GNG 2101 Deliverable C

Deliverable C: Conceptual Design, Project Plan, and Feasibility Study

Submitted by

GNG 2101 Lab Section D2, Team D5

Magdalena Richardson, 7231925

Josiah Bigras, 300125987

Victoria Hough, 300136908

Osilama Oyageshio, 300066418

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University of Ottawa

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1 Introduction

This project aims to improve the lives of our client Erica and her husband Fahad by creating a lightweight walker that can be easily transported in and out of their car with one hand. In previous deliverables, we have determined that this walker must be sturdy, collapsible, lightweight, and able to brake and stop.

This document has two main sections. The first section, "Conceptual Design", outlines the design process that we followed to create our initial holistic concept for this project. We include the conceptual designs that we came up with individually. We then present our design and include a description of how it compares with our product target specifications.

The second section, "Project Plan and Feasibility Study", outlines our projected tasks that we will need to be able to complete this project on time, as well as examines the realistic likelihood of our team finishing this project in the allotted time using the TELOS method.

This document does not contain a projected BOM, however in our "Conclusion and Next Steps", we do include some preliminary research into the materials that we would like and some potential suppliers.

2 Conceptual Design

This part of the document guides the reader through the design process that our team used to determine our idealized final product. We started with functional decomposition of our product, wherein we broke down our product functionality into simple tasks. This broke our walker into four subsystems which we brainstormed in depth. After evaluating our concepts, we were able to come up with a final design that will guide the rest of our semester.

2.1 Functional Decomposition

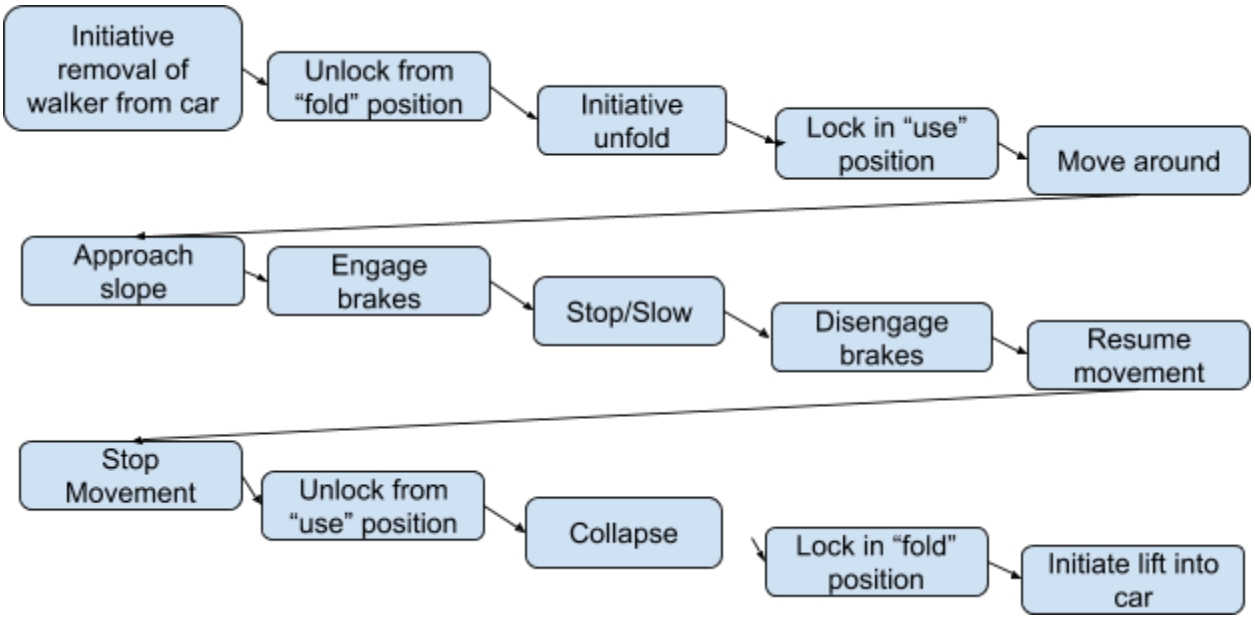


Figure 1: High-level functional decomposition of our final walker design.

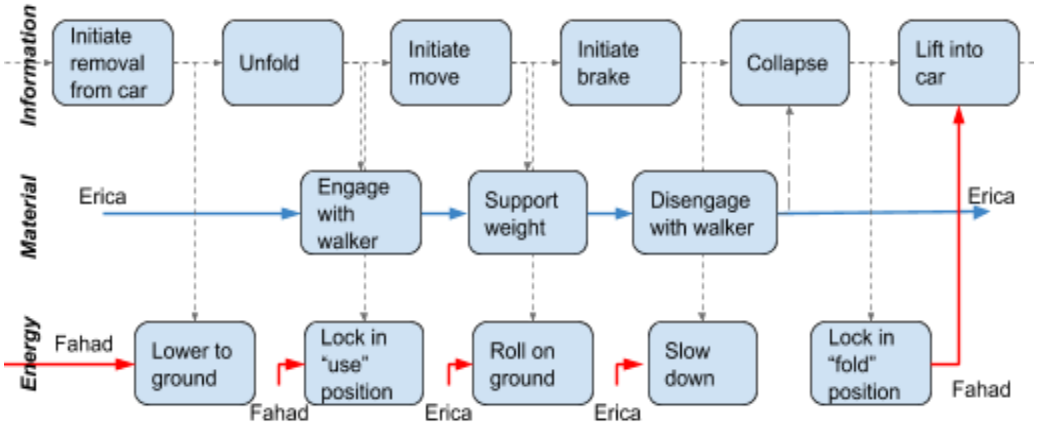


Figure 2: Visualizing information, material and energy moving through our system in a detailed functional decomposition.

From the charts above, we can identify four subsystems that we will need to synthesize together for our final design.

1) **Walker frame.** This frame must be able to lock into two positions ("fold" and "use" positions) and allow movement.
2) **Collapsing mechanism**. This mechanism must permit easy transitions between "fold" and "use" positions.
3) **Wheels**. These wheels must allow easy movement.
4) **Wheel brakes**. These brakes must allow the user to slow down and stop as needed.

2.2 Product Concepts

During brainstorming, we generated many concepts relating to the four subsystems listed above (wheels, frame, collapsing mechanism, braking mechanism). In this subsection, we list three individual concepts each that we feel contributed the most to our design process, either because we used elements from them to contribute to our final design, or because they reflect an important step in our brainstorming process.

