Project Deliverable C

-Conceptual Design, Project Plan, and Feasibility Study-

Group B12

Bill Wu [300170086]

Gordon Akins - Barker [300177225]

Bayza Woldemariam [300131459]

Han Yan [300188341]

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Introduction

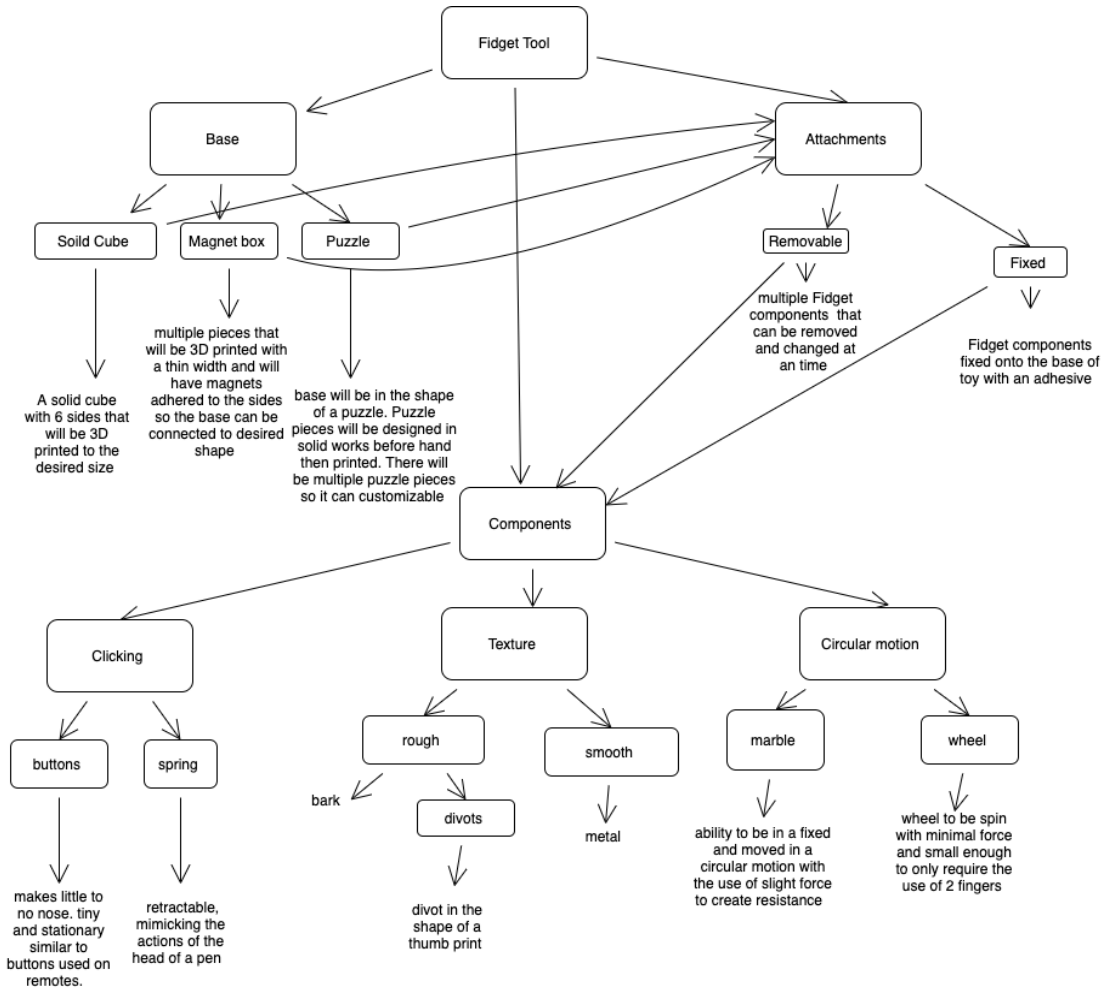
The goal of this deliverable is to present the conceptual design, project plan, and feasibility study. A functional decomposition of our project will be presented to describe the design concepts. With a group goal of creating a fidget tool, each team member conceptualised different ideas for the tool, as well as expanded off of concepts of others. Once everyone's concepts were presented they were all ranked based on a list of target specifications that were set. Based on our ranking, a more specific goal will now be presented in this deliverable. The specified concept will then be presented to our client during our upcoming meet with the addition of questions that we have prepared to ensure a more efficient meeting where we will obtain feedback from our client as well as obtain more up to date information. With a project plan in mind, our wrike account has many aggressive yet realistic goals set to ensure that our group is staying on task.

