
Speed PLOW

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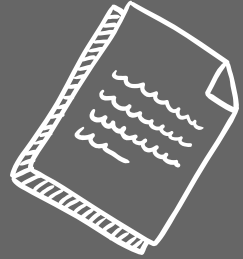
Project final presentation

GNG 2101 - Introduction to Product Development & Mgmt for Engineers & Computer Scientists

Overview



- The client: Is suffering from Cerebral Palsy which was diagnosed 10 years ago. He has **limited motor skills** and is currently in an electric wheelchair.
- Instead of staying inside all winter, he would like to go outside and shovel his driveway.



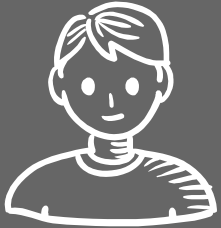
Overview

Problem statement:

Innovating an **interchangeable**, **lightweight** product, that allows the client to plow snow while remaining in his wheelchair without any need of assistance.

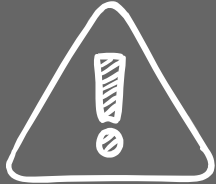
Customer Needs

The wheelchair plow is...



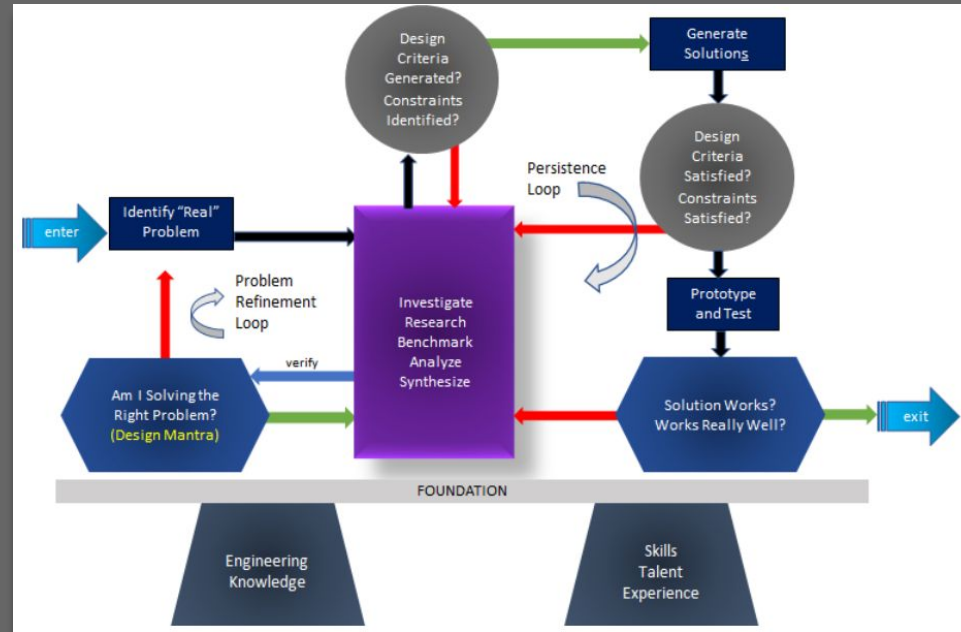
- **Interchangeable** from one electric wheelchair to another.
- **Portable** (carryable by 1 person).
- Able to **raise** when not plowing to avoid obstacles.
- **Rigid and waterproof.**
- **Able to fit through the front door.**
- **Easy to install.**