Magdalena's Concepts

Table 1: Concepts relating to wheel brakes. These include wedge brakes, bike-style brakes, and tension slow-down brakes.

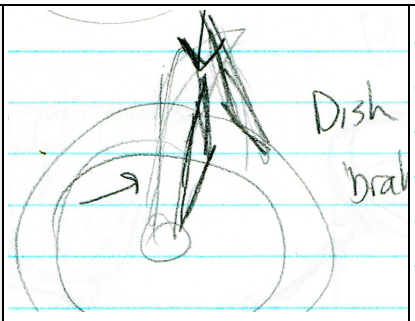
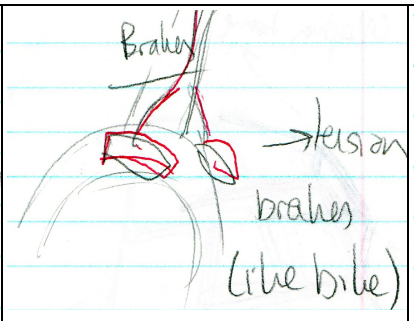
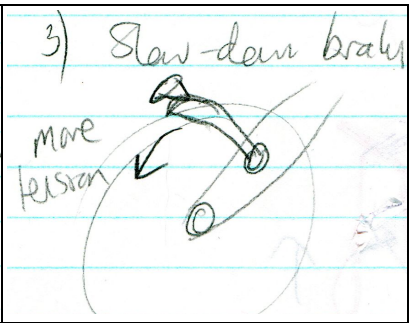
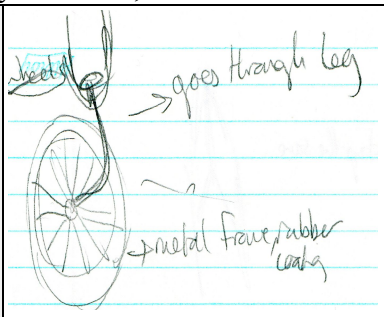
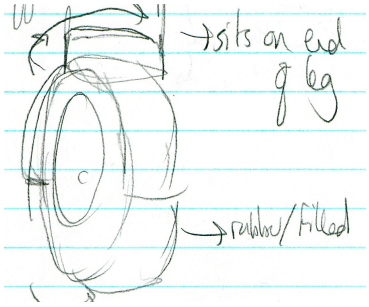
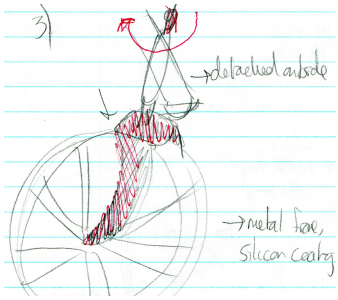
Image			
Name	**Wedge brakes**	**Bike-style handbrakes**	**Tension slow-down brakes**
Brief Description	These brakes are a steep-V shape that push down on the wheel from two angles to increase friction.	These handbrakes use wires running up to handles to apply pressure to a wheel that is proportional to hand strength.	These brakes are offset from the centre of the wheel so that pushing them down applies even pressure on the wheel.
Pros	- Easy to mount with a vertical beam.	- Easy to find pre-made parts.	- Reliable. - Distributes friction evenly.
Cons	- Rubs away tire quickly.	- Requires a lot of hand strength. - Requires regular maintenance.	- Requires bending down to activate.

Table 2: Concepts relating to wheels types. These include wheels with curved axles, office chair-style wheels, and wheels mounted on external ports.

Image			
Name	**Curved axle**	**Office chair style wheels**	**Mounted wheels**
Brief Description	These wheels have a rotating axle that connects to the bottom of the walker leg.	These wheels rotate inside a wheel well close to the bottom of the walker leg.	These wheels are held in a mounting unit that is mounted to the walker leg.
Pros	- Lightweight and difficult to jam.	- Easily accessible. - Good mobility.	- High potential to be sturdy. - Can maintain easily.
Cons	- Requires strong material. - Difficult to apply brakes.	- Easily jammed.	- More material is more weight. - Difficult to apply brakes.

Josiah's Concepts

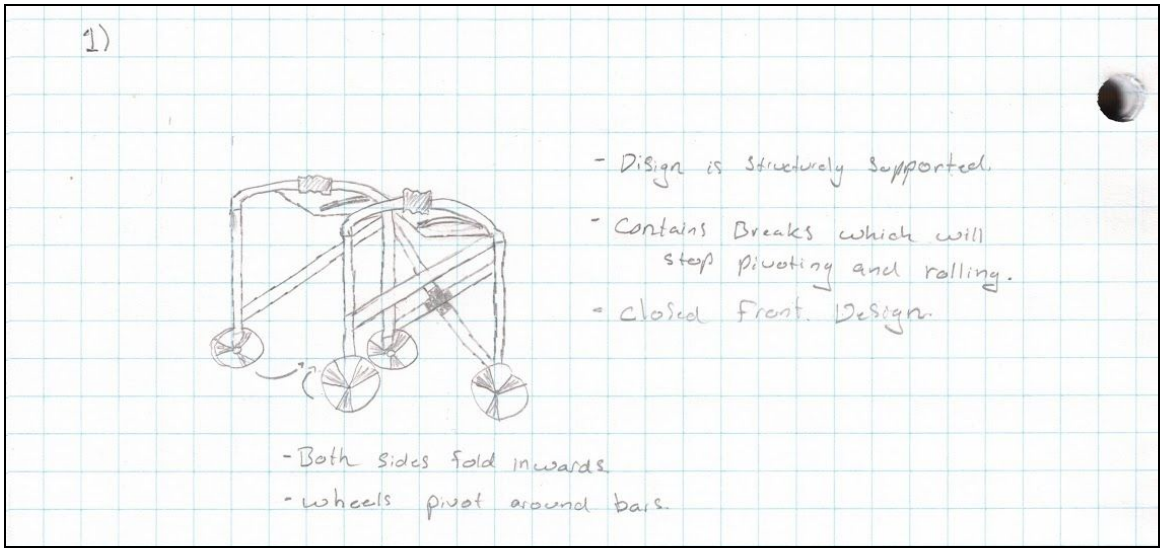


Figure 3: Josiah's first concept.