Functional Decomposition

This diagram shows the functional decomposition of a fidget tool. Although the tool we are making can be used in multiple different ways the decomposition below highlights the key aspects that will be implemented in our tool. There are still many ideas that we have for the development of this tool, so all the different ideas have been added into the decomposition. Starting from the top, the base, components, and attachments will be the most important part. For the base it will either be a solid cube, or a customizable cube with the use of magnets or puzzle pisces. The base can be used on its own without the use of the fidget components but that is all based on the user's preference. For the means of attachment, the components will either be fixed onto the base with the use of an adhesive, or removable so the components can be frequently changed or simply used without having a base. For components, the subcategories are broken up into clicking, texture, and circular motion. These subcategories are all descriptive of the functionality of the different components. Although they all have fixed functions, the user is free to use them in whatever way. For example, the subcategory for texture describes components that can be used as a touch stimulus or as a noise stimulus if rubbed against a surface. All in all there are many ways to decompose this tool and there isn't

necessarily a wrong or right way to go about it. This tool is meant to be as versatile as possible to cater to the users needs.

Figure 1 : Functional Decomposition Flow Chart



Team Concepts

Foldable Box Concept (Han)

- Create a box that would be able to be folded out and is connected using magnets. (or snap-on hinges)
- Could be like a 12 sided cube.

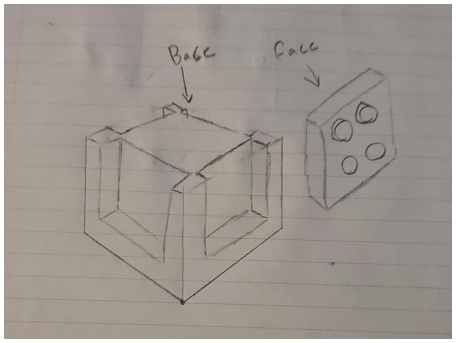
Single-layer module Concept (Han)

- Have no main unit
- The unit is consist with different individual units
- Each unit could be used individually
- Each unit can be connected with magnet built in on the side wall of each units

Replaceable Sides Concept (Gordon)

- Have a single solid cube where the faces of the cube can be removed and swapped for different faces so she can choose which tools she wants to use that day.
- There will be different tools on each face(Texture faces, clicking faces, squishy faces)
- Can have any amount of faces because they can be switched out
- Could have two different depths of faces, deeper ones for faces that would require a greater depth and ones that require smaller depths.

Figure 2: Replaceable Sides Concept



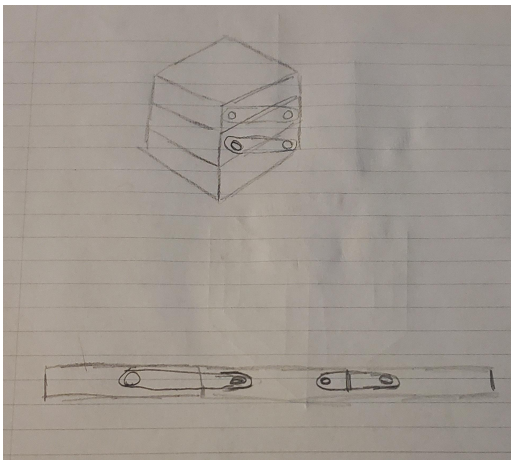
Cabinet Concept (Gordon)

- The object would be like a cabinet
- Different tools would come out on each shelf of the cabinet
- The faces that don't have a shelf will have shallow tools like textures and buttons
- Each shelf will have a different tool available

Shelving Folding Out Concept (Gordon)

- Have 3 layers on top of each other that will fold out into a flat surface sort of like shelving.
- Buttons on bottom shelf, texture part on middle shelf, top shelf will be a squishy part
- Can have any amount of faces because they can be switched out
- Could have two different depths of faces, deeper ones for faces that would require a greater depth and ones that require smaller depths.

