Project Armadillo

A Safe, Portable Ramp

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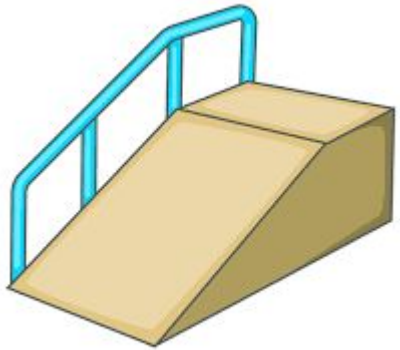
Introduction

There are thousands of people with disabilities who are unable to pursue their dreams due to their limitations.

Our project is to ensure that everyone has a source of accessibility and an equal opportunity to do what they love regardless of their struggle.



Customer Needs

Safety

- Ensuring safety by adding a hand rails on both sides of the ramp
- Needs to able safety handle a load 500lbs
- Weather resistant
- Tracktion

Portability

- Light weight
- Components of the ramp should to be detachable
- Our ramp also folds
  - Ensure quick assembly times

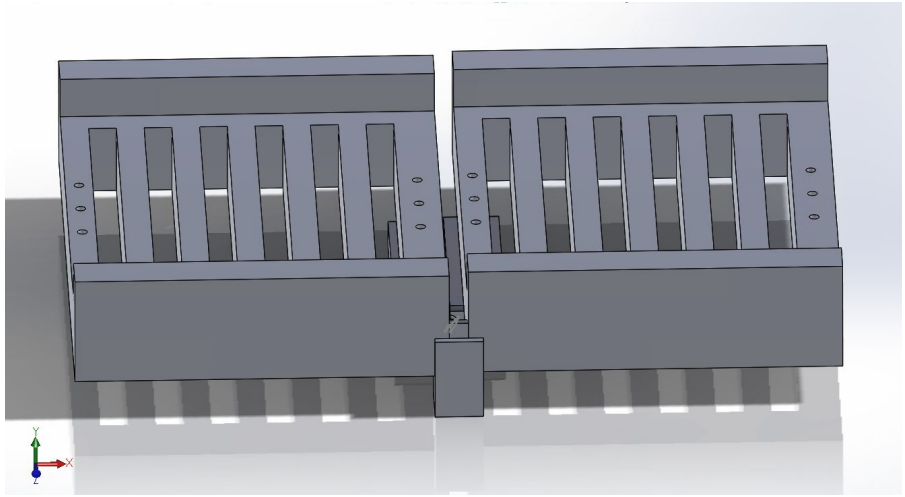
Overall allows ease of transport and storage

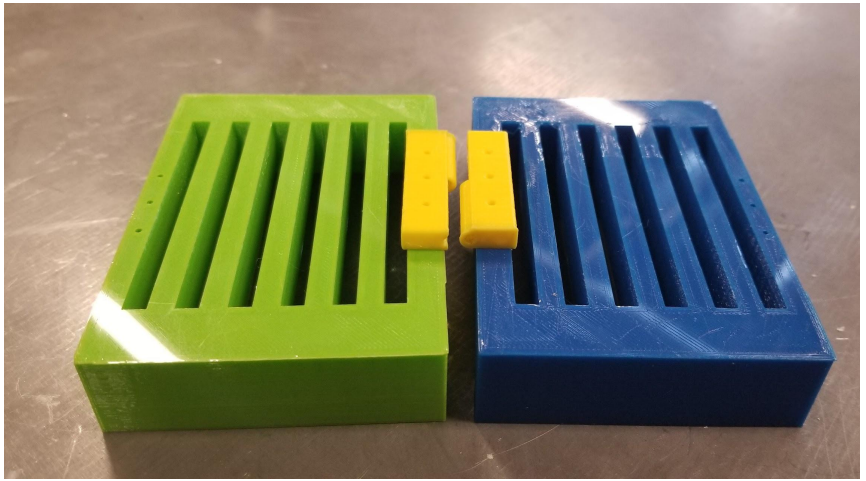
Define

Problem Statement:

Our client needs a portable, cheap and secure ramp for people who have various forms of disabilities as there are not accessible ways for them to go up and down stairs in various types of buildings / homes.