Pros of concept 1:	Cons of concept 1:
Design is very sturdy Design contains big enough breaks Design is easily foldable with lock hinges. Good grip with handles	Wheels may not be reliable when doing 360 rotations Placement of handles may be uncomfortable Having a closed front might be difficult for used to get out of the walker

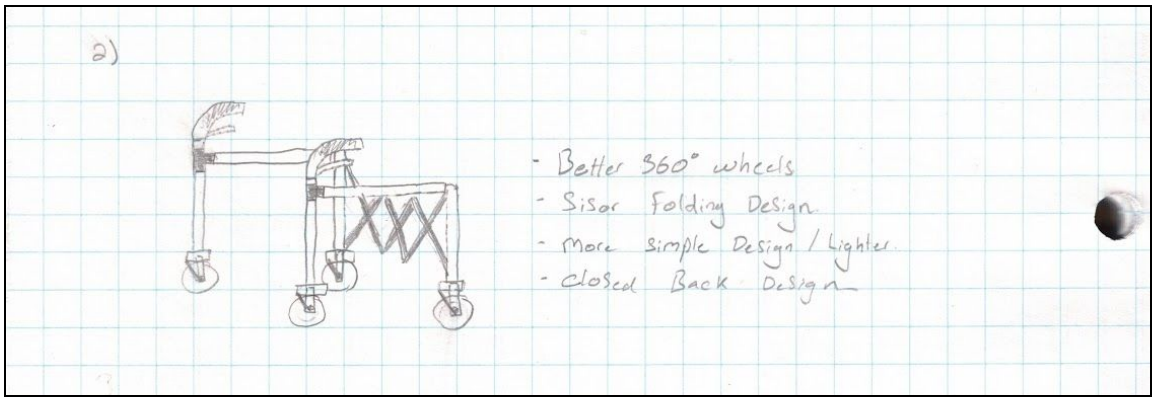


Figure 4: Josiah's second concept.

Pros of concept 2:	Cons of concept 2:
- Design contains very good wheels	

- Design has a good way to fold - Design has good handle placement	- Design is not very sturdy/structurally sound - Design may be unreliable/ cheap like

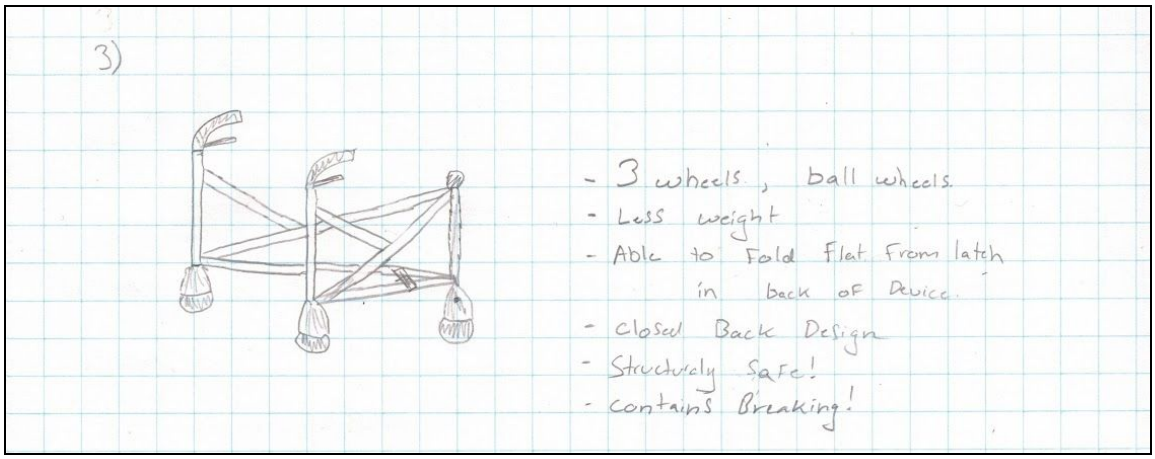


Figure 5: Josiah's third concept.

Pros of concept 3: Design is very strong/ supporting/ sturdy Design has good handle placement Design structure is reliable Cheaper design with 3 wheels Has foldability (folds to smaller size)	Cons of concept 3: Round wheels aren't suitable for all surfaces (no grip, etc), may get stuck easily 3 wheels might not be supporting enough Folding is "janky" and may be a weak spot in the design Triangle design might not be big enough for someone to comfortably walk in

Osilama's Concepts

Figure 6 : Osilama's First Concept

Definition

This is a concept for the posterior walkers legs. It uses a telescoping mechanism to adjust the height and firmly lock it in place.

Pros	Cons
● This mechanism will be easy to use.	● This mechanism can get stuck easily ● It can add unnecessary weight to the walker

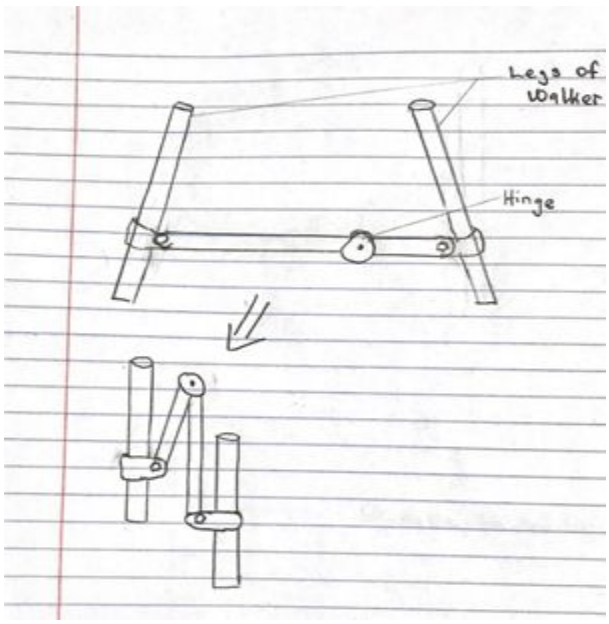


Figure 7 : Osilama's Second Concept

Definition

This uses a linkage system that consists of two links (bars) that collapses together when the mechanism is unlocked and pulled upwards.