Major design Challenges

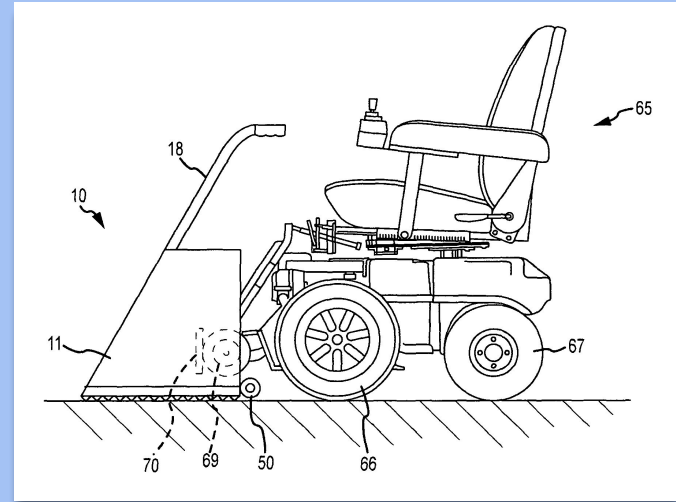


- Accomodation for client's limited **motor abilities** and **strength**.
- Plow has to be **interchangeable**.
- Limited **budget**.
- Little experience with **manufacturing**.
- Always ensuring **safety** of end user.

Design process - Iterative design



Design process - Benchmarking



Design process - Benchmarking

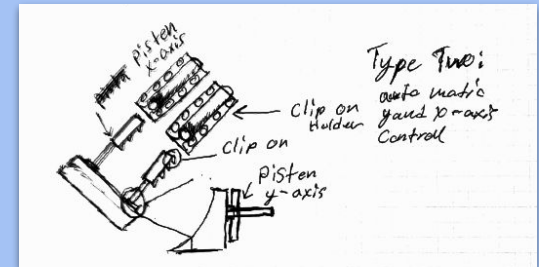
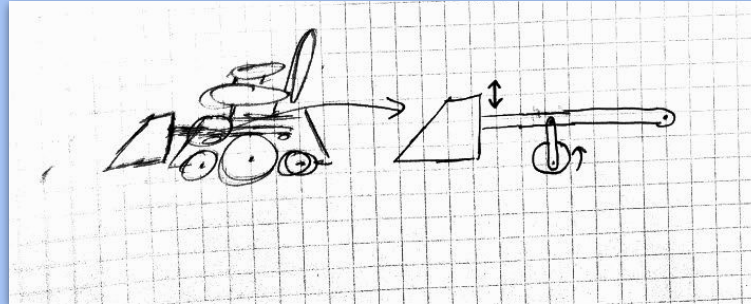
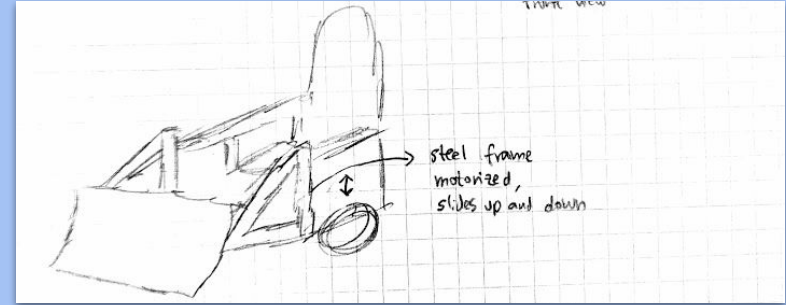
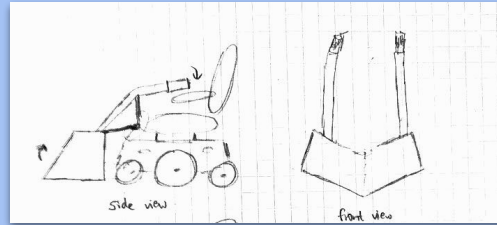


Design process - Target specs.

