Project Deliverable D
-Detailed Design, Prototype 1, BOM, Peer Feedback and Team Dynamics-

Group B12

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Abstract

Our client, a PhD student, is in need of a device that will help individuals with ADHD mitigate distractions with the use of a fidget tool. In this deliverable, as a team, we were responsible for creating a detailed design, prototype 1, and a bill of materials. Based on user and technical benchmarking that were created in previous deliverables, each team member developed different concepts then as a team reconvened and decided on the best concepts to present to the client and based on feedback received a detailed design was made. After a detailed design was produced as a team, a prototype was then designed with the specific criteria to then cater to the ideal development of our project. With a prototype produced, a bill of materials was then created based on the components needed to create the device. Although the prototype has a low functional fidelity, since it was produced on solidworks, it has a high visual fidelity since colours, size, and different components can be viewed. By prioritizing the clients needs we were able to produce a prototype which we will then present to our client for further feedback. The most important thing is that we test our design as much as possible so we can be aware of any possible risk and improve our concept to ensure the ideal final result. To ensure that we are able to finish our final product on time our project plan is constantly updated with tasks that need to be completed as well as their deadlines. Each task is assigned to a member of the team to ensure that someone is responsible for it being completed. Moving forward our main goal is to keep our project plan on track and test our device as much as possible.

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Introduction

The goal of this deliverable is to present a detailed design, prototype 1, and a bill of materials. After presenting our top concepts to our client we were able to revive feedback which was then used to create a more defined and detailed design that will be presented. Once the detailed design was produced, prototype 1 was then created. While composing a prototype is important, having a list of material cost is just as important to ensure the feasibility of our project in terms of cost and ensuring that it is within budget which is why a bill of materials was created.

Opinions on the Presented Concepts

Replaceable Sides concept.

- The client thought that this was the most conceptual design and most similar to current options in the market.
- Isn't the most sustainable concept, easily breakable.
- Since some sides might not have a face that is currently attached it could be unbalanced or feel weird in the hand.
- Would like the concept to be more creative.

Single - Layer Module.

- The client liked this concept the most.
- The client thinks this is the concept that would work the best.
- Really liked how she could only be using one or two pieces at once and have an extra two in her bag that she could just swap out with a different one.

Foldable Box Concept.

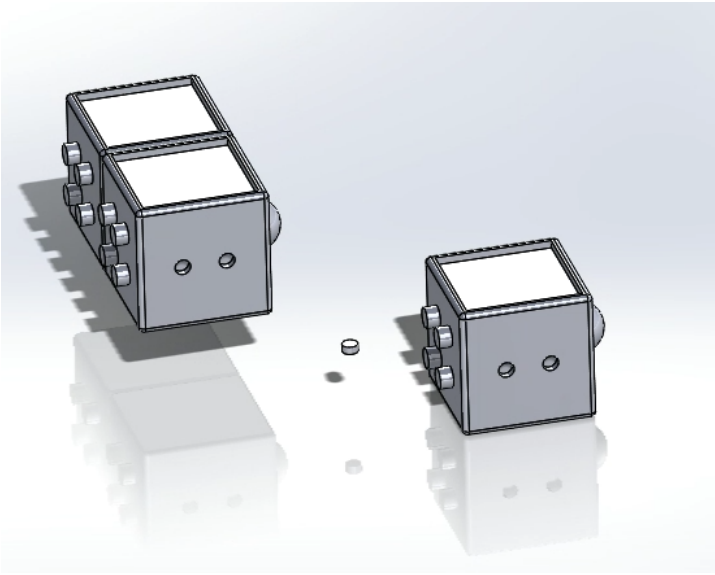
- Really liked how it could fold out .
- Liked how it would be able to change into different shapes(Rectangle).
- This was the second most liked concept by the client.

Extra comments from the client

- When pieces are being connected or attached they could make a clicking noise.

- The client thinks it would be nice if there was some sort of bag that the product could be carried in.
- Would like the product to be very tough so it won't sustain damage.
- Isn’t worried about the use of magnets in the product

Figure 1: Updated Design Concept



In this updated design it gives a visualization of some of the fidget tools that we are going to use like buttons, a roller and a section on top where a texture piece will be placed. In this updated design it used proper measurements for the magnets and the size that we would like to have the cube in. It shows how the cubes will be attached and how each different cube can have different fidget tools on the cube.