Figure 3: Shelving Folding Out Concept



Detachable Pieces Concept (Bill)

- Detachable pieces that can be switched throughout the day, all being different games

Sliding Puzzle Concept (Bill)

- User can input and cause lights to flash
- Sliding puzzle

Roller Concept (Bill)

- A round ball/cylinder
- Can roll around, has a couple things on it
- Opens up and has a few more things to fiddle around with inside

Multi-Shape Concepts (Bayza)

My concepts below are ideas for a global concept as well as a subconcepts. A global concept is a multi shape base that can be formed into the user's desired shape. A subconcept for the multi shape piece is that it can be used on its own as a fidget device without the use of additional attachments if the user desires. In addition, another concept is the ability for the components to be adhesive to the base which would be a sub concept for attachments.
Device with ability to switch into different shapes dependent on the users preference at that time.

- User will be given many piece so the toy can be attached to the desired size
    - The action of building the base will be a fidget component in itself
    - The piece will be in many different shapes and sizes so they will be able to form a wide variety of shapes
    - The pisces will adhere together with the use of a magnet
- Many addition fidget components will have the ability of sticking on to the surface of the base cube
    - Can be stuck on with an adhesive if the user would like it to stay on permanently
- Fidget components will have the ability of being used without the need of it being adhered to the main body as well

Evaluation

Based on design criteria that were set each concept was then evaluated based on how closely they reflected the clients needs and met all the specific criteria. After we had the results it was much easier to narrow down the concepts that we would use moving forward. Following the results being obtained, a pros and cons list was then made which included all the concepts that scored over 90%.

Table 1: Concept Evaluation

Concept	Importance	Shelving Folding Out	Replaceable Sides	Foldable Box	Cabinet	Sliding Puzzle	Detachable Pieces	Multi-shape	Roller(Sphere/Cylinder)	Single-Layer Module
Cost (Cad)	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Weight (Gram)	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Size (cm)	2	3	6	6	4	4	4	6	6	5
# of Buttons	4	3	5	5	4	6	6	5	3	6
# of Clicky Switch	4	1	6	6	2	6	5	5	3	5
Sliders	3	1	6	6	6	6	5	6	5	6
Texture Pad	5	3	5	6	5	6	6	6	3	6
Joystick	2	0	6	4	1	5	6	4	2	4
Colour Options	3	6	6	6	6	6	6	6	6	6
# of Sides	3	2	5	6	4	4	5	6	4	5
Lanyard Hole	2	2	6	5	6	4	5	3	6	5
Modifiable	5	1	6	6	1	5	6	6	3	6
Material		Plastic	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic
Total Score		73	186	188	124	177	182	180	127	183
Score as Percentage	198	36.87%	93.94%	94.95%	62.63%	89.39%	91.92%	90.91%	64.14%	92.42%

Table 2: Pros and Cons list for the concepts that scored over 90%

Concept	Pros	Cons
Replaceable sides	- Easy to replace sides so it's easy to modify - Always the same size - Easy to adjust to your daily needs - Would be easy to design and create	- Can't fold out to clients requests - Can only have 4 options that will change - There may be an issue with the thickness of the pieces and the depth the tool requires
Foldable box	- Multiple, easy to change sides - Can fold out flat	- Isn't as sturdy as other concepts - Since it doesn't have a base it can be hard to have a lanyard hole
Detachable pieces	- Can have many tools as long as they have the blocks - Can have a greater variety in tools (Joysticks) since they have a whole block to work with	- Only can have a few sides on each cube that has a tool - Few sides so if the user wants lots of tools they will have a large block.
Multi-Shape	- Many sides so many tools - Folds into different shapes	- Since it folds it will be hard to have a lanyard hole - Couldn't have a joystick
Single-layer module	- Can have a wide variety of tools currently being used - Easy to connect to each other - Easy to manufacture	- Gets larger the more tools you want - Limit area on every block for tools

The evaluation method is used because it scores the performance of each concept for the clients requirements. Each score the concepts get in each category is added together and is then made into a grade of the concepts overall performance in what the client requires. The pros and cons list show us where each concept performs well in a practical sense as well as showing us where any concerns we may have with the concepts are.This overall evaluation tactic combined with the pros and cons list is a good way to judge the concepts because it scores them based on the item's performance in each one of the clients requirements.

Promising solutions

We would like to pursue the replaceable sides concept, foldable box concept, detachable pieces concept and the multi-shape concept farther as they all had a score over 90% and we believe that they all would be accomplished in the given time frame. We think each concept has features that will be very beneficial to the client and have interesting aspects that the client would like.

Group design concept

Approach 1:

Having a main body, with slots on 4 sides. Each side has the capacity of clip in one piece of attachment with a clip-in mechanism. Each attachment will be in the shape of a thin layer, and will have different texture or functions (buttons, joystick, roller…)

Approach 2:

No main body unit. Each attachment will be in the shape of a thin layer with magnets (or clip-in mechanism) on the side. These clips will connect pisces to pisces, also at the same time allow each side to fold up into a cube.

Approach 3:

No main body unit. Each attachment will be in the shape of a cube, with magnets built in on the sides. These magnets will allow each unit to be connected.

Visual representation

Figure 4: Approach 1

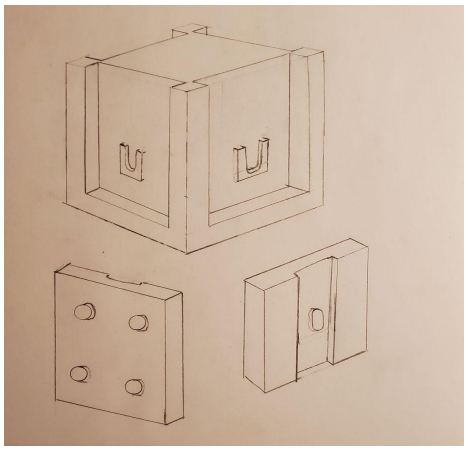


Figure 5: Approach 2

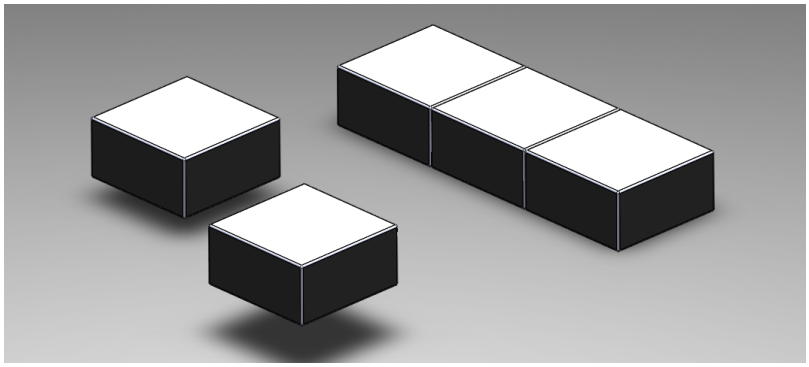
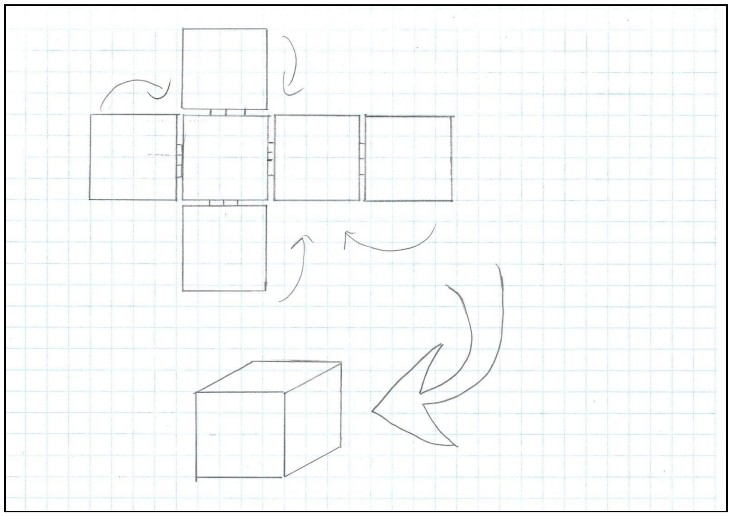


Figure 6: Approach 3



Concept’s relationship to the target specifications

Approach 1: Allows a simple exchange of parts and leaves everything compact. Efficiently saves space, sliding parts act as another thing to use. However it is limited to only four slots, and the pieces would be rather small. Chance for clips to break and the cube itself is unusable without the sliding parts.

Approach 2: Layers of magnets that allow easier gathering of parts, easy to separate, easy to find, hard to lose a single piece. Magnets might stick to things and be harder to separate. Less space and harder to put gadgets on it. More expensive and texture can be unpleasant.

Approach 3: Easy to fold, very simple to understand. Can store more things inside and outside. Allows the user to not need everything to start playing around with. Joints could be easy to break apart. Magnets can stick onto unwanted items.