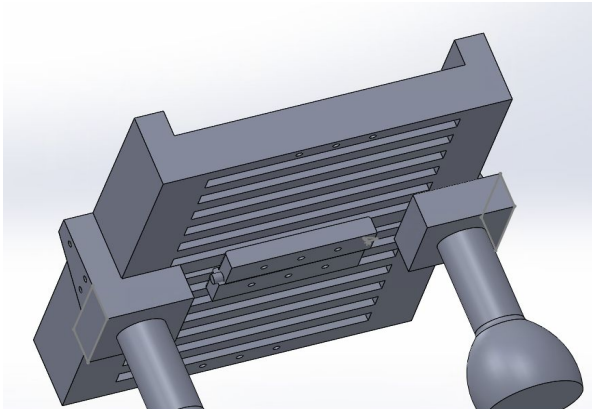
Ideate - Prototype 1

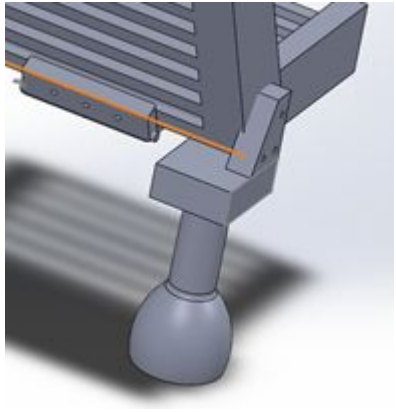


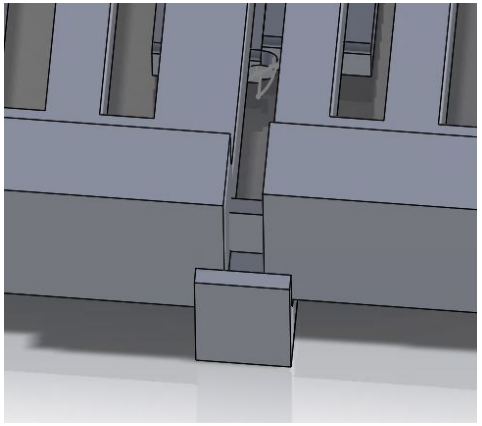


Testing Communication

Ideate - Prototype 2



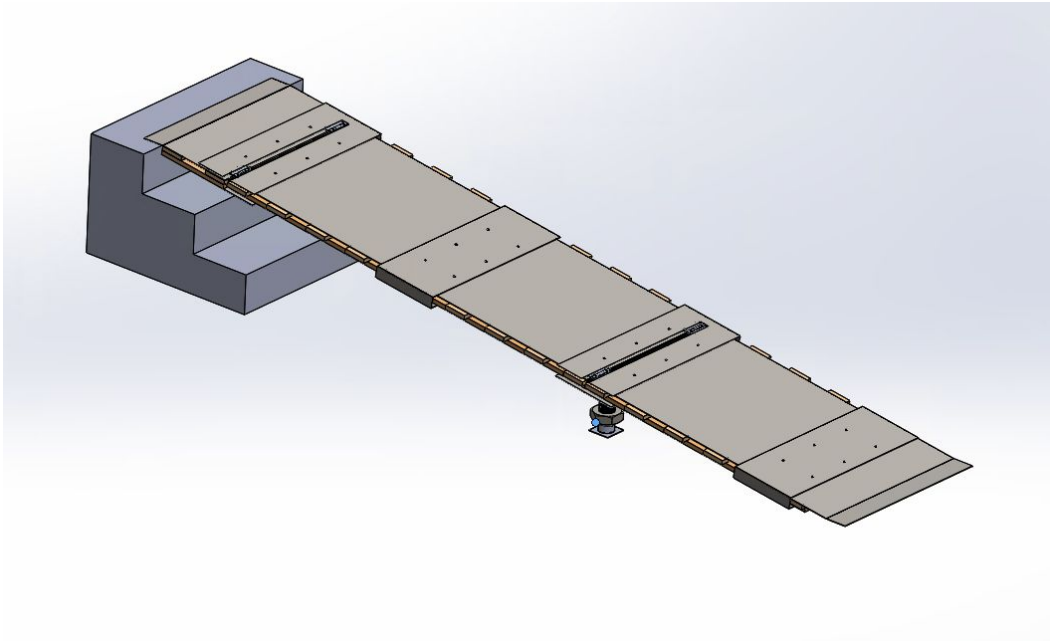




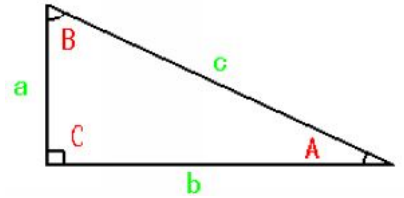
Adjustable Legs, Support System

Locking Mechanism

Ideate - Final Prototype 3



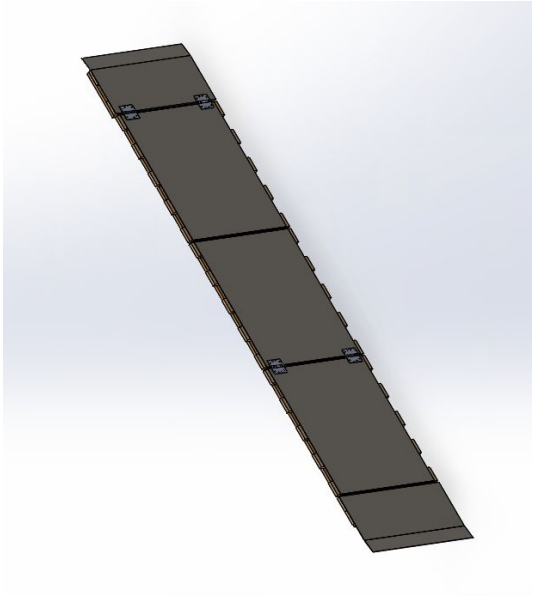
Ramp on 3 steps standard stairs

- 

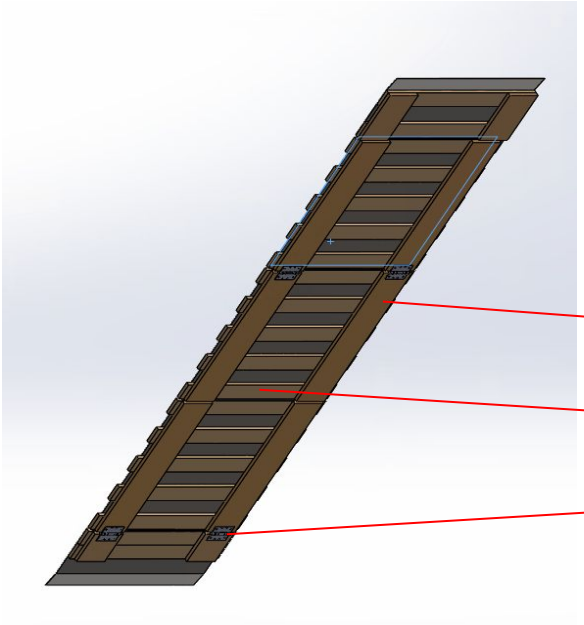
  A=8.2 degree
  a=54 cm, b= 376cm, c=380cm

- Testing: tried with more adjustable legs.