Pros	Cons
● It's easy to use and adjust	● It requires considerable amount of force to operate

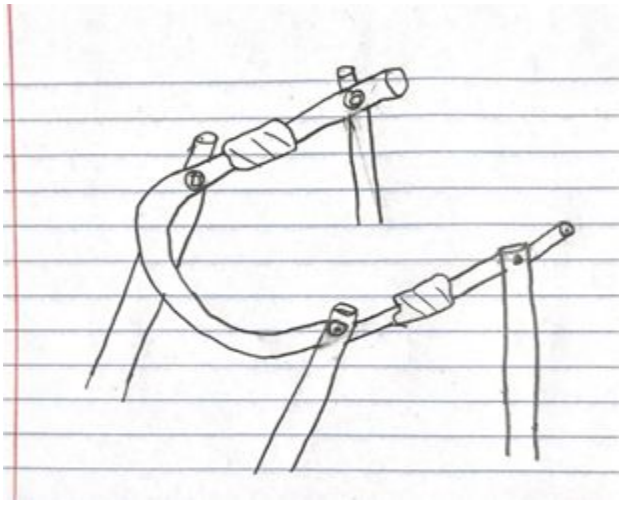


Figure 8 : Osilama's Third Concept

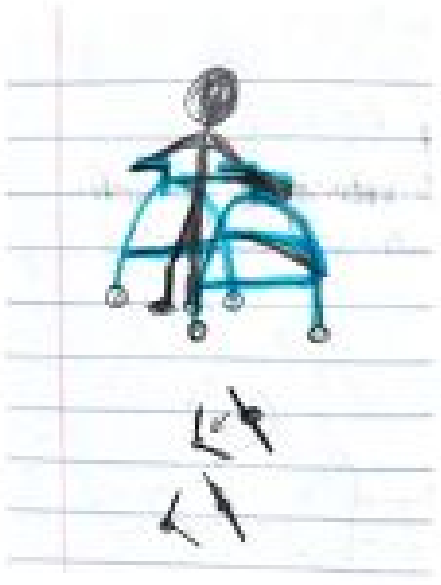
Definition

This concept shows a walker which is curved at the top and the client stands in the middle with 2 grips at either side.

Pros	Cons
● This system helps to develop good posture	● This system does not have a brake system ● The grip is not adjustable

Victoria's Concepts

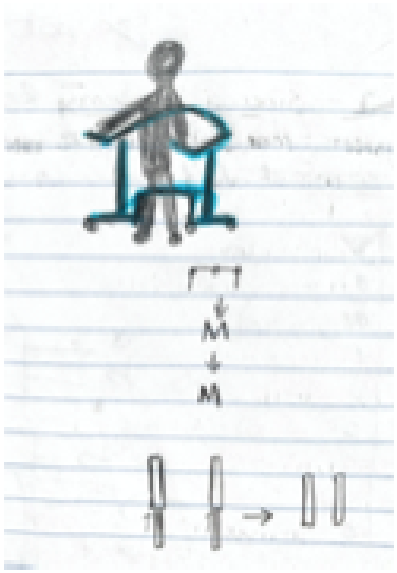
Figure 9: Concept 1



My first concept shows a walker designed with two arched sides that collapses inwards. Similar to Erica's current walker, the sides come inwards as it is lifted but what is different is the way it folds. It folds as seen in the representation above, the parts at the back attaching the two sides of the walker are connected by a joint and collapse downwards. One of the good things about this

walker is that it would be very stable as the sides are arches. The only thing that would be complex is the making of the structure into two arches.

Figure 10: Concept 2



My second concept shows a posterior walker with two polls on the sides and two arches at the back holding the sides together. The way this one would collapse is similar to how her current walker folds in an ‘M’ shape. This walker would not be as stable as the walker from concept 1 would be but it would be a lot more straightforward to make as we would only be dealing with straight rods and wouldn’t have to shape the rods.

Figure 11: Concepts 3

My third concept is a third posterior walker illustrated which collapses just like a foldable chair would. This design would not be as stable as the first concept and might be hard to prevent from collapsing when it is not supposed to. Although this walker would probably be more stable than the one in concept 2, it will not be as easy to fold and unfold this walker.

2.3 Concept Evaluation

To evaluate our concepts, we compared our designs against our initial set of needs that we outlined in Deliverable B [1]. Some members of our team chose to highlight holistic product designs, while other members chose to highlight ideas for individual subsystems. While we have assigned scores to each of our designs by comparing them against each other, we have still incorporated what we believed were the strongest elements of all of our designs, even if a component came from a losing concept.

Evaluation of Magdalena's Concepts - Brakes

ID	Need		Rating	Concept 1	Concept 2	Concept 3
1	The walker	supports at least 120 lbs of weight.	5	--	--	--
2	The walker	stays in upright and locked position in use.	5	--	--	--
3	The walker	turns smoothly in any direction, from motion or rest.	4	2	5	5
4	The walker	collapses to a size that will fit behind the front car seat.	5	--	--	--
5	The walker	allows Erica to stand at full height with her hands on the handles.	4			
6	The walker	brakes.	5	4	3	5
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	3	5	5
8	The walker	is lightweight.	5	4	3	3
9	The walker	has good traction on the ground.	4	--	--	--
10	The walker	is stable when unexpected or uneven forces are put on it.	5	--	--	--
11	The walker	stays collapsed when it is intended to be collapsed.	4	--	--	--
12	The walker	has a limited range of height-adjustability.	4	--	--	--
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	3	4	5
14	The walker	feels sturdy.	4	2	3	4
15	The walker	does not degrade with intense, everyday use.	3	1	2	4
16	The walker	is compact when lifted.	4	--	--	-
17	The walker	can be picked up without a lot of bending over.	3	5	5	3
18	The walker	is a pretty teal colour.	2	--	--	--
19	The walker	feels sturdy and strong.	4	2	3	4
20	The walker	collapses with a smooth and easy one-handed motion.	4	--	--	--
21	The walker	requires little maintenance.	3	3	1	4
22	The walker	has comfortable handles.	3	--	--	--

*Some categories have been ignored where they are not applicable to brakes.

Total sum of points with ranking applied:

Concept 1 (wedge brakes): 118
Concept 2 (bike-style handbrakes): 139
Concept 3 (slow-down brakes): 170

According to our criteria, the slow-down brakes are the best for our needs.