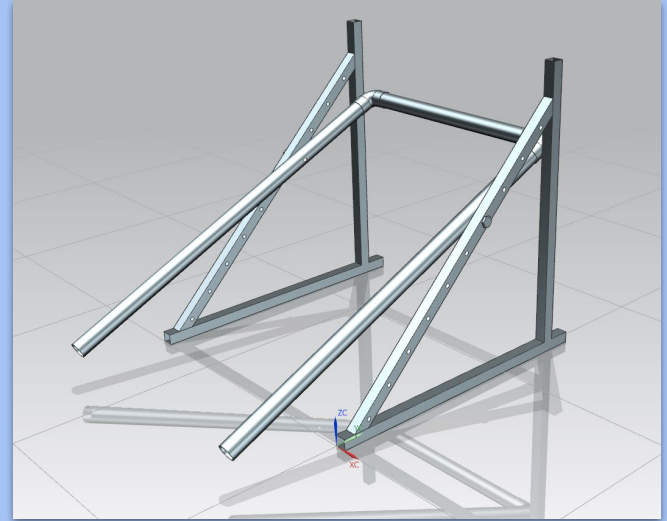
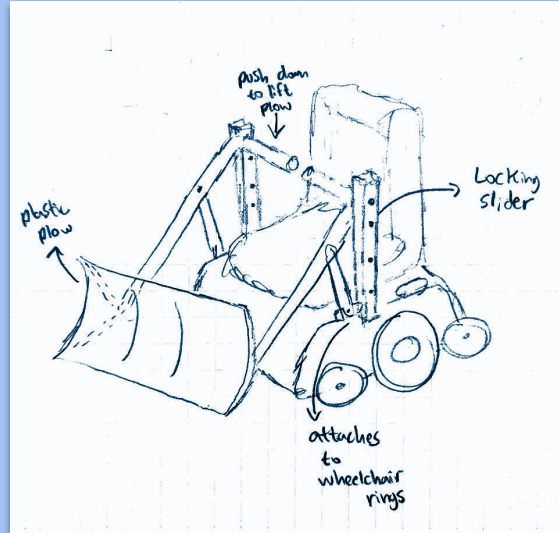


#	Need #	Metric	Units	Marg. value	Ideal value
1	6	Plow width	in.	> 33	< 30
2	5	Rigidness	GPa	> 150	> 200
3	2	Plow total mass	kg	< 30	< 20
4	8	Wheel traction	N	< 26	< 29
5	8	Wheel size	cm	<45.72	<61
6	7	Time to assemble plow	s	< 500	> 300
7	3	Motor torque	N-m	4.45-0.3048	4.45-0.3048
8	3	Plow angle	degree	<55	>65
9	4	Raised distance to ground	cm	<1	<1
10	1	Plow component dimensions	cm	<45.75	<53.34
11	10	Aesthetics	rel.		
12	9	Blinker light brightness	cd	< 400	< 600
13	5	Corrosion resistance	material	Steel	Poly

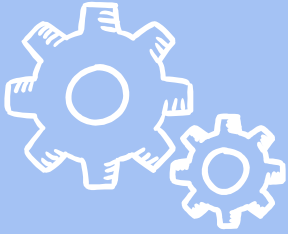
Design process - Prototyping



Design process - Prototyping



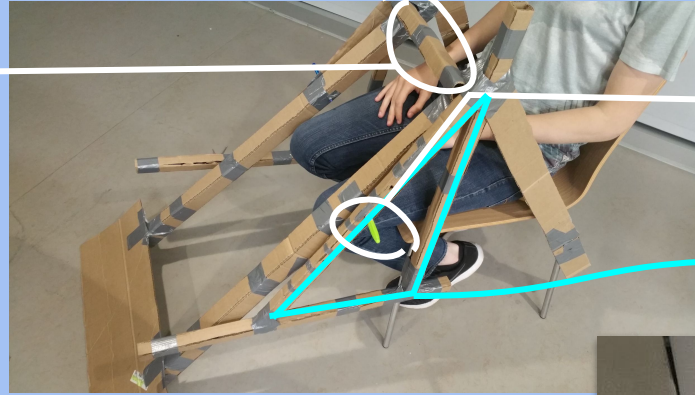
Design process - Prototyping



Handlebar

Pin joint
attachment

Truss

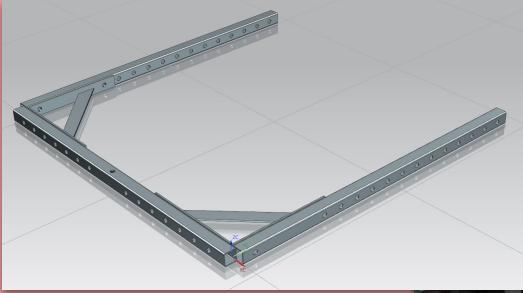


Client feedback

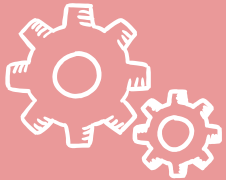


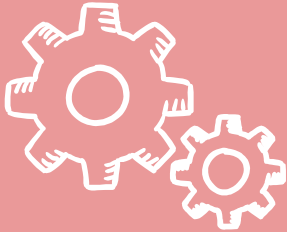
- The handle mechanism has to be easy to operate and light on the arm.
 - Later deemed that handle mechanism was too much of a hassle for our client, **not viable**.
- Investing in snow tires is desirable.
- Preferable that shovel has steel edge.