Ideate - Final Prototype 3



Top surface

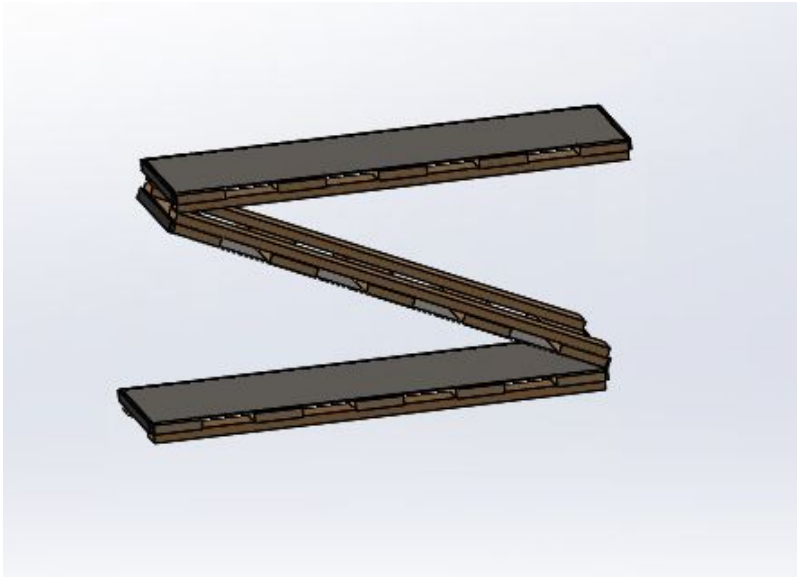


Bottom surface

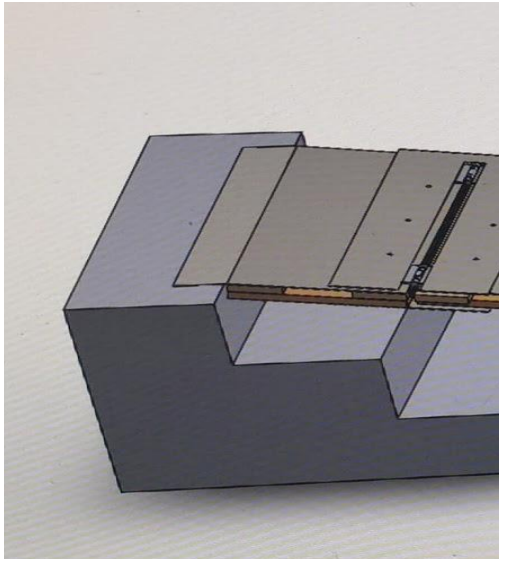
Ramp Platform

- Metal plates
- Wood support
  - 2*4*8
  - 2*6*8
- Hinges

Assembly / Disassembly

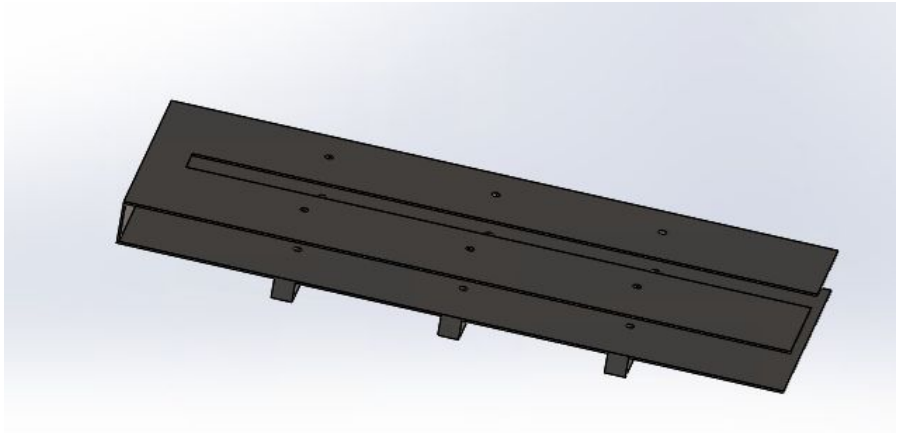


80cm x 95cm x 20cm



Last step

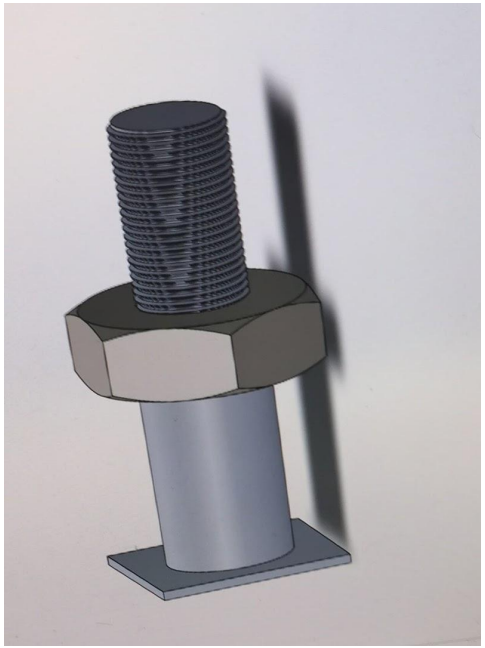
Ideate - Final Prototype 3

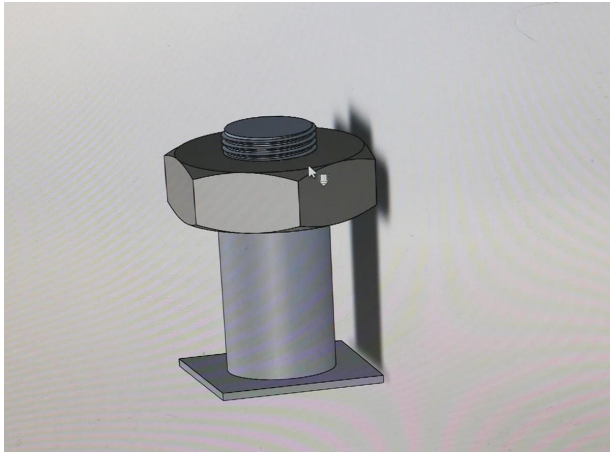


Locking Mechanism

- C-Shape
- Slot
- Beam (weld)
- Size
  - width - 80 cm
  - Length - 30 cm

Ideate - Final Prototype 3





Adjustable Leg

- 3 sizes

3 Parts

- Base
- Nut
- Shaft

Additional Features

- **Handrails**
  - 2 sizes