Evaluation of Magdalena's Concepts - Wheels

ID	Need		Rating	Concept 1	Concept 2	Concept 3
1	The walker	supports at least 120 lbs of weight.	5	2	5	5
2	The walker	stays in upright and locked position in use.	5	--	--	--
3	The walker	turns smoothly in any direction, from motion or rest.	4	5	4	5
4	The walker	collapses to a size that will fit behind the front car seat.	5	--	--	--
5	The walker	allows Erica to stand at full height with her hands on the handles.	4	--	--	--
6	The walker	brakes.	5	2	4	4
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	2	4	4
8	The walker	is lightweight.	5	5	4	3
9	The walker	has good traction on the ground.	4	3	3	4
10	The walker	is stable when unexpected or uneven forces are put on it.	5	3	5	5
11	The walker	stays collapsed when it is intended to be collapsed.	4	--	--	--
12	The walker	has a limited range of height-adjustability.	4	--	--	--
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	3	2	4
14	The walker	feels sturdy.	4	4	2	4
15	The walker	does not degrade with intense, everyday use.	3	3	2	4
16	The walker	is compact when lifted.	4	--	--	--
17	The walker	can be picked up without a lot of bending over.	3	--	--	--
18	The walker	is a pretty teal colour.	2	--	--	--
19	The walker	feels sturdy and strong.	4	3	4	5
20	The walker	collapses with a smooth and easy one-handed motion.	4	--	--	--
21	The walker	requires little maintenance.	3	4	3	4
22	The walker	has comfortable handles.	3	--	--	--

*Some categories have been ignored where they are not applicable to wheels.

Total sum of points with ranking applied:

Concept 1 (curved axle wheels): 163
Concept 2 (office chair-style wheels): 185
Concept 3 (mounted wheels): 217

According to our criteria, the mounted wheels of concept 3 are best suited for our product.

Evaluation of Josiah's Concepts

ID	Need		Rating	Concept 1	Concept 2	Concept 3
1	The walker	supports at least 120 lbs of weight.	5	4/5	4/5	3/5
2	The walker	stays in upright and locked position in use.	5	4/5	3/5	2/5
3	The walker	turns smoothly in any direction, from motion or rest.	4	2/5	4/5	5/5
4	The walker	collapses to a size that will fit behind the front car seat.	5	4/5	3/5	2/5
5	The walker	allows Erica to stand at full height with her hands on the handles.	4	5/5	5/5	5/5
6	The walker	brakes.	5	3/5	4/5	1/5
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	3/5	5/5	1/5
8	The walker	is lightweight.	5	2/5	4/5	3/5
9	The walker	has good traction on the ground.	4	4/5	4/5	1/5
10	The walker	is stable when unexpected or uneven forces are put on it.	5	4/5	3/5	2/5
11	The walker	stays collapsed when it is intended to be collapsed.	4	4/5	4/5	3/5
12	The walker	has a limited range of height-adjustability.	4	0/5	4/5	4/5
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	4/5	4/5	1/5
14	The walker	feels sturdy.	4	5/5	2/5	3/5
15	The walker	does not degrade with intense, everyday use.	3	4/5	3/5	2/5
16	The walker	is compact when lifted.	4	4/5	2/5	2/5
17	The walker	can be picked up without a lot of bending over.	3	4/5	4/5	2/5
18	The walker	is a pretty teal colour.	2	---	---	---
19	The walker	feels sturdy and strong.	4	5/5	2/5	3/5
20	The walker	collapses with a smooth and easy one-handed motion.	4	2/5	4/5	3/5
21	The walker	requires little maintenance.	3	4/5	2/5	3/5
22	The walker	has comfortable handles.	3	4/5	4/5	4/5

Total points with ranking applied:

Concept 1: 308

Concept 2: 309

Concept 3: 223

Therefore, when ranking the three concepts, the second concept seems to be the most wanted design.

Evaluation of Osilama's Concepts

ID	Need		Rating	Concept 1	Concept 2	Concept 3
1	The walker	supports at least 120 lbs of weight.	5	5	3	5
2	The walker	stays in upright and locked position in use.	5	5	4	4
3	The walker	turns smoothly in any direction, from motion or rest.	4	5	--	5
4	The walker	collapses to a size that will fit behind the front car seat.	5	5	5	3
5	The walker	allows Erica to stand at full height with her hands on the handles.	4	5	--	5
6	The walker	brakes.	5	--	--	--
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	--	3	4
8	The walker	is lightweight.	5	2	4	3
9	The walker	has good traction on the ground.	4	3	--	4
10	The walker	is stable when unexpected or uneven forces are put on it.	5	4	2	5
11	The walker	stays collapsed when it is intended to be collapsed.	4	5	3	--
12	The walker	has a limited range of height-adjustability.	4	5	--	3
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	--	--	3
14	The walker	feels sturdy.	4	4	2	4
15	The walker	does not degrade with intense, everyday use.	3	2	2	3
16	The walker	is compact when lifted.	4	3	4	3
17	The walker	can be picked up without a lot of bending over.	3	3	2	4
18	The walker	is a pretty teal colour.	2	--	--	--
19	The walker	feels sturdy and strong.	4	3	4	5
20	The walker	collapses with a smooth and easy one-handed motion.	4	2	5	--
21	The walker	requires little maintenance.	3	2	3	4
22	The walker	has comfortable handles.	3	--	--	5

Total sum of points with ranking applied:

Concept 1 (Telescoping Legs): 266
Concept 2 (Linkage System): 198
Concept 3 (Curved Body): 296

Evaluation of Victoria's Concepts

ID	Need		Rating	Concept 1	Concept 2	Concept 3
1	The walker	supports at least 120 lbs of weight.	5	5	4	3
2	The walker	stays in upright and locked position in use.	5	4	4	3
3	The walker	turns smoothly in any direction, from motion or rest.	4	3	5	4
4	The walker	collapses to a size that will fit behind the front car seat.	5	5	4	3
5	The walker	allows Erica to stand at full height with her hands on the handles.	4	5	5	5
6	The walker	brakes.	5	5	2	3
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	4	3	4
8	The walker	is lightweight.	5	4	3	3
9	The walker	has good traction on the ground.	4	5	4	4
10	The walker	is stable when unexpected or uneven forces are put on it.	5	5	2	3
11	The walker	stays collapsed when it is intended to be collapsed.	4	4	4	2
12	The walker	has a limited range of height-adjustability.	4	0	5	5
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	4	4	4
14	The walker	feels sturdy.	4	5	2	3
15	The walker	does not degrade with intense, everyday use.	3	3	3	3
16	The walker	is compact when lifted.	4	3	3	5
17	The walker	can be picked up without a lot of bending over.	3	5	5	3
18	The walker	is a pretty teal colour.	2	---	---	---
19	The walker	feels sturdy and strong.	4	5	3	4
20	The walker	collapses with a smooth and easy one-handed motion.	4	5	3	4
21	The walker	requires little maintenance.	3	4	4	4
22	The walker	has comfortable handles.	3	4	5	4

Total points with ranking applied:

Concept 1: 343

Concept 2: 313

Concept 3: 312

According to the ranking system, Concept 1 is the best design.

