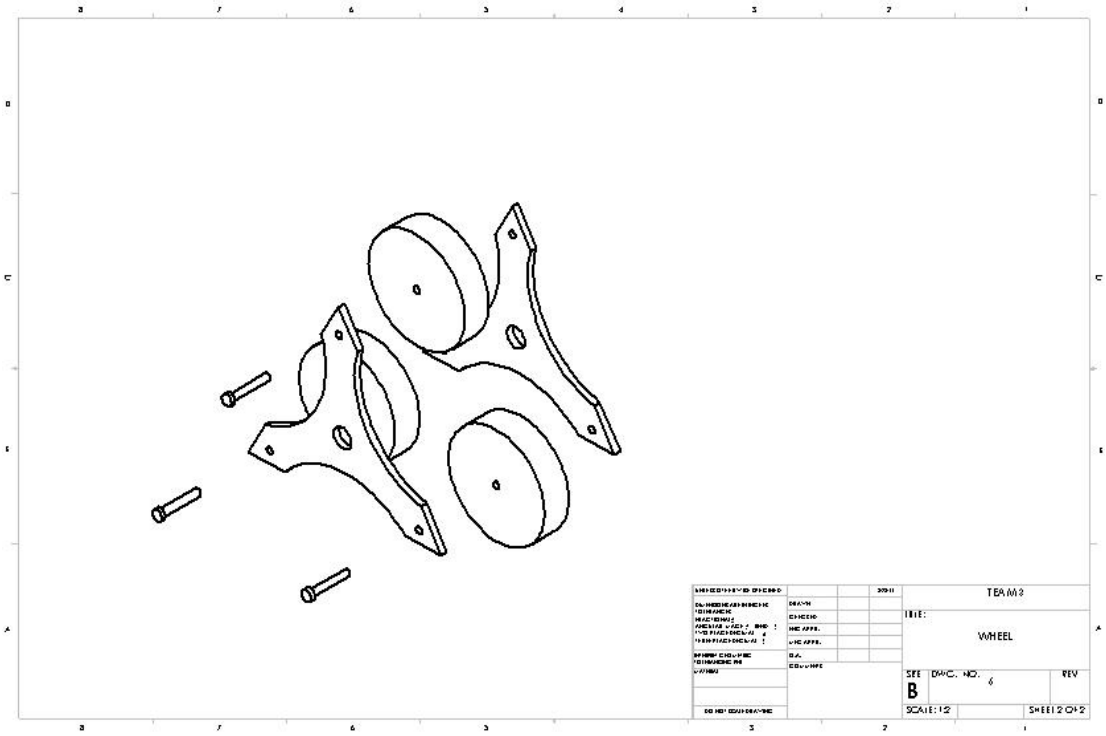


Fig 9. Tri-Wheel Exploded View

Prototype

Our prototype was scaled 1:3. Because our prototype was removed from the work room, we are unable to provide a picture. Joe and Dan built the prototype.

Design Features (Alexa)

Our Tri-Wheel Technology Folding Shopping Cart features a lightweight aluminum frame, tri-wheel tires, and durable and washable Tyvek fabric, all lending to its remarkable folding capabilities and ease of use.

Operation Instructions (Alexa)

Once the cart is properly assembled, it is able to travel up and down stairs and over many types of terrain. To fold the cart, simply pull up the base towards the handles. The bag will compact and the pegs must be pushed parallel to the base.

Engineering Analysis

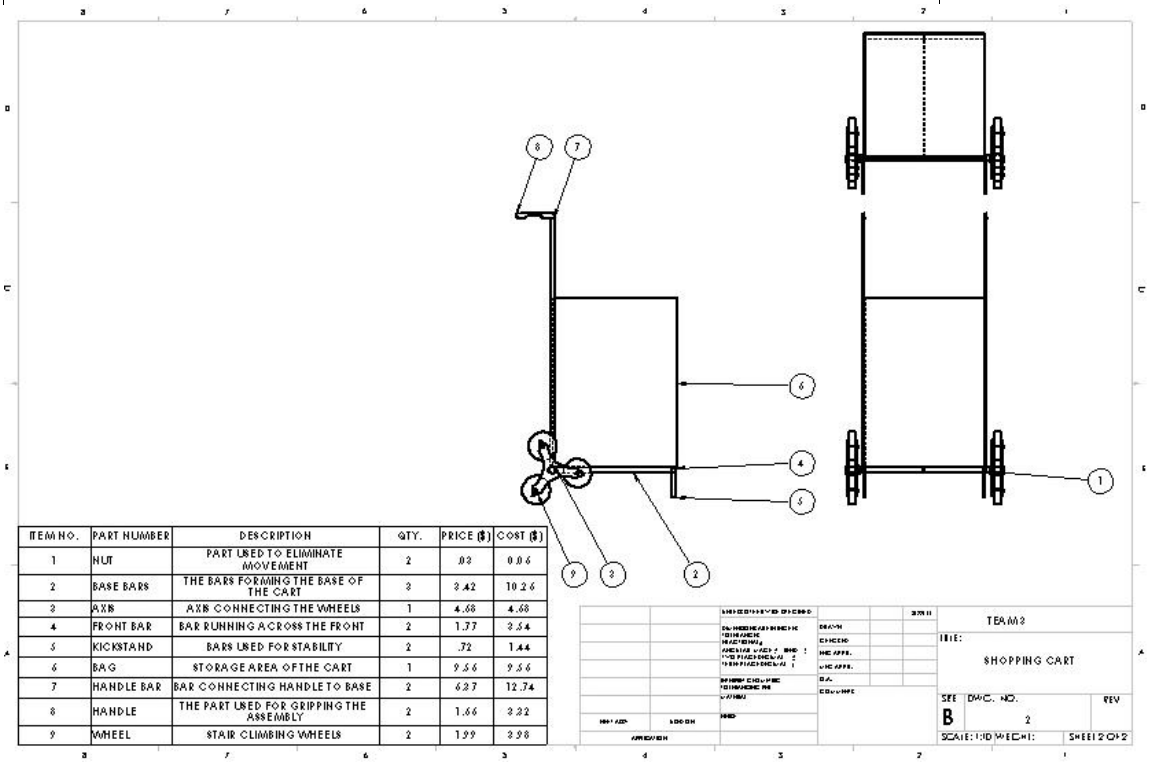
Working Mechanism (Alexa)

The Tri-Wheel Technology Folding Shopping Cart gets its name from its tri-wheel tires. As the cart is pulled up or down stairs, the platform on which the wheels are attached rotates, allowing the cart to smoothly ascend or descend without jostling the goods within the bag.

Cost Analysis (Stacy)

Table 4. Total Cost

Item:	**Price ($):**	**Quantity:**	**Cost ($):**
Tri-Wheel Tire	3.99/pair	1 pair	3.99
Aluminum Pipe- Outer Diameter of 0.75”	2.57/foot	14 feet	35.98
Lightweight Tyvek Fabric- 60” wide	2.73/foot	3.5 feet	9.56
Nut	0.03	2	0.06
Total Cost:			$49.59



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	PRICE ($)	COST ($)
1	NUT	PART USED TO ELIMINATE MOVEMENT	2	.03	0.06
2	BASE BARS	THE BARS FORMING THE BASE OF THE CART	3	3.42	10.26
3	AXIS	AXIS CONNECTING THE WHEELS	1	4.68	4.68
4	FRONT BAR	BAR RUNNING ACROSS THE FRONT	2	1.77	3.54
5	KICKSTAND	BARS USED FOR STABILITY	2	.72	1.44
6	BAG	STORAGE AREA OF THE CART	1	9.56	9.56
7	HANDLE BAR	BAR CONNECTING HANDLE TO BASE	2	6.27	12.74
8	HANDLE	THE PART USED FOR GRIPPING THE ASSEMBLY	2	1.66	3.32
9	WHEEL	STAIR CLIMBING WHEELS	2	1.99	3.98

FIG 10. Bill of Materials

Conclusion (Alexa)

Our group was given the task to create a foldable shopping cart for less than $50. Not only did we design a lightweight, durable, maneuverable, folding cart, but we revolutionized the way carts should be built. The Tri-Wheel Technology Folding Shopping Cart combines a sleek design with its straight-forward folding mechanism to cater to those who do not have easy access to grocery shopping.

References (Alexa)

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