POLITEKNIK MALAYSIA

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FINAL YEAR PROJECT

MOTORIZED ULTRAVIOLET BRUSH

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ABSTRACT

Nowadays, there is too many automatic brushes or floor cleaners have been created and created with various functions. However, we find that the functions found on almost all of these automatic brushes are not in line with the era of progress. An innovation was conducted by producing an automatic brush that has been innovated from an existing product called "Smart UV Brush". Our main purpose of creating this innovation product is to add new functionality from existing products. The result of our project innovation is by adding a new function called "Ultraviolet Light" (UV Light).

This innovation product began to identify the shortcomings and weaknesses of the existing automatic brush by finding the best solution to the problem. The first problem is the existing motorized brush could not kill germs and bacteria found on the floor surface. In addition, most floor cleaners are also not completely effective when killing germs and bacteria.

The scope of the product is that this brush can only clean an area of 1 square foot and above only at a time. In addition, this brush is not completely automatic because it still requires human to operate and determine where to brush. The 12V battery that is equipped can last for about 2 hours after fully charged.

The study begins with the collection of information through questionnaires, analysis of information obtained as well as comparisons made with previous studies. The results of the questionnaire found that 90% of respondents agreed that brushing the floor manually is a tiring task. In addition, 70% of respondents have never used a motor brush. At the same time, 61% of respondents are not confident that using cleaning agent when brushing the floor can completely kill the bacteria or germs.

The design of this brush is aiming to make this tool work well, and also able to be a brush dry surface. Adding "UV Light" for more effective results by killing bacteria on the floor surface. We are hoping that this product can eradicate bacteria and maintain human health while maintaining the cleanliness of the floor surface.

CHAPTER 1: INTRODUCTION

1.0 RESEARCH BACKGROUND

This product is named Smart Brush. It is an innovation of previous motorized brush. This product purpose is to provide a better and easy way to clean floor. Our traditional way of cleaning using brush sometimes did not work on stubborn dirt like grease and moss on the floor. A lot of people admitted that brushing using physical movement made them tired. This product, Smart brush will solve this problem.

Smart Brush operates using rechargeable battery that will last approximately 2 hours. It comes with extra handy feature which the brush can be swap with mop. The spinning mechanism is driven by A DC motor and the speed can be adjusted via speed controller. It also utilized four small wheels for easy movement. The brush can be pressed to make contact to the floor. To ensure better cleaning, 8w germicidal UV tube light is fixed at the bottom of the brush. Another extra feature is the brush is equipped with two separate tanks for water and cleaning agent. Nobody likes cleaning floor because it makes people tired. It takes too much time using regular brush. Therefore, Smart Brush is invented to overcome this problem. Smart Brush is more convenient brush that can reduce the time taken to clean floor and provide better cleaning.

1.1 PROBLEM STATEMENT

Existing motorized brush can only clean dirt that can be seen with naked only. A study from the Hygiene Council found that kitchen floor just in front of the sink has more bacteria (830 per square inch) than the trash can (411 per square inch). Most bacteria cannot be killed just only using cleaning water. This problem causes less effective cleaning. The floor may look cleaned but most of the bacteria is still there and may cause health issue like infection or skin disease. Kids are the most exposed to this situation. Some of the bacteria that can be found on the floor is Bacillus, Micrococcus, Pseudomonas, and Staphylococcus. Even though the bacteria are not highly dangerous it still will be a problem. In addition, A research from Aston University in England stated that food retrieved just a few second after being dropped is less likely to contain bacteria than if it is left for longer periods of time. The research team also noted that the type of surface on which the food has been dropped has an effect, with bacteria

least likely to transfer from carpeted surfaces. Bacteria is much more likely to linger if moist foods make contact for more than five seconds with wood laminate or tiled surfaces.

Next, according to the survey we've done 72.7% of respondents take more than 15 minutes just to clean house floor. It takes too much time for a simple task. This task or job should not be a time consuming process.

1.2 RESEARCH OBJECTIVES

i. Killing bacteria effectively
ii. To reduce time consumption when cleaning house floor

1.3 SCOPE

i. Can only clean about 940 cm^2 of area at one time
ii. Can't clean dirt between small gap (40 cm and above only)
iii. The battery can only last for about 2 hours after fully charged

1.4 PROJECT DEFINITION

This project and research is about motorized brush innovation. We equipped previous motorized with UV tube light, wheels, and tank to enhance its performance. The brushing mechanism will be using DC motor and this brush also equipped with motor speed controller.

CHAPTER 2 : LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, will be shown materials used in making automatic floor brush and mop in the current markets. These materials have its own advantages and disadvantages. Hence, all the characteristics of those materials will be compared to our own product which has its own specialties and benefits. The mop is a patented invention that is part of social history as well as the evolution of house wares. In the 19th century housework became easier although it was still hard work. Carpets were mass-produced in Britain from the mid-19th century and they became much cheaper. However, cleaning carpets was no easy task in the 19th century. You had to hang up the carpet and beat it with a carpet beater (a handle and large flat paddle, usually made of cane). Melville Bissell invented a carpet sweeper in 1876. It made it far easier to clean rugs and carpets. Although to clean carpets people sometimes sprinkled them with dry tea leaves then brushed them up. Also in 1876, Susan Hibbard patented the feather duster. Meanwhile in 1860 Frederick Walton invented linoleum, which was a cheap and easy to clean floor covering. Then in 1893, Thomas W Stewart invented a mop with a replaceable head. It also had a clamping device. when a lever was pulled water and dirt were wrung out (before mops had to be wrung manually). His invention made cleaning the floor easier.

In now modern days, automatic floor cleaner development has been much more rapid and so the materials used an aluminium and plastic material. Plus, the automatic floor cleaner nowadays is lighter compare to what it used to be. So in this chapter, it will be explained about materials that are used to make automatic floor cleaner and the comparison between those materials and our product material.

2.2 Floor Brush and Mop

2.2.1 Introduction

The mechanical attachment fixes the brush head to the handle, but the attachment varies widely depending on the type, shape, and use of the brush. The mechanical attachment for a brush is made of steel wire, plated metal, or plastic that supports the shape of the head and carrier substrate. It also usually supports a swivel, also made of metal or plastic, that fastens to the

frame and handle. Plastic is the most common material for mechanical attachments and swivels on household dust , brush and the plastic attachments are made of durable resins that are injection-moulded. Brushes used for cleaning come in various sizes. There are brushes for cleaning tiny cracks and crevices and brushes for cleaning enormous warehouse floors. Brushes perform a multitude of cleaning tasks. For example, brushes lightly dust the tiniest figurine, they help scrub stains out of clothing and shoes, they remove grime from tires, and they remove the dirt and debris found on floors with the help of a dust pan. Specific brushes are used for diverse activities from cleaning vegetables, as a toilet brush, washing glass, cleaning tiles, and as a mild abrasive.

2.2.2 Characteristic Of Floor Brush And Mop

2.2.2.1 Advantages

This automatic floor brushes are extremely easy to use, and it won't take long to train any of the users on how to operate them without issue. While some models are fitted with power cords and need to be plugged in, the majority of automatic floor brush are powered by rechargeable batteries There will never be the need to hunt for a place to plug it in. And the users won't be restricted by the length of the cord.

Traditional methods of thoroughly cleaning floors will often require considerable time to dry. Think of how long the floors normally take to dry after being cleaned with a mop. On the other hand, automatic floor brush use less water, so a surface will naturally take far less time to dry after cleaning.

Since automatic floor brush have all the cleaning equipment needs such as water, brushes and mop, they're able to clean much quicker and more efficiently. This will save time and energy thanks to these advanced technology.

2.3 Material Selection

2.3.1 DC MOTOR

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. Small DC motors are used in tools, toys, and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. Workings of a brushed electric motor with a two-pole rotor (armature) and permanent magnet stator. "N" and "S" designate polarities on the inside axis faces of the magnets; the outside faces have opposite polarities.

Advantages

The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. DC motors have the advantage of: higher starting torque, quick starting and stopping, reversing, variable speeds with voltage input and they are easier and cheaper to control than AC.

2.3.2 MOTOR SPEED CONTROLLER

Motor speed controllers are electronic devices that control motor speed. They take a signal for the needed speed and drive a motor to that speed. There are a variety of motor speed controllers Advantages.

Advantages

Most modern controllers have the following protections; under-voltage, over-voltage, short circuit protection, current limit protection, thermal protection and voltage transients. Without these protections the motor is “exposed” to threats that will possibly result in permanent electrical or mechanical damage. It also use to ensure the motor remains under control and at the constant speed.

2.3.3 ABS PLASTIC TUBE

Plastic tube is a tubular section, or hollow cylinder, made of plastic. It is usually, but not necessarily, of circular cross-section, used mainly to convey substances which can flow liquids and gases (fluids), slurries, powders and masses of small solids. It can also be used for structural applications. Hollow tubes are far stiffer per unit weight than solid members. It also can be used to hold loads.

Advantages

The most important mechanical properties of ABS are impact resistance and toughness. A variety of modifications can be made to improve impact resistance, toughness, and heat resistance. The impact resistance can be amplified by increasing the proportions of polybutadiene in relation to styrene and also acrylonitrile, although this causes changes in other properties. Impact resistance does not fall off rapidly at lower temperatures. Stability under load is excellent with limited loads.

2.3.4 MOP

1. Flat mop

Features: The mop head can be rotated 360 degrees, and the cloth surface is glued with the devil's felt, which can be removed and removed.

Advantages: When it comes into contact with the ground, it can be brought up with a very close fit.

Disadvantages: It is difficult to wring out when cleaning the mop cloth.

Application: Suitable for cleaning cabinets, furniture, corners, ceilings, etc.

2. Cotton mop

Features: The mop head is made of sponge, so it has strong water absorption and good washing.

Advantages: The moisture on the ground can be quickly towed, and the mop is easy to clean, and it can be rinsed under the tap.

Disadvantages: If the glue contains less water, it is not easy to apply force when mopping the floor, and it cannot extend into the cleaning gap under the furniture.

Application: Suitable for situations where it is necessary to quickly dry the wet ground. It is not suitable for rooms with more furniture or more dead ends.

3. Double-sided mop

Features: Use the up and down flip way to directly change the face to clean, the cloth slope is convenient to clean the dead angle.
Advantages: The cloth surface can be removed and washed, the mop head can be flipped, and the double-sided alternate use can reduce the number of times the mop is cleaned.
Disadvantages: After long-term adsorption of wool and dust on the surface fiber, it is easy to become dirty and difficult to clean.
Application: Suitable for cleaning wooden floors and leather flooring.

2.3.5 FLOOR BRUSH

A brush is a common tool with bristles, wire or other filaments. It generally consists of a handle or block to which filaments are affixed in either a parallel or perpendicular orientation, depending on the way the brush is to be gripped during use. The material of both the block and bristles or filaments is chosen to withstand hazards of its intended use, such as corrosive chemicals, heat or abrasion. It is used for cleaning, grooming hair, make up, painting, surface finishing and for many other purposes.

Advantages
High quality, robust synthetic fibres brush even the finest dust from deep holes and gaps ideal for thorough cleaning of hard-wearing tiled and textured hard floors.

2.3.6 LOFT TANK

Loft tank is a container for storing water. These unique and rectangular shaped tanks are designed in order to keep the space where it is to be placed. These tank are also made from high quality plastic.

Advantages
Its main features include safe drinking water, quality tested and verified, best quality plastic is used, rust and corrosion free and lightweight. The modern design makes it excellent to be used in today's world and it's completely leaking free. They are manufactured as per the consumer's

demand and checked by the experts for the quality and durability before it is made available to the customers. At the same time, they are economical in comparison to other manufacturers. They have a good lifespan and are highly dependable.

2.4 Chapter's Summary

The overall findings of this chapter are the experiments that will be carried out in reference to the sources of previous studies and the theories of materials that will be used to refine the work done. In addition, some information on DC Motor, UV Light, Speed Controller, Brush, ABS Tube and more.

As to conclude this chapter, literature review is important to showcase all the studies of materials and methods to enhance the knowledge on this project. Every thesis and others projects that are related to this Smart Brush is really helpful especially for us to understand it fully. Due to its characters and advantages, its satisfy us and decide to proceed this project.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

As it is indicated in the title, this chapter includes the research methodology of the dissertation. In this part the author outlines the research strategy, the research method, the research approach, the methods of data collection, the selection of the sample, the research process, the type of data analysis, the ethical considerations and the research limitations of the project.

3.2 RESEARCH METHOD

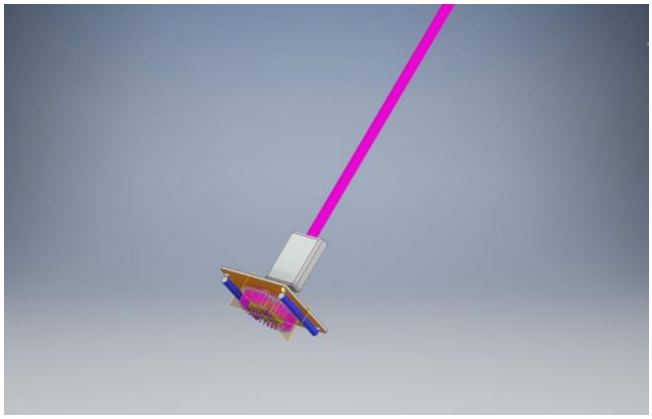
For the purpose of this research, We has decided to use a two combination of two of the classic social science research tools – questionnaires. The questionnaires will be distributed among cleaners, housewives, and regular civilians. The advantages and disadvantages of the method are discussed below.

Questionnaires

Questionnaires were chosen for this research because they are reliable and quick method to collect information from multiple respondents in an efficient and timely manner. This is especially important when it comes to large projects, with several complex objectives, where time is one of the major constraints. This study was no exception and questionnaires were a quick and effective way for the researcher to reach multiple respondent within several weeks. A general disadvantages of the questionnaires however is their fixed and strict format, which eliminates the possibility for more in-depth or abstract observation. Again, this study was not an exception from this rule, as the questionnaires provided linear and clear results, but many elements from the research were left uncovered.

3.3 PRODUCT DESIGN AND PARTS

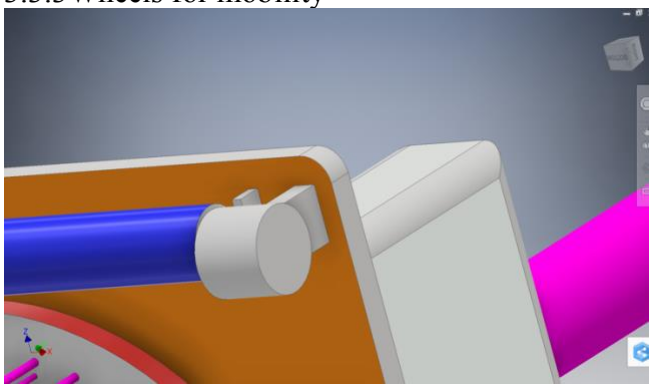
3.3.1 The Final Product



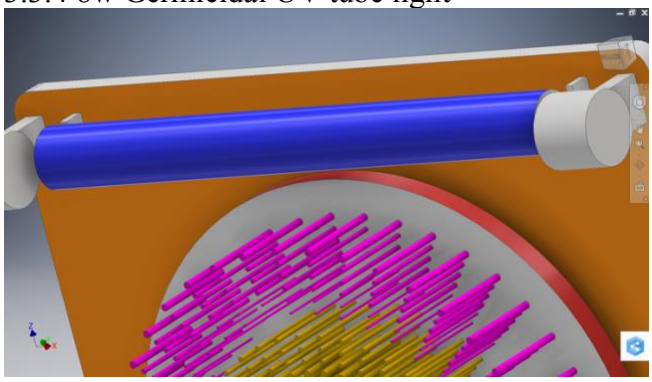
3.3.2 Motor speed controller and On/off button

- Controlling the DC motor speed

3.3.3Wheels for mobility



3.3.4 8w Germicidal UV tube light



3.4 Budget Calculation

Material	Quantity	Price (RM)
DC Motor 12V 80W	1	RM 100
Brush	3	RM 20
Loft Tank	1	RM 30
ABS Tube	1	RM 15
Wire	1 meter	RM 5
DC motor Speed Controller	1	RM 100
Switch	1	RM 5
Nut & Screw	15	RM 10
8W Germicidal UV Tube light	2	RM 60
	Total	RM 345

3.5 Summary

In this chapter we describes the research methodology used to collect and analyse the data required to address the research questions and to test the hypothesized relationships developed in this study. The chapter begins with questionnaires about motorized brush effectiveness. The discussion focus about data collection methods. Next, all of the collected data are analyse to create better solution.

CHAPTER 4 : FINDINGS AND ANALYSIS

4.1 INTRODUCTION

The data and study of the Motorized Ultraviolet Brush and its content measurements are incorporated in this chapter. In order to meet the aims and scope of the project, this knowledge and review are very important for this project. These details reveal the good outcomes of the research of components. After having all this knowledge, to make it better, we examine most of the product imperfections and try to find a better solution. The percentage is shown in the chart to provide better understanding

4.2 RESPOND RATE

A set of questionnaires were spread through online platform that targeting all kinds of people from different social background. We were able to compile all the data and analysis from the questionnaires. We were able to get more than 30 respondents during study. The respond rate was considered enough since it shows a big different in the chart.

I.

(Diagram 4.2.1 shows average time taken to clean floor manually.)

II.

(Diagram 4.2.2 shows how many respondents had uses automatic brush.)

III.

(Diagram 4.2.3 shows whether brushing is a tiring task.)

4.3 ADVANTAGES AND DISADVANTAGES

During conducting this project we've discovered some flaws and advantages of this project. The disadvantages are the cost of this project and this prototype is not very easy to carry around.

However, this UV brush provides a lot of advantages to the community such as making floor cleaning task more efficient and faster.

4.4 PROJECT TESTING

The product has been tested to clean tiles floor and it functions well enough to our expectations. The DC controller controls the DC motor very well while performing the task. The UV lights also functioning without any problems. However, we did find some parts that needs an upgrade such as the acrylic board/Perspex and steel tube. The brush successfully cleaned the dirty floor without any major problem.

4.5 CHAPTER SUMMARY

In conclusion, a lot of information have been analyzed. This project has some flaws that need an upgrade. Future development of this product should be taken for a better life quality. The test run is done to determine the capability of this product and it works just fine.

CHAPTER 5 : DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

In this chapter, the decision is made based on all the data obtained from the study and discussion from the previous chapters also from the data of the test run of the product. In this chapter as well, the relevant matters are regarding the objectives of the study and also the recommendations for the study. The analysis has been done. Hence, the discussion from all the results of test run and analysis will be explained in this chapter. Then, the conclusion will be made based on the discussion and upgrade plan that have been made.

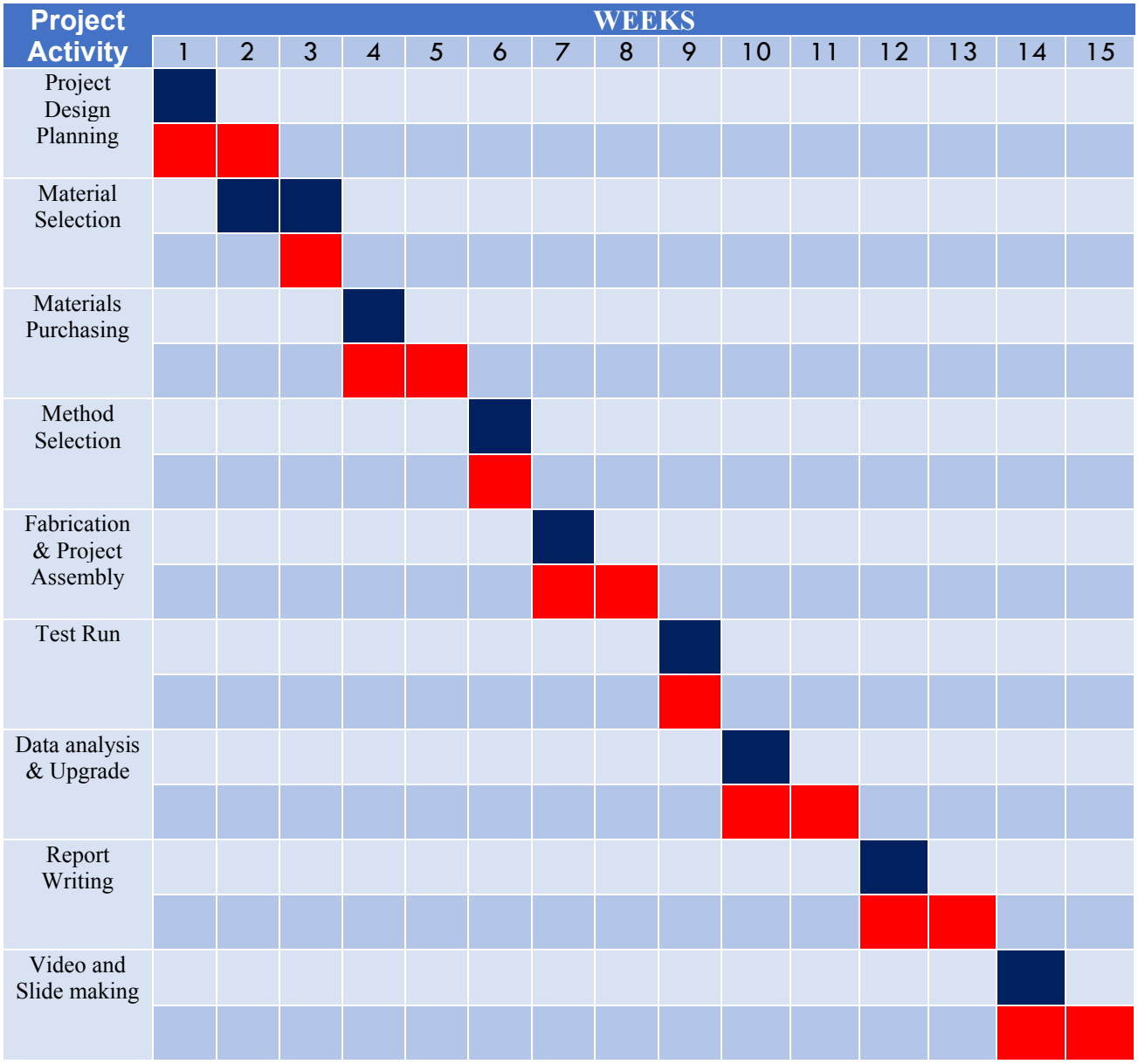
5.2 DISCUSSION

For the UV Brush, we have made a test run on our product. This product was tested by ourselves. After doing a test run, we found that the minimum age that suitable to use our product without having difficult problems when using it is 14 and above. The 12V DC motor makes a loud noise when in use. This is because higher DC motor volt makes louder noise.

In addition, the level of product effectiveness is assessed based on stubborn dirt that is difficult to remove without using a lot of energy to clean it. Dirt on the cracks in the tile can also be easily cleaned. Based on the data we collected, we agree to improve the brushes on our product by designing our own brushes instead of using regular brushes that are in the market. The brush textures suitable for washing floors of different textures. This will make our products more useful and not rely on washing only one type of floor texture.

In addition, we are all agree to change body of the brush from steel to aluminium to provide more efficiency and conveniences. We found out the steel is too heavy and causes the weight of the brush to increase.

Last but not least, to make the product more convenient, we planned for future upgrade to add water and soap tanks. So, users do not need to use other equipment, in fact users only need our product and can directly do the cleaning work with one tool only.



5.2 PROJECT ACTIVITY

	Planning
	Actual

5.3 CONCLUSIONS

In conclusion, this project was successfully carried out based on what we intended to do. A lot of research and analysis have been done throughout the semester. We are hoping Motorized UV brush can contribute the community to provide a better life quality. This project still has a lot of room for improvements for further upgrade and innovations.

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