Critical Product Assumptions

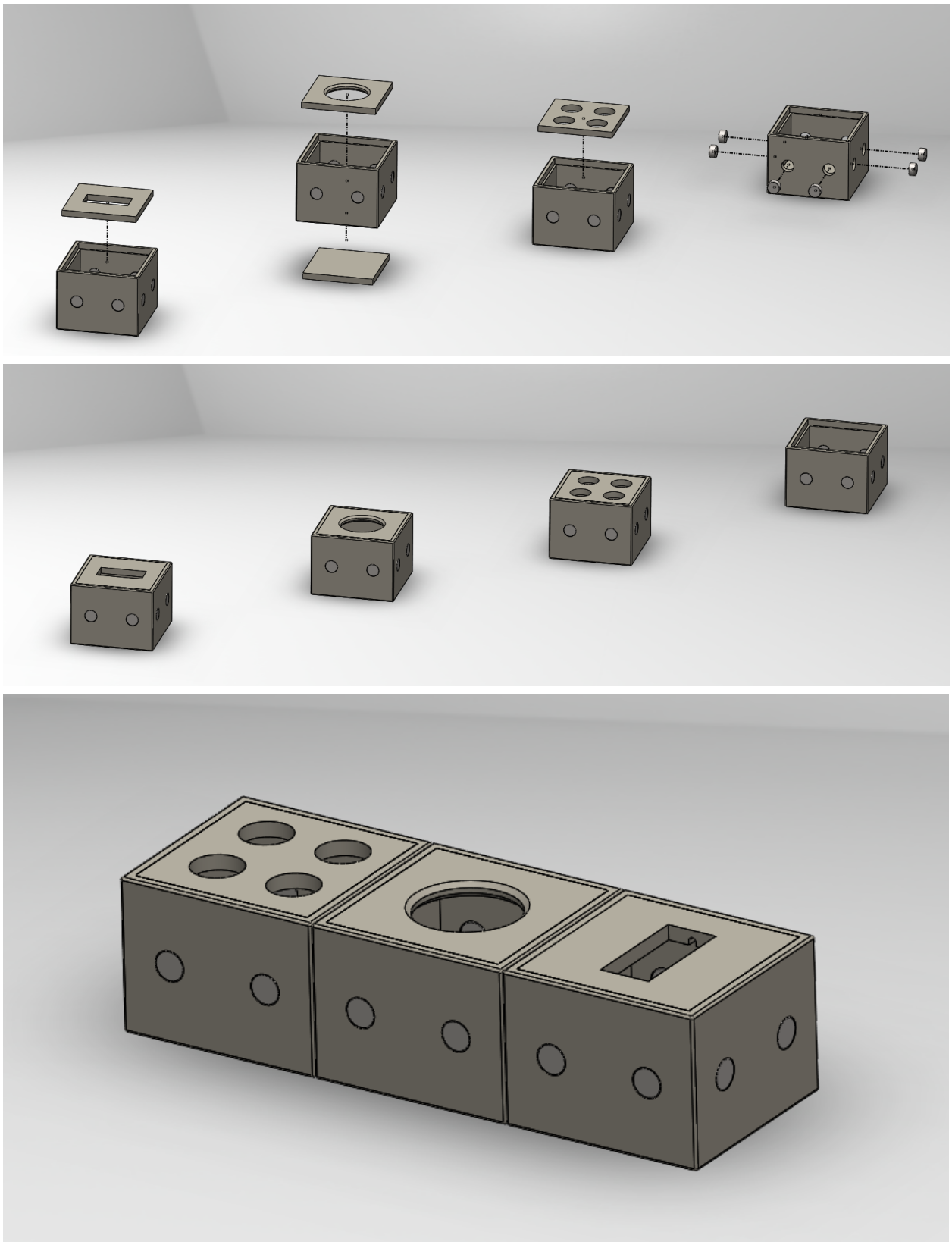
Magnets of this device will be purchased in a large bulk, and will be in abundance after purchasing. These magnets are to be small and thin and will have two of them on each compartment. Price will only be about 11% of the budget, the magnets are expected to be relatively strong, and the size of roughly a nickel. Will weigh about as much as one and it is a major element that will be a part of the device, being what allows it all to attach to one another. We are assuming that the magnets will have the strength to hold the pieces together while it is being used and we are also assuming that we will have access to a 3D printer at a constant basis that could be used whenever. In addition this

prototype is helping us create assumptions about the colour, size, and design of the different components. The printer itself is expected to be free, and the printing resource is expected to be decently water resistant and will be able to recreate multiple different squares/parts that allows compartments to be stored. The scrap and sample material is predicted to be abundant and the 3D printer filament will be the main material of the device. All other materials will have varying levels of importance, these will comprise of the different gadgets on the tools and the size, weight for the final product has not been calculated yet.

Prototype 1

Our first prototype consists of eight small magnets per each unit. We are using magnets because the client would like something other than plastic hinges which will not wear out easily. The other reason for using magnets is to have the ability to “grab and go”, saving time on taking product apart and playing with hinges. We combine the texture pad with each unit (each unit will have a texture pad on the flip side of the main function side, regardless of what the main function is). We did not include a texture pad with a joystick simply because it would be hard to hold with a joystick on the flip side. Each unit shares the same base. With different inner structures installed, there is a specific cover to accommodate (universal base see figure beside).

Figure 2: Prototype Visualization



Information for Upcoming Client Meet

Our team should provide a very basic version of the prototype done. Whether it is the basic shell or a couple of the detachable parts with their little minigame on it. The device does not need to be complete, but just represents the basic shape of some or all of the fidget tools.

We will be looking for approval of the client over the design of the prototype. Whether or not it is of a size that is considered adequate or if the way the tool is structured is useful. Or if the mechanisms are what the client expected or would approve of. As well as whether or not the tools put on it are what the client wanted.

Bill of Materials

In the table below is a list of materials that will be used for the production of the fidget tool. 3D printer filament will be used for the base of the device making it a key material for this project. Magnets will then be used to attach pieces to one another. An adhesive will then be needed to attach the magnets to the respective piece. If a cheaper, yet effective, glue is found, it can be used in place of the gorilla glue that is listed in the table below. In addition, certain components for the project can be composed of scrap material found from maker space as well as free samples from hardware stores. The main purpose of these scrap pieces is that they have texture to them meaning that there is not one specific type of material that is needed, many many different types of scraps can achieve the same final goal. We will also be purchasing a key tester set and we will be removing the buttons that are on the key to then use on our tool. In addition, we will be purchasing rubber wheels to attach onto our device. All in all, this is a fairly low cost product allowing for a lot of freedom in terms of testing out different materials without the risk of losing money, we just have to ensure that we are efficient without 3D printing filament use because that is where a majority of our money will be invested towards.

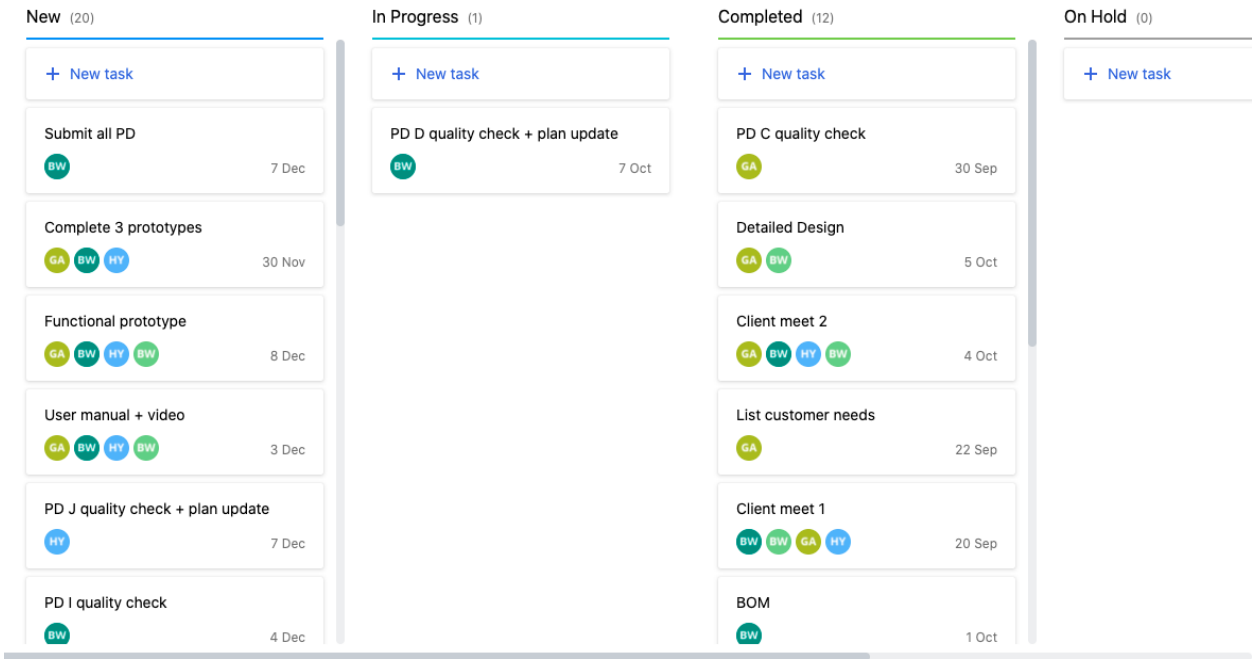
Table 1 : Bill of Materials

Item number	Part Name	Description	Quantity	Unit Cost	Extended Cost
1	3D printer filament	1kg/2.2lb(250 gx4), 0.25kg/spool	1	$39.98	$41.79
2	Magnets	6 x 3 mm	100	$11.99	$13.55
3	Gorilla Glue	0.71oz/20g	1	$8.48	$9.58
4	Scrap metal	Small pieces from MTC	5+	Free	N/A
5	Sample textures	Small pisces from hardware stores	5+	Free	N/A
6	10mm rubber wheels	10mm	8	14.99	16.9
7	Key tester set	Keys with different resistance	12	21.14	23.8
					$105.6

Project Plan

The following diagram is the project plan board 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 that are under title called “new” are yet to be started while the ones under “In progress” are currently being worked on and “completed” are tasks that are completed. When you click onto a task you will see who is responsible for it as well as its dependencies (predecessor and successor) as well as any sub tasks that it might have.

Figure 3: Project Plan Board



Conclusion

In conclusion, our team has taken some time to produce a detailed concept of the final product. With a detailed design our group was able to create our first prototype. We are now ready to proceed to the next step of the project which is the making of our prototype 2. But before that we must wait for the clients feedback about our first prototype and changes will then be made accordingly. Concerning the cost, even if we are not expecting to spend anything on scrap material, it is important that we are efficient with our filament use being that it is not cheap. All in all, if we ensure that we are following our detailed project plan and always keep it up to date we should be able to successfully present a function prototype to our client.