- **Alarm Button**
  - Discrete

Target Specifications

Metric	Marginal	Ideal	Prototype 3
Cost of ramp (CAD)	$400	$100	$176
Width of the ramp (cm)	72cm	75cm	80cm
Angle of ramp when at 3 steps (°)	9.5°	4.8°	8°
Weight supported (Newtons)	2250N	3340N	2500N
Length of time to set up/take down (Minutes)	30 min	10 min	(unknown)

Decision matrix & chosen solution

	Weight	Foldable ramp	Rolled ramp
Portability	3	Quite portable	Quite portable
Cost	4	Inexpensive (for a ramp)	Quite expensive
Mass of Ramp	2	Fairly light for a ramp	Heavy
Ease of setup	3	Somewhat challenging	Incredibly easy
Safety	5	Very safe	Very safe
Reliability	4	Fewer breaking points	Lots of moving parts
Total		10	3

Benchmarking

Advantage:

- Portability
  - Size of the ramp / rolling mechanism
  - Ease of transport through carrying handle
- Quick assembly

Disadvantage:

- Very heavy

Feasibility Study

Technical:

- Solidworks
- Physical Prototypes

Economic:

- Prioritization of material needed
- ‘Dumpster Diving’

Legal:

- Inspiration issues
- Engineering standards

Operational:

- Flexible time schedule
- Financial Constraints

Scheduling:

- 6 hours outside of class
- Someone responsible for each deliverable

Economics

Net Present value

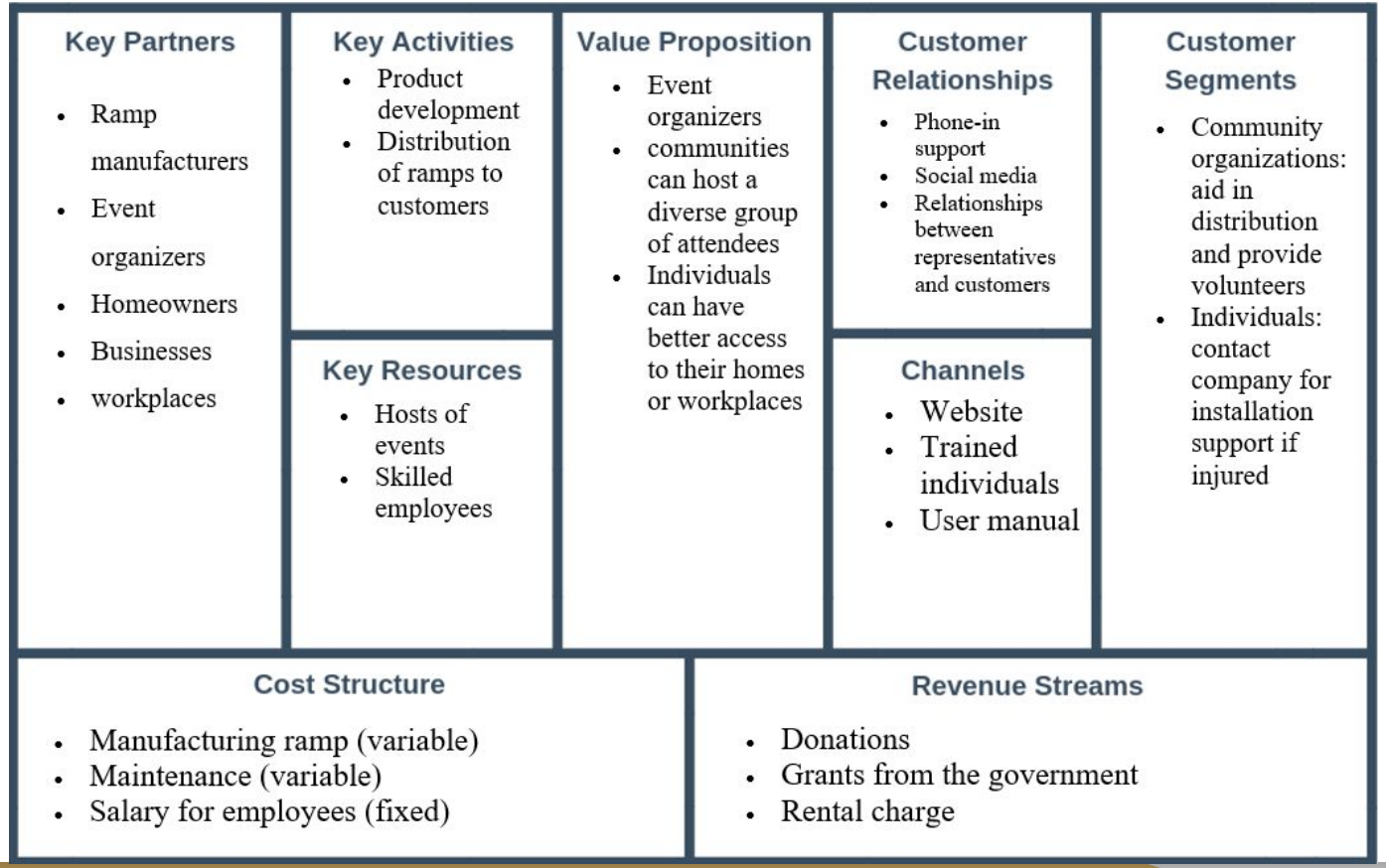
- Total project value cash flow in Today's market
- Accepted value for project was met

Net Future Value

- Total project value cash flow in a future market as economy has inflation
- Aiming at lower product cost

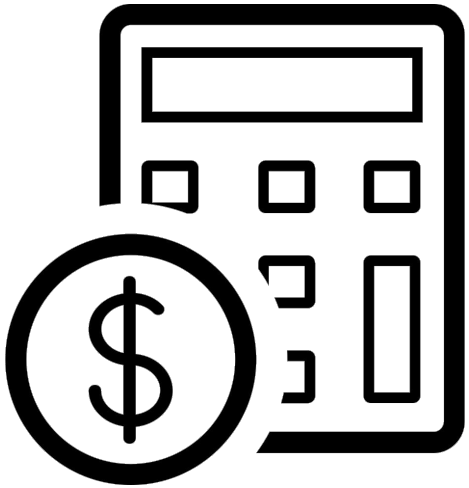
Total initial cost	$ 672,200	Accepted
Total fixed cost	$1,459,200/year	Accepted
Total variable cost	$940,000/year	Accepted
Price for consumer	$700/ramp	Accepted
Profit	7,500,000	

Business Model Canvas



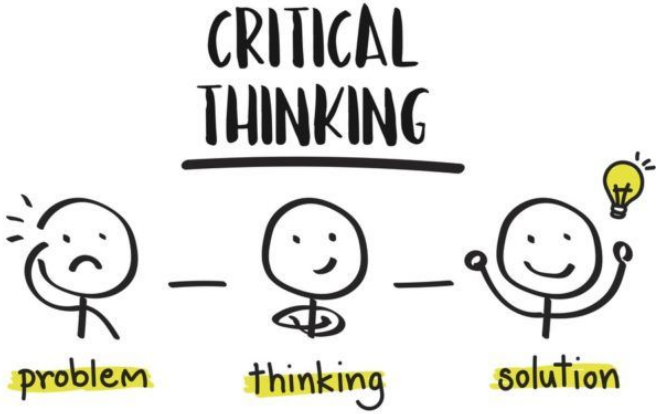
Future Work

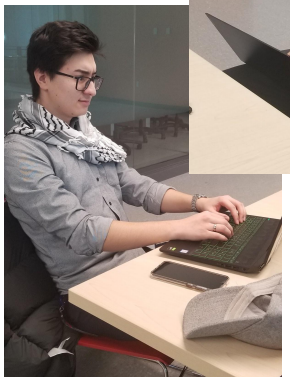
- Upgrade and enhance the design
- Applying for patent
- Establishing partnership
- Re-evaluating costs
- Advertising & outreach

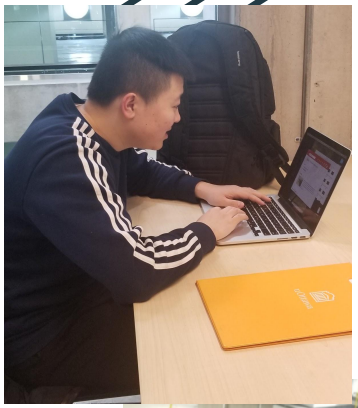


Lessons Learned

1. Teamwork and communication
2. Critical thinking
3. Problem solving
4. Budget managements
5. Adaptivity to resources







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Thank you for listening!