Plan for client

Firstly it is important to ask the client for their opinion of the final concept. If they are happy with the overall design then keep it. If they are not satisfied, then fall back to the back up concept. After this ask for any personal improvements, and personal specifications. Ask for more detail in case of a situation that causes questions or is left rather vague. Constantly check in on the clients personal own opinions. Let clients talk and give their ideas, after main questions are asked let other team members ask questions that may come up. Don’t stop, don’t stagnate, move forward, keep talking, no silence.

Plan for client meeting

First we will introduce our plan to the client by telling them how we are planning on doing the presentation and asking her to reserve any questions until after we have finished our presentation. We will then go through a presentation where each team member presents the concept they came up with and give a short description on how each one will work. After we have gone through the presentation we will ask our client if she has any questions about the concepts that we presented. After we have discussed the concepts with our client and answered any questions she has, Bill will go through a prepared list of questions that are relevant to the project as a whole and not just to a specific concept

Questions for client meet

What are your overall opinions of our main concept of the tool?

(Show other concepts) Any parts of those concepts that you want to add onto the final concept?

Is this device meant to be weather resistant?

Going to use the final product as is?

Will anyone else use this, will you recommend this to others, or lend it?

Do you want the design specs and information?

Are you alright with the tool being in multiple pieces? Possible to forget?

What happens if it breaks?

Which concept is your favorite?

How do you think we could improve those concepts?

Gantt Chart

The following diagram is the Gantt chart created using Wrike detailing every single deliverable over the course of this project. Two of the upcoming deliverables have been expanded as examples to show job breakdown so that each team member of the team is contributing equally and so that all parts of each deliverable are completed. To ensure completion, each sub task is tagged with a team member and deadline. Tasks with arrows represent dependencies while tasks that are in the shape of a diamond are milestones which don’t have a start date but have an end day.

Figure 7: Gantt Chart

	Title	Start date	Due date	Predecessors	Assignee
1	**GNG2101 Project**				Zaineb Al-Faesly, Gordon ...
2	Project Skeleton	14/09/2021	16/09/2021		Han Yan
3	Benchmarking spec...	22/09/2021	23/09/2021		Bill Wu
4	PD B quality check	22/09/2021	23/09/2021		Bill Wu
5	Deliverable C conce...	23/09/2021	27/09/2021		Gordon Akins - Barker, H...
6	PD C quality check	29/09/2021	30/09/2021		Gordon Akins - Barker
7	BOM	28/09/2021	05/10/2021	5FS	Gordon Akins - Barker
8	Detailed Design	30/09/2021	07/10/2021		Gordon Akins - Barker, Bil...
9	PD D quality check ...	06/10/2021	07/10/2021		Han Yan
10	Prototype 1	30/09/2021	07/10/2021		Gordon Akins - Barker, Ba...
11	Sub-task related to ...	30/09/2021	07/10/2021		Bill Wu
12	PD E quality check ...	12/10/2021	13/10/2021		Bayza Woldemariam
13	Project progress pr...	07/10/2021	13/10/2021		Gordon Akins - Barker, Ba...
14	Client meet 3	25/10/2021	25/10/2021		Gordon Akins - Barker, Ba...
15	Prototype 2	21/10/2021	28/10/2021		Gordon Akins - Barker, Ba...
16	PD F quality check ...	03/11/2021	04/11/2021		Han Yan
17	Prototype 2 testing	29/10/2021	04/11/2021	15FS	Gordon Akins - Barker, Ba...
18	Sub-task related to ...	21/10/2021	04/11/2021		Bill Wu
19	Business model and...	11/11/2021	18/11/2021		Gordon Akins - Barker, Ba...
20	PD G quality check ...	17/11/2021	18/11/2021		Gordon Akins - Barker
21	Complete 3 prototy...		30/11/2021		Gordon Akins - Barker, Ba...
22	PD H quality check	01/12/2021	02/12/2021		Bill Wu
23	User manual + video	29/11/2021	03/12/2021		Gordon Akins - Barker, Ba...

Conclusion

In conclusion, with the combined efforts of each team member, many valuable concepts were developed. With the use of a design criteria, which is composed of target specifications based on the clients needs, we were able to score each aspect of the different concepts and narrow our concepts based on its overall scoring. In addition, the use of the functional decomposition flowchart allowed for a clear representation of the main functions and subfunctions of this tool. This information will now be presented to our client along with questions that have been planned for the upcoming client meet so feedback can be received and our project can further be specified to match our clients ideal needs.