Second prototype - testing



- Can plow snow
- Shovel twists too much
 - Solution: Weld supports and bolt on shovel handle
- Difficult to get through bumps w/o lifting mechanism
 - Solution: side attachments!



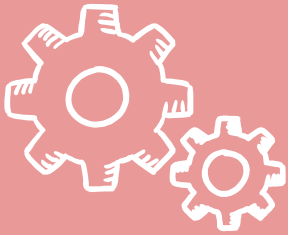


Final prototype

- ✓ Lightweight
- ✓ Interchangeable
- ✓ Able to use without user exerting any force
- ✓ Easy to install
- ✓ Rigid and weatherproof
- ✓ Aesthetic design



Final prototype



- Can plow snow!

Cost breakdown



Item no.	Description	Supplier	Quantity	Unit price	Net price
1	Snow Joe Edge 26" snow shovel	Amazon.ca	1	\$30.99	\$30.99
2	Steel square tube 1" x 1/16" x 120"	Metal Supermarkets	1	\$23.23	\$23.23
3	6" zinc plated corner brace	Home Depot	2	\$3.20	\$6.40
4	zinc-plated U-bolt	Lowes	2	\$5.99	\$11.98
5	5/16" x 2" hex bolt	Home Depot	8	\$0.49	\$3.92
6	5/16" hex nut	Home Depot	8	\$0.15	\$1.20
7	5/16" locking washer	Home Depot	8	\$0.50	\$4.00
8	1/2" x 2" hex bolt	Home Depot	1	\$1.05	\$1.05
9	1/2" flat washer	Home Depot	1	\$0.39	\$0.39
10	1/2" hex nut	Home Depot	1	\$0.43	\$0.43
11	1/4" hex nut	Home Depot	12	\$0.12	1.44
12	1/4" Round head screw	Home Depot	12	\$0.57	\$6.84
13	1/4" Flat head screw	Home Depot	4	\$0.81	\$3.24
14	Steel Coat Paint	Home Depot	1	\$8.47	\$8.47
15	1*1*0.12 HR Steel tube	Brunsfeld	1	\$3.86	\$3.86
16	1/8" x 2" x 4" CR steel bar	Brunsfeld	0.33	2.83	\$0.93

SUBTOTAL	\$107.44
TAXES	\$13.47
TOTAL	\$120.91

Canvas Business Model



Key Partners

- Pimpmychair.com
- Steel and plastic manufacturers
- PerMobile

Key Activities

- Developing the website
- Manufacturing plows
- Marketing

Key resources

Advertisements on
pimpmychair.com

Value Proposition

- Fulfilling disabled people's aspirations by allowing them to plow snow in the winter.
- Access to an excellent quality product guaranteed to last.
- Cheap cost compared to other alternatives

Customer relationships

Automated services

Community

Channels

- Canada Post
- UPS
- Pimpmychair.com
- Our website

Customer segments

- People in wheelchairs who live in areas where it snows.
- Disabled hobbyists.

Cost Structures

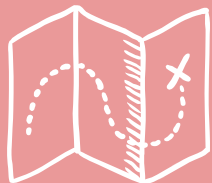
Web Hosting Costs
Product Development
Manufacturing

Marketing and Sales
General and Administrative

Revenue Streams

Product sales

Lessons learned and next steps



- Working around **limitations** is a big challenge, but yields the most **creative** results.
- When in doubt, just **build it** and **test it**.
- Small-scale manufacturing is expensive!.
- Good **communication** (team and client) is key.

Next steps:

- Get client to test our prototype, get feedback
- Continue improving design
- Small-scale business?

Thank you!

Q&A





SlidesCarnival icons are editable shapes.

This means that you can:

- Resize them without losing quality.
- Change fill color and opacity.

Isn't that nice? :)

Examples: