SCHOOL OF ENGINEERING
TAYLOR'S UNIVERSITY

CODE NAME OF THE MODULE: PRJ60203
TYPE OF ASSESSMENT: Project Proposal

TITLE: UNIVERSAL ADJUSTABLE HOLDER STAND FOR TABLE

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Due Date: 30/9/2017
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Return of student marked assessment tasks. Please check (√) the necessary column.

√	Electronically to the individual student via the University learning management system
	Collect during class, only by the student
	Collection from the school or a staff member upon presentation of their student ID card
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ENGINEERING DESIGN AND COMMUNICATION

SUBJECT CODE :

PRJ 60203/ ENG1533

PROPOSAL

FOR

(SEMESTER 2)

AUGUST 2017

GROUP NAME : Team GD

MEMBERS NAME :

- Yip Winn Sheng Alwyn
- Jonathan Tan Kok Jin
- Teoh Zhi Heng
- Toh Thien Ee
- Lawrence Chin Jen Han

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Abstract

The main purpose of the making of this proposal is to give an idea and information about our project that are to be made for a semester 2 module, The Engineering Design and Ergonomics. The main objective of this project is that it addresses the Grand Challenges, and our project fulfil the checklist 'Restore and Improve Infrastructure'. Through surveys and researches, it is found that the built-in table panel on the lecture seats are small and working space is not sufficient enough to place studying items for students. Students tend to find it distracting and unsatisfactory because they cannot place both electronic devices and books on the table panel at the same time. Thus, after discussions and considerations among our group, we decided to build a multi-functional detachable table panel. This project is aimed to act as a working space extension on the table panels of the lecture seats so that students or lecturers can use both laptops and dropping down notes simultaneously during lecture. Other than that, we will also be focusing on the mobility of the project in such a way that it is detachable and easy to be brought between places due to its small in weight.

After having a serious discussion among our group members on the structure of this project, we have decided to mainly use wood and aluminium because of its light and strong property. After compiling all the information on the budget list, it is calculated that this project will cost approximately RM250. Our materials mostly will be bought from hardware shops and online shopping website.

In order to keep our project's progress to be well-organized and smooth, several tables and charts have been made. For example, in the Organizations structure and Linear Responsibility Chart, each member's role and job are tabulated and written down clearly so that each member's workload are equally distributed and they are very certain of what they are responsible on. Other than that, to keep track on the progress of our project, charts such as Work Breakdown Structure (WBS), PERT chart and Gantt Chart are also tabulated. With the aid of these tables and charts, we can ensure that our project will be run smoothly and able to complete within this semester, especially before Engineering Fair.

Introduction

In the module, The Engineering Design and Ergonomics is a semester 2 module which teaches and guides students on various ways of designing to enhance and improve products or structures by considering the usage of people around the world and its ability to suit the principle of ergonomics. In this semester, our project is titled to create an ergonomic structure that improve the facilities of the Taylor's University. Other than that, our project is also aimed to fulfil one of the checklist in the 14 Engineering Grand Challenge. In this project, we will be focusing on building a multi-function detachable table panel which will improve the usage experience in terms of studying or working. Through this project, we are also able to fulfil one of the Grand Challenge, which is 'Restore and Improve Infrastructure'.

For years, improvements and innovations have been made on various product and structure in order to bring convenience and also flexibility to humans. Taking classroom or lecture hall as an example, people in the past just tend to use simple chairs and tables to study and listen in class, but nowadays many improvements have been added such as the creation of desk-chair seats that are used in lecture halls. Such structure brings mobility and flexibility to students as those seats are also easily movable as normal chairs and it has a foldable table panel that acts as a workspace for students to write down notes and refer to their respective electronic devices. As a matter of fact, those seats are also innovated in such a way that cushions are placed on the chair so that it comforts and eases students' stress during lecture. However, those seats also have limitations as it still causes discomfort to students, such as the small workspace that are usually built on the seats. These small workspaces are limiting students' study activity as they are unable to do multiple work at the same time. Thus, after doing future research and serious discussion, it was decided unanimously that our group will create a detachable workspace platform that is able to largen the workspace of the student or lecturer when using lecture seats.

Ergonomic is relatively a branch of science where it involves process in designing, manufacturing and creating an improved workspace or structure that will ease and bring convenience to humans' lifestyle. Besides that, ergonomics also aimed to reduce and minimize the risk of injury when using it. With this our product, multi-function detachable table panel that incorporates ergonomic principles, students will be able to expand their working space as this product will act as an extension so that more items such as laptops, tablets or books can be placed and being used simultaneously during class. Other than that, this product is also convenient and easy to use because it is detachable and light in such a

way that it can be brought easily from places to places especially lecture halls without increasing the weight burden of students since mostly in college or universities requires electronic devices such as laptops or tablets to study. In a nutshell, this ergonomic product will definitely be help students and lecturer to work more comfortably, efficiently and effectively.

The Engineering Grand Challenges are the challenges set by various organization to encourage technological or architectural innovations on structure or product that are existing currently. There are 14 challenges that are involved and our product does meet one of the criteria in the challenge, which is 'Restore and Improve Infrastructure'. The aim of this challenge is for engineers to maintain or create some improved and economic structures that will ease humans' lifestyle such as our product. Even though our product doesn't seem to have a very huge impact on the society, it is indeed a small scaled contribution to the world because it definitely solves issues and discomfort of students when studying in a lecture hall. Only with innovation architectural design and along with engineering knowledge, a stable and extensive table panel can be made. For example, the joints or the hinge of the extension on the table panel and the considerable weight of object that are going to be placed requires engineering calculation so that it is stable and safe to be used.

From our survey that were done among Taylor's University students and lecturer, it is found that majority of the students complains that the working space of table panel in the lecture hall is not sufficient as they were unable to place several items on the table at the same time. Other than that, majority of the students also find that their workspace during examinations is not big enough as some exam papers require several scientific table reference and calculator and even sketching paper to complete the papers. Lastly, from the survey is it obtained that majority of the students or lecturers agree to have an extension on the table panels like our project product, a multifunctional detachable table panel.