2.4 Final Concept Design

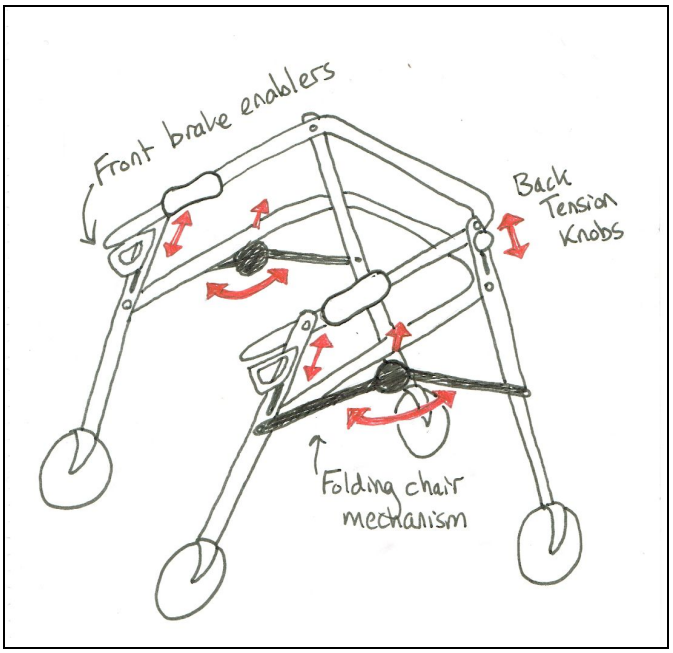


Figure #: High-level view of our final concept design.

Our final design incorporates ideas from our client's current walker with that of a simple folding chair. Using lightweight materials, this design will provide stability, braking, and easy transportation to and from the client's car. We have incorporated various elements from our concepts that we came up with during brainstorming, such as handle placement, folding ability, wheel type, and others.

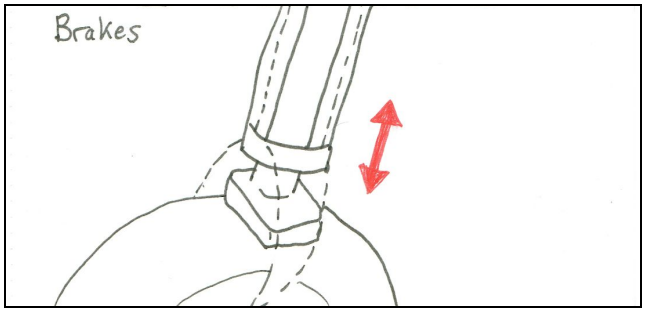


Figure #: A closer look at our proposed braking mechanism.

Our ideal final walker will have wheels with a radial axis aligned with the tubes that make our frame. This will allow us to embed full-contact friction brakes on top of the wheels that can be

directly controlled with a hand grip near the handles. This will likely be difficult to implement with store-ready wheels, so we may decide that this needs to change as the project continues.

2.5 Comparing Concept to Target Specifications

ID	Need		Rating	Final Concept
1	The walker	supports at least 120 lbs of weight.	5	5
2	The walker	stays in upright and locked position in use.	5	5
3	The walker	turns smoothly in any direction, from motion or rest.	4	5
4	The walker	collapses to a size that will fit behind the front car seat.	5	5
5	The walker	allows Erica to stand at full height with her hands on the handles.	4	5
6	The walker	brakes.	5	5
7	The walker	has controllable wheel speed (ie roll slower on slopes).	5	4
8	The walker	is lightweight.	5	4
9	The walker	has good traction on the ground.	4	4
10	The walker	is stable when unexpected or uneven forces are put on it.	5	3
11	The walker	stays collapsed when it is intended to be collapsed.	4	5
12	The walker	has a limited range of height-adjustability.	4	5
13	The walker	has wheels that maintain traction with dust, salt, and cat hair.	4	4
14	The walker	feels sturdy.	4	4
15	The walker	does not degrade with intense, everyday use.	3	3
16	The walker	is compact when lifted.	4	5
17	The walker	can be picked up without a lot of bending over.	3	4
18	The walker	is a pretty teal colour.	2	4
19	The walker	feels sturdy and strong.	4	5
20	The walker	collapses with a smooth and easy one-handed motion.	4	4
21	The walker	requires little maintenance.	3	4
22	The walker	has comfortable handles.	3	4

The total sum of points for the final concept is 392 / 445 (88%). From the table you can see that the lowest points are that the walker might degrade with everyday use. The walker might also not

be very stable when uneven forces are applied to it because of its small weight. Our final concept also almost perfectly covers the main target specifications given by our client.

3 Project Plan and Feasibility Study

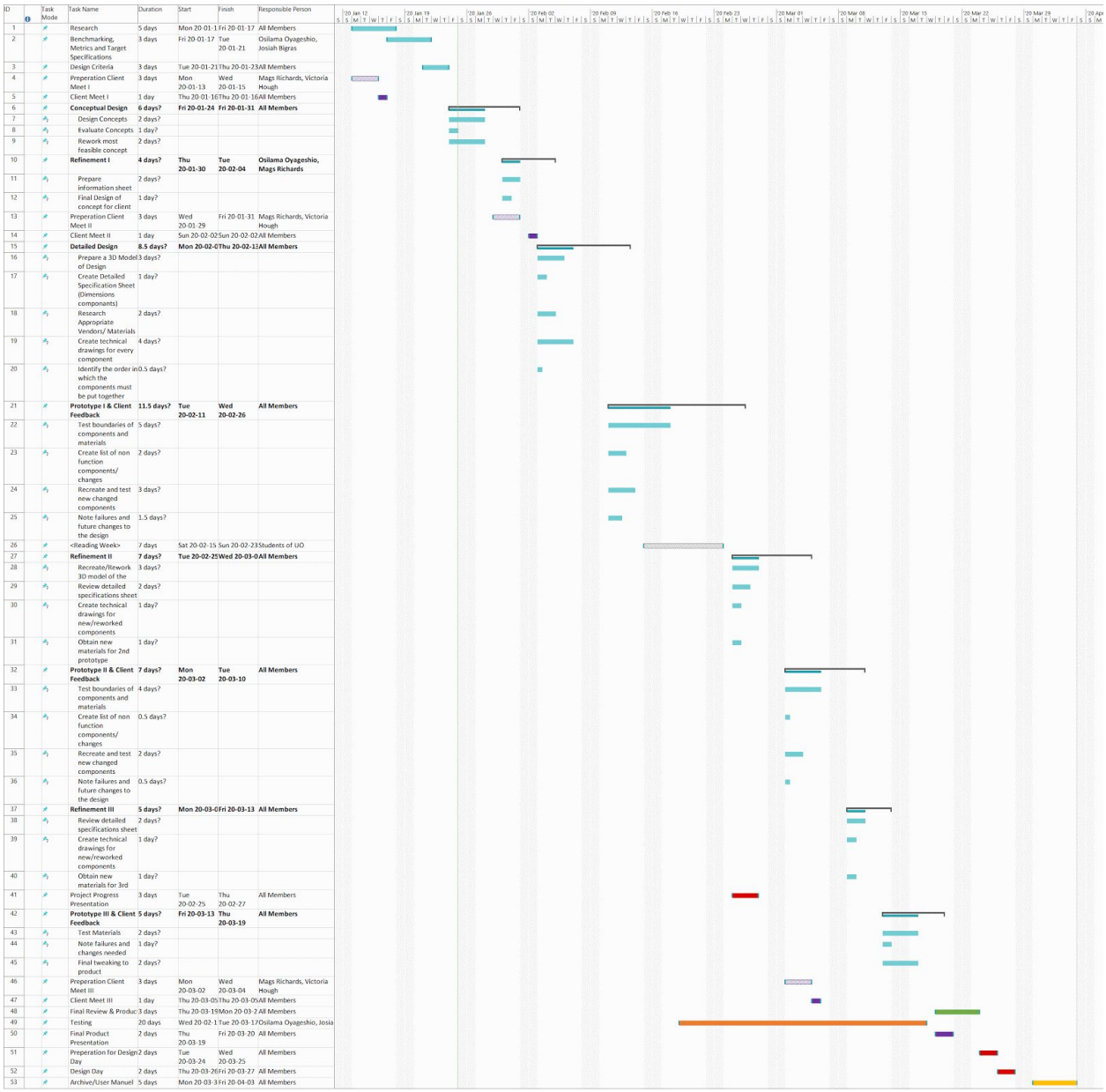
3.1 Project Plan

O - Osilama, M - Magdalena, J - Josiah, V - Victoria, C - Client, AL - All Members

#	*Task Name*	*Task Owner*	*Required Resources*	*Completion Deadline*
1	Design concepts	AL		2 d?
2	Evaluate concepts	AL		1 d?
3	Rework most feasible concept	AL		2 d?
4	Prepare information sheet for client	M, O		2 d?
5	Final design of concept for client	O, J, V		1 d?
6	Prepare a 3D model of the design	O, J		3 d?
7	Create a detailed specifications sheet	V, M		1 d?
8	Research appropriate materials/ vendors	AL	6, 7	2 d?
9	Create technical drawings for every component	AL	6	4 d?
10	Identify the order the components go together	V, O	6, 9	0.5 d?
11	Test boundaries of components and materials	AL	6, 8	5 d?
12	Create list of non functional components/ changes	AL	11	2 d?
13	Recreate and test new changed components	AL	6, 8, 12	3 d?
14	Note failures and future changes to the design	AL	13	1.5 d?
15	Get client feedback	AL, C	14	0.5 d?
16	Recreate/Rework 3D model of the design	O, J	6, 11, 14	3 d?
17	Review detailed specifications sheet	M, V		2 d?
18	Create technical drawings for new/reworked components	M, V	16	1 d?
19	Obtain new materials for 2nd prototype	AL	17, 18	1 d?

20	Test boundaries of components and materials	AL	19	4 d?
21	Create list of non functional components/ changes	AL	20	0.5 d?
22	Recreate and test new changed components	AL	19, 21	2 d?
23	Note failures and future changes to the design	AL	22	0.5 d?
24	Obtain clients feedback		23	
25	Review detailed specifications sheet	M, V		2 d?
26	Create technical drawings for new/reworked components	M, J	18, 23	1 d?
27	Obtain new materials for 3rd prototype	AL	26	1 d?
28	Project Process Presentation	AL	26, 27	0.5 d?
29	Test Materials	AL	27	2 d?
30	Note failures and changes needed	AL	29	1 d?
31	Final tweaking to product	AL	30	2 d?
32	Final inspection/review	AL	31	3 d?
33	Design Day	AL	25, 26, 32	1-2d?
34	Creation of User Manual	AL	25, 26, 32	5 d?

Microsoft Project Gantt Chart:



ID	Task Mode	Task Name	Duration	Start	Finish	Responsible Person
1		Research	5 days	Mon 20-01-13	Fri 20-01-17	All Members
2		Benchmarking, Metrics and Target Specifications	3 days	Fri 20-01-17	Tue 20-01-21	Osilama Oyageshio, Josiah Bigras
3		Design Criteria	3 days	Tue 20-01-21	Thu 20-01-23	All Members
4		Preperation Client Meet I	3 days	Mon 20-01-13	Wed 20-01-15	Mags Richards, Victoria Hough
5		Client Meet I	1 day	Thu 20-01-16	Thu 20-01-16	All Members
6		**Conceptual Design**	**6 days?**	**Fri 20-01-24**	**Fri 20-01-31**	**All Members**
7		Design Concepts	2 days?			
8		Evaluate Concepts	1 day?			
9		Rework most feasible concept	2 days?			
10		**Refinement I**	**4 days?**	**Thu 20-01-30**	**Tue 20-02-04**	**Osilama Oyageshio, Mags Richards**
11		Prepare information sheet	2 days?			
12		Final Design of concept for client	1 day?			
13		Preperation Client Meet II	3 days	Wed 20-01-29	Fri 20-01-31	Mags Richards, Victoria Hough
14		Client Meet II	1 day	Sun 20-02-02	Sun 20-02-02	All Members
15		**Detailed Design**	**8.5 days?**	**Mon 20-02-03**	**Thu 20-02-13**	**All Members**
16		Prepare a 3D Model of Design	3 days?			
17		Create Detailed Specification Sheet (Dimensions components)	1 day?			
18		Research Appropriate Vendors/ Materials	2 days?			
19		Create technical drawings for every component	4 days?			
20		Identify the order in which the components must be put together	0.5 days?			
21		**Prototype I & Client Feedback**	**11.5 days?**	**Tue 20-02-11**	**Wed 20-02-26**	**All Members**
22		Test boundaries of components and materials	5 days?			
23		Create list of non function components/ changes	2 days?			
24		Recreate and test new changed components	3 days?			
25		Note failures and future changes to the design	1.5 days?			
26		<Reading Week>	7 days	Sat 20-02-15	Sun 20-02-23	Students of UO
27		**Refinement II**	**7 days?**	**Tue 20-02-25**	**Wed 20-03-04**	**All Members**
28		Recreate/Rework 3D model of the	3 days?			
29		Review detailed specifications sheet	2 days?			
30		Create technical drawings for new/reworked components	1 day?			
31		Obtain new materials for 2nd prototype	1 day?			
32		**Prototype II & Client Feedback**	**7 days?**	**Mon 20-03-02**	**Tue 20-03-10**	**All Members**
33		Test boundaries of components and materials	4 days?			
34		Create list of non function components/ changes	0.5 days?			
35		Recreate and test new changed components	2 days?			
36		Note failures and future changes to the design	0.5 days?			
37		**Refinement III**	**5 days?**	**Mon 20-03-09**	**Fri 20-03-13**	**All Members**
38		Review detailed specifications sheet	2 days?			
39		Create technical drawings for new/reworked components	1 day?			
40		Obtain new materials for 3rd	1 day?			
41		Project Progress Presentation	3 days	Tue 20-02-25	Thu 20-02-27	All Members
42		**Prototype III & Client Feedback**	**5 days?**	**Fri 20-03-13**	**Thu 20-03-19**	**All Members**
43		Test Materials	2 days?			
44		Note failures and changes needed	1 day?			
45		Final tweaking to product	2 days?			
46		Preperation Client Meet III	3 days	Mon 20-03-02	Wed 20-03-04	Mags Richards, Victoria Hough
47		Client Meet III	1 day	Thu 20-03-05	Thu 20-03-05	All Members
48		Final Review & Produc	3 days	Thu 20-03-19	Mon 20-03-2	All Members
49		Testing	20 days	Wed 20-02-1	Tue 20-03-17	Osilama Oyageshio, Josia
50		Final Product Presentation	2 days	Thu 20-03-19	Fri 20-03-20	All Members
51		Preperation for Design Day	2 days	Tue 20-03-24	Wed 20-03-25	All Members
52		Design Day	2 days	Thu 20-03-26	Fri 20-03-27	All Members
53		Archive/User Manuel	5 days	Mon 20-03-30	Fri 20-04-03	All Members

3.2 Feasibility Study

This first part of the TELOS feasibility study is the Technical part. Our team does have enough expertise and technical resources to build this posterior walker. Even though we have three electrical engineers in our group and only one mechanical engineer, we are more than capable of putting all of our individual skills together to make this walker as proven by all of the explanations above outlining our project and the exact steps that will be taken to complete it.

The second part of the TELOS feasibility study is the Economic factor of if the cost of our project is reasonable. With the task that was given to us for this project, to build a walker for a person, that is reliable and something that Erica would actually use every day to hold her weight and reliably bring her places, an $100 budget just won't cut it. We will have to reach out to companies to fund our purchases as we need to build an 8lb walker that is sturdy enough to transport a person and that is fairly light. To fit the lightweight criteria, we will need to use carbon fiber, a very expensive material. We will be using aluminum for some of the parts of the walker as it is cheaper but this will still not be low enough as also have to account for the wheels which will be expensive.

The third part of our feasibility study is the Legal issues with releasing our walker to the public. There will be no legal issues with the release of this walker. The only issue we might have is if our client gets seriously injured from using this walker. Our project team would not be liable in this situation as we are students without engineering licenses, and we were told by our professor that we would not be liable.

The fourth part of the feasibility study evaluates if the walker is Operational. There are no organizational constraints that will prevent our success working on this project that we can predict. Our group has been pretty organized thus far and has worked very well together.

The final part of the feasibility study is the Scheduling of the process of creating this walker. The deadline to complete our final prototype is March 26th, design day, but it should be completed at least one week in advance. The deadlines are not very reasonable considering we are building a device that our client will be using every day that must be durable but with the help of our Gantt chart and the hard work of our team, we will be able to stay on task and get the walker finished on time.

According to our feasibility study, our project is overall viable and our final concept is the best option to pursue for our project. This posterior walker is achievable for our team and we will do the best we can with our given circumstances.

4 Conclusions and Next Steps

We have now settled on a final conceptual design for our product, although we expect that elements of our design will likely change as we prototype, test, and learn more about our materials and our manufacturing process.

We have also put together a plan for project management that revolves around task management in accordance with our deliverable schedule given for this project. We have also evaluated our design against our project plan in a feasibility analysis and have determined that we will have to try and finish our prototype as early as possible as we have a limited amount of time for this project and also do anything we can to get companies to fund our project as the $100 budget is unreasonable in our circumstances.

The next part of our project will involve getting together a bill of materials (BOM) and determining what kinds of materials and items we will need in order to create this walker. We would like to investigate carbon fiber tubes as an option for the straight sections of our walker due to its strength and lightweight properties, however as it is an expensive material, it will only be possible to incorporate this into our design if we are able to get it as a donation or at a greatly reduced price from a supplier. We have identified some potential suppliers in the Ottawa area that we are ready to contact [2-4]. As carbon fiber loses its strength when it is curved after it is cured, we are investigating steel-aluminum alloys for the curved sections of our walker. At this time, we have identified some potential wheel candidates (believing that it will not be possible to design our own wheels given the timeframe of this project) in the Ottawa delivery area [5]; some of these wheels have brakes already that are not exactly in line with our vision. We will likely need to be creative to determine a way to incorporate brakes and slow-down mechanisms into our wheels as our client has stated that this functionality is a major priority for safety and comfort [1].

5 References

[1] Bigras, J., Hough, V., Oyageshio, O., and Richardson, M. (2020). *Deliverable B: Deliverable B: Needs, Problem Statement, Benchmarking, Metrics and Target Specifications.* Retrieved from Brightspace.

[2] Competition Composites Inc. 'Rudder Posts, Spars and Tubes', 2020. Web. http://cci.one/site/marine/rudder-posts-spars-and-tubes/?doing_wp_cron=1580084591.8720629215240478515625

[3] Composites Canada. 'Online Order Portal: Finished Goods', 2020. Web. https://shop.compositescanada.com/#/catalogue/category/FINISHED%2520GOODS?page=1

[4] Clearwater Composites LLC. 'Round Carbon Fiber Tubes', 2020. Web. https://www.clearwatercomposites.com/products/carbon-fiber-tubes/round/

[5] ULINE. 'Casters and Wheels Catalog', 2020. Web. https://www.uline.ca/Grp_463/Casters-and-Wheels