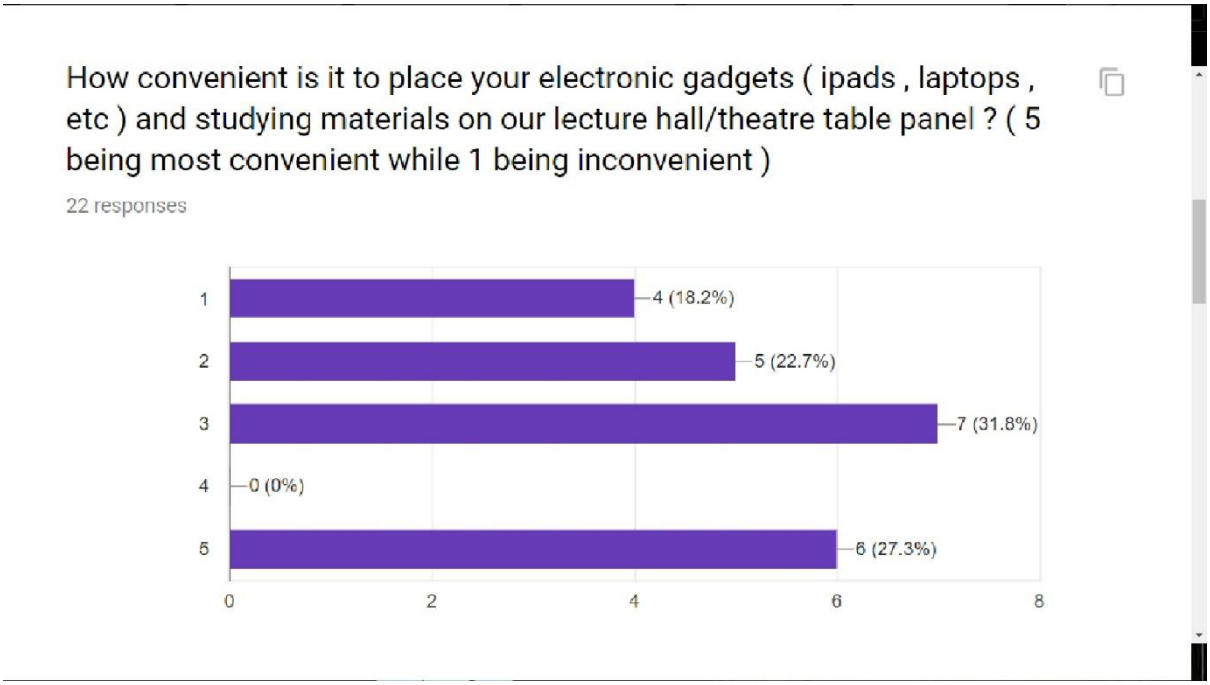


Figure 1 : Convenient of current table panel

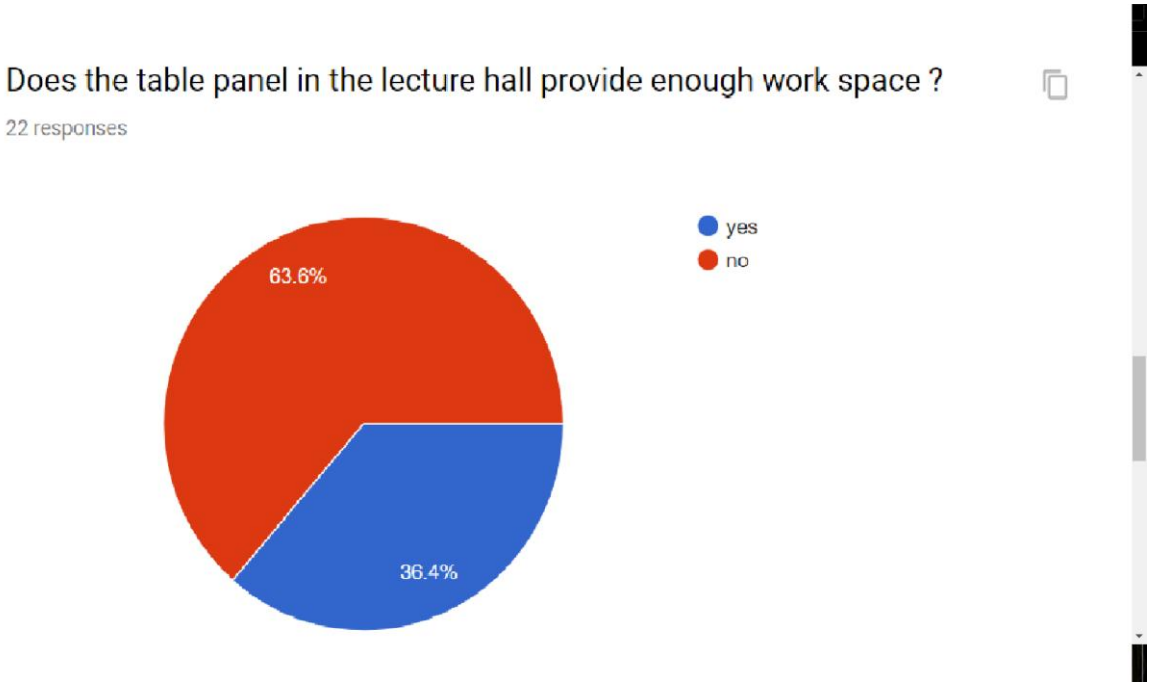


Figure 2

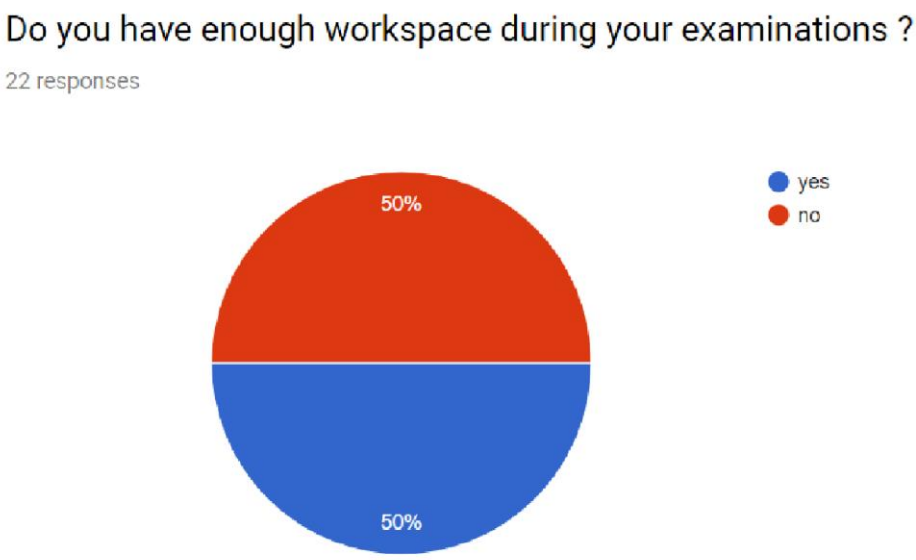


Figure 3

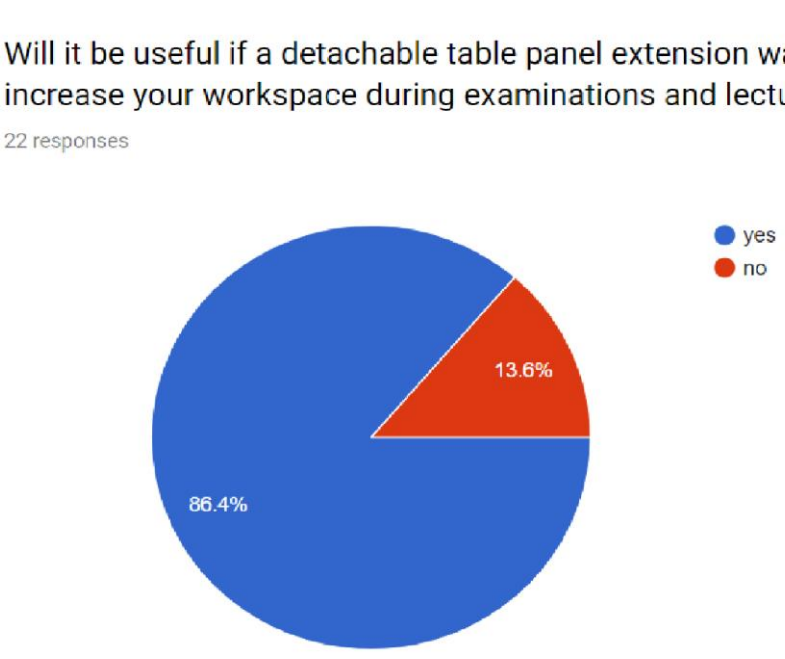


Figure 4

Objective

- To create a successful ergonomic table panel
- To design and build a multi-function detachable table panel
- To provide a more comfortable working space for students or lecturers
- To produce a structure that meets one of the checklist in the Engineering Grand Challenge

Concept

Since the theme for this semester's project is to improve the current facilities in our university , the challenge for the team is to choose a certain product and to incorporate ergonomics principles to produce a more efficient product . Hence , the team has chose to build a multi function detachable table panel extension which will provide more workspace for users . Our team came up with two ideas with 2 different sub system , namely a clamp-clip system and a magnetic system .

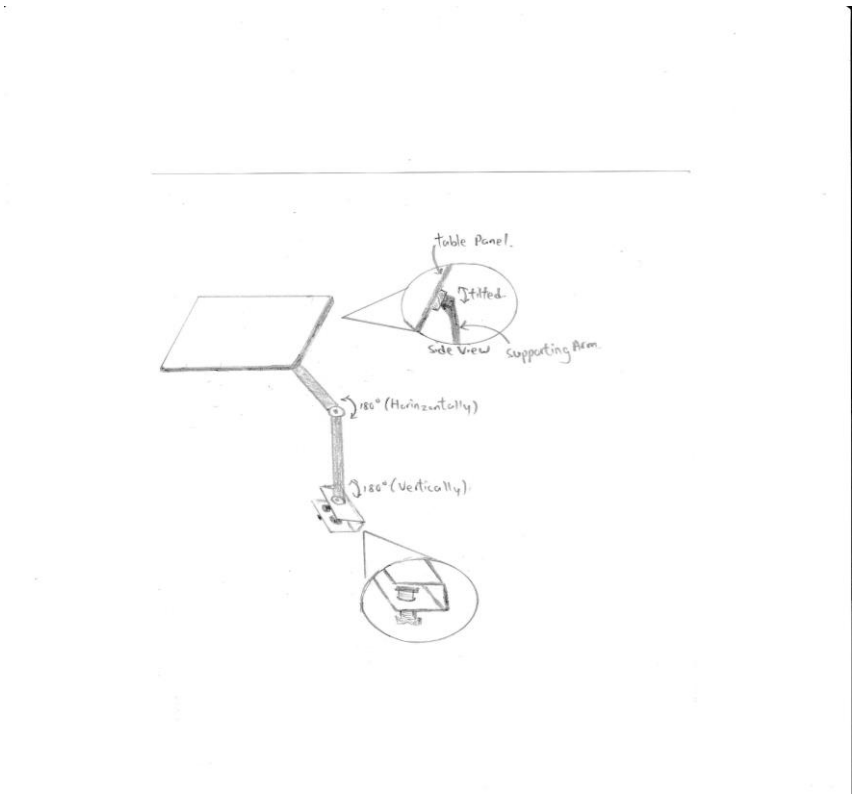


Figure 5 Our prototype

According to the detail figure above, our multi-function detachable table panel (MDTP) is mainly intended to overcome the insufficient workplace that the current table panel has in lecture halls. Besides, MDTP is also built to prevent the user from leaning forward to the fixed table panels as our table panel is adjustable and has a fixed distance between the consumer and itself, this is to improve the principle of ergonomics. Other than that, when users are having sufficient workspace, they can remove the MDTP from the chair or table , hence it's built to be detachable and handy to be carried around . In the past , we could place a few items on the table panel which limits our workplace . With MDTP , more items can be placed on the table without obstructing the view or limiting the workspace . Since our product is detachable , it can benefit both left and right handed users which has been a challenge in the past .

Decision Matrix

Table 2 : Decision Matrix

Criteria	Weightage	Multi function Detachable table panel extension	Magnetic Table Panel Extension
Ease of use	5	5	5
Productivity	4	4	3
Comfort	3	3	3
Aesthetic	2	4	4
Safety	1	4	2
Total Rating		62	56

According to the decision matrix in Table 2 , the multi-function detachable table panel (MDTP) extension obtained the highest rating which makes this an ideal prototype to build for our project .

From the ease of use point of view , MTDP and the magnetic table panel extension (MTPE) have the same ratings . However , MTDP is much be user friendly and universal . This is because it can be fitted and clamped onto most tables and chairs .

Whereas , the magnetic table panel can only be fitted on most chairs as it requires a surface to wrap around it .

MTDP has the highest rating for productivity as compared to MTPE . This is due to MTDP being more efficient and universal as it can be used at almost every chairs and table . Besides MTDP is also more cost efficient as it does not require a magnet to function . This projected can also be adjusted to the user's perferences because of it's flexible table and arms .

Comfort vise , both the multi function detachable and magnetic table panel are equally comfortable to use . Both table panels provide a bigger workspace which enable the user to place more gadgets such as laptops or tablets on the table . On the aesthetic point of view , both table panels also provide equally elegance without being too complicated to use . It is built to last and work efficiently to its fucntion . Hence , both table panels obtain equal rating .

For the safety view , MTDP obtained a slightly higher rating because it's easier and more safe to use a clamp than an magnetic holder . The clamp is harmless to any materials of the chair and table . On the other hand , the magnet produces magnetic field which might damage electronic devices which causes it to obtain a lower rating when compared to MTDP .

3.0 Methodology

Insufficient of workspace is struggling most of the university students while doing their note in the lecture theatre. Other than that, students who required to bring extra items for example cheat sheet, formula paper, standard value paper or even calculator has limited workspace. Therefore, our team propose an idea to tackle the problem we describe above. We came out with the idea of building a Multi-Function Detachable Table Panel (MDTP) which can maximize the workspace for the students.

Basically, the product MDTP consists of three parts which is clamp, supporting arm and table panel. The MDTP can be attached onto most of the handle of the chairs. Besides, the MDTP can be attached onto tables when the chairs are handle-less so that students have sufficient workspace to deal with their work. The MDTP is designed to priorate the student because the table panel is adjustable to comfort positions for the student instead of the student adjusting their body posture according to the fixed table panel. Furthermore, our product is concern about the visual of the student by adding the tilting feature into the table panel. This improve the principle of ergonomic on our product. (figure 1)

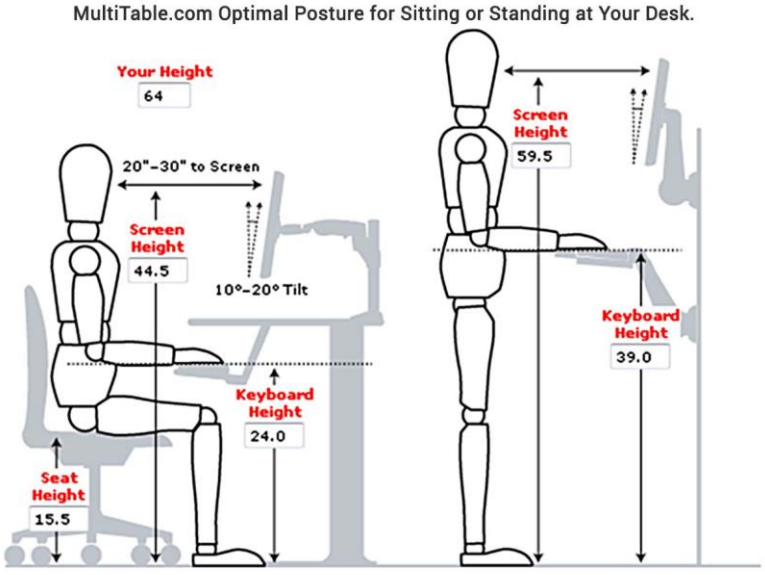


Figure 6

The inspiration of our idea on the design come from tablet holder as its setup process of the MDTP is user friendly, foldable and handy to carry around the campus. The size of MDTP is designed to fit into normal backpacks.

3.1 Table Panel

The table panel is made up of wood because it is cheap and easy to shape it. The wood is smoothened by polishing it with sand paper then coated by a layer of paint to prevent the consumer from hurting by the wood. In addition, wax is applied as the final coat for the table panel to add a degree of protection to it. (figure 2)

Figure 7

3.2 Supporting (arm & joints)

There is two sub-system that made up the supporting of the table panel which the arm and the joints. The supporting system consists of two arms and three joints. The materials for the arms is aluminium because it is light and strong enough to sustain the weight. There is two different type of joint in our product. One of them is attach to the table panel for the tilting part of the system, whereas the other two joints are rotatable (360 ° and 180 °) which located between the two arms and at the clamp respectively. (figure 3)

Figure 8

3.3 Clamp

Our team are using a c-shaped clamp for our product and two-screw system for the part we fix the clamp to the handle of the chair or table because it is more stable. The two screws are attach to the bottom plate of the c-shape clamp and the 180 ° joint is connected to the top plate of the c-shape clamp. The material use for the clamp is aluminium because is light and better appearance. The clamp for our will be the combination of two identical clamps as shown in the figure 4.

Figure 9

4.0 Budget

Vendors	Materials	Quantity	Price Per Piece (RM)	Total (RM)
RV Woods Sdn Bhd	Wood Piece	1	40	40
Choo Bee Sdn Bhd	Aluminium Rod	2	50	100
Ace Hard Ware	Paint	2	10	20
	Wax	1	10	10
	Clamp	2	15	30
www.alibaba.com	Joints	3	10	30
			Total (RM)	230

Table 3

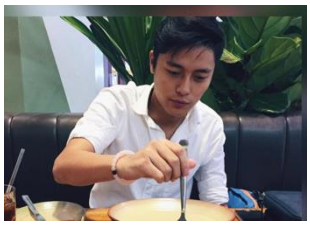
Our team finalised the materials that we will use to build our product is being shown in the table above. The wood piece which used to build the table panel will be purchased from RV Woods Sdn Bhd since it's a big wood factory and the price they offer is reasonable. Other than that, the aluminium rod for the supporting arm will be purchased from Choo Bee Sdn Bhd since the company is reliable and well known is Metal Manufacturer, and also the price offered by the company is fair enough. The paint and wax which used for coating the table panel and the clamp is purchased from the Ace Hard Ware with fair price. The joints part will be purchased from the online shop which allow us to get cheaper price than the physical shop.

5.0 ORGANIZATION STRUCTURE & TASK DISTRIBUTION

Organization structure

The organizational structure of the group can be seen in the following figure.

ALWYN YIP
LEADER
ORGANIZER



JONATHAN TAN
Financial Officer
Media Officer

THIEN EE
Inventory
Material Officer

LAWRENCE CHIN
Co-Leader
Creative Officer

ZHI HENG
Secretary
PR

Figure 10: Organization Structure

5.2 Linear Responsibility Chart

Table 4: Linear Responsibility Chart

WBS code	Element	Person in Charge				
		AY	JT	ZH	TE	LC
	Concieve					
1	Research on the Project	6	6	6	6	6
2	Brainstorming ideas	6	6	6	6	6
3	Presenting ideas to Advisor	6	6	6	6	6
4	Finalizing ideas	6	6	6	6	6
5	Research of materials for clamp	6	5	5	6	6
6	Research of materials for arms	5	6	6	5	5
7	Research of materials for table	6	6	5	6	5
	Design					
8	Determine the dimensions of the product	6	3	5	4	3
9	Research sources for clamp, arms, table	5	4	6	3	2
10	Purchasin of materials	3	2	5	4	6
11	Gathering materials	4	6	3	2	5
	Implement					
12	Constructing of clamp	6	5	4	3	2
13	Constructing of arms	2	3	4	5	6
14	Constructing of table	3	4	5	6	2
15	Testing of the table panel parts	4	5	6	2	3
16	Assembly of parts into final product	5	6	2	3	4
17	Testing and checking	6	2	3	4	5
	Operate					
18	Engineering Fair	6	6	6	6	6

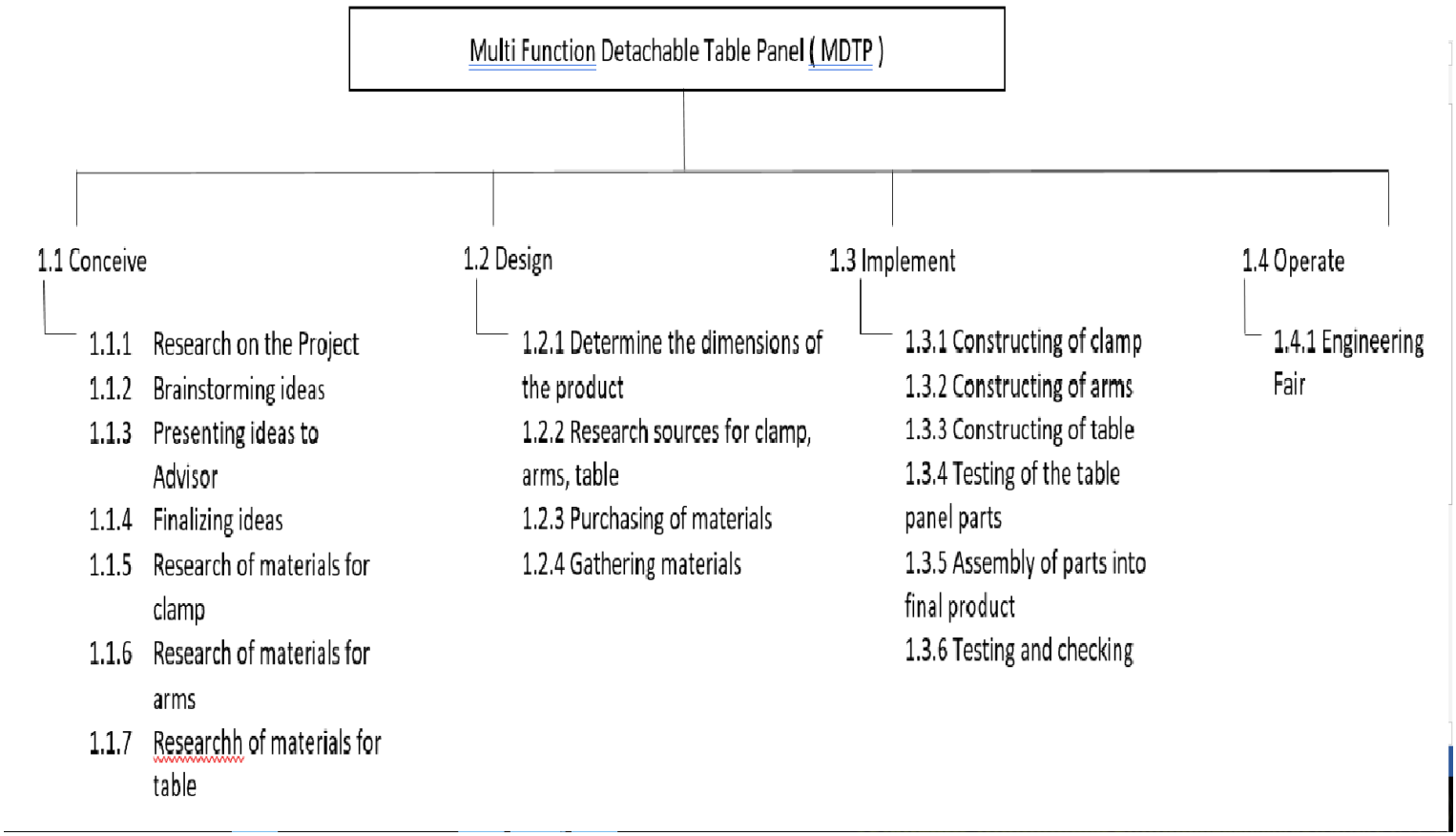
Whereby,

5Person in Charge ~ 1 Assistance

Table 5: Description of PERT Chart

No.	Tasks	Person in Charge	Duration (Days)
	Conceive		
1	Research on the Project		7
2	Brainstorming ideas		7
3	Presenting ideas to Advisor		7
4	Finalizing ideas		14
5	Research of materials for clamp		7
6	Research of materials for arms		7
7	Research of materials for table		7
	Design		
8	Determine the dimensions of the product		14
9	Research sources for clamp, arms, table		14
10	Purchasing of materials		21
11	Gathering materials		14
	Implement		
12	Constructing of clamp		14
13	Constructing of arms		14
14	Constructing of table		21
15	Testing of the table panel parts		14
16	Assembly of parts into final product		14
17	Testing and checking		14
	Operate		
18	Engineering Fair		1

6.1 Work Breakdown Structure (WBS)



6.5 Gantt Chart

WBS code	Element	September					October				November					December
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Mid Sem	Week 10	Week 11	Week 12	Week 13	Week 14
Concieve																
1	Research on the Project															
2	Brainstorming ideas															
3	Presenting ideas to Advisor															
4	Finalizing ideas															
5	Research of materials for clamp															
6	Research of materials for arms															
7	Research of materials for table															
Design																
8	Determine the dimensions of the product															
9	Research sources for clamp, arms, table															
10	Purchasin of materials															
11	Gathering materials															
Implement																
12	Constructing of clamp															
13	Constructing of arms															
14	Constructing of table															
15	Testing of the table panel parts															
16	Assembly of parts into final product															
17	Testing and checking															
Operate																
18	Engineering Fair															

7.0 Conclusion and recommendation

In conclusion, the product MDTP that will be designed by our group GD will be compete in the Ideas to Improve Taylor University Facilities, which is to produce an ergonomic product that could improve the facilities of Taylor University. In order to face this challenge, our team has decided to build the MDTP. MDTP is a table panel extension which could be attach to most of the handle of the chair or table. This could increase the workspace for students during the lecture or examination. With the MDTP, it is more convenient for students during their examination as it could provide extra workplace for students to put their formula paper, question paper, answer sheet, cheat sheet or even their stationary. From the survey we done, it is noticeable that during the lecture, students have insufficient workspace to deal with and our product, the MDTP can come in handy for this situation. Other than that, the MDTP has designed in a way where students are able to put their laptop, Ipad and stationary on the MDTP. Apart from that, the budget plan for this project is RM 200. If the materials could be subsidized by the university, there is a decrease of around RM 50 in the budget plan of our project. Finally after the survey we have done, we believe that the engineering design will be able to provide a better and more comfortable environment for students to do their task.

Since there is a short time limit for our project, the product we designed is far from perfect and it could modify and improve. The durability of the product t is the most important aspect to look into when we designed a product. Hence in order to increase the durability of the MDTP, instead of using wood for the table panel, plastic is used instead which has more resistance to the surrounding environment. For the supporting arm for the table panel, carbon fibre could be used as it is lighter and extremely strong compare to aluminium. The weight of the product could be decrease significantly so that the product is convenient to carry around the campus.

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