



MEB 3063 ENGINEERING TEAM PROJECT

EXTENDED PROPOSAL

MAY 2020 SEMESTER

“SMART DRUNK DETECTION”

By Group 23

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1.0 INTRODUCTION TO MPU4

1.1 BACKGROUND

For the past several weeks, there is an increased rate of road accidents due to drunk driving. This problem once again has become a hot issue in Malaysia. Research provided by the Economic and Social Commission for Asia and the Pacific (ESCAP) of the United Nations (2019), drunk driving contributed for around 25% of deaths on Malaysian roads as of 2018. Around 2,281 individuals were affected by drink driving accidents in Malaysia from 2011 to 2018, with about half of them dying and about half of them either suffering serious or minor injuries. This is not a small amount of numbers that can be neglected. Drunk drivers are basically a threat on the road that jeopardize innocent's and their life.

Number of persons who were injured or died from drink driving accidents in Malaysia
(2010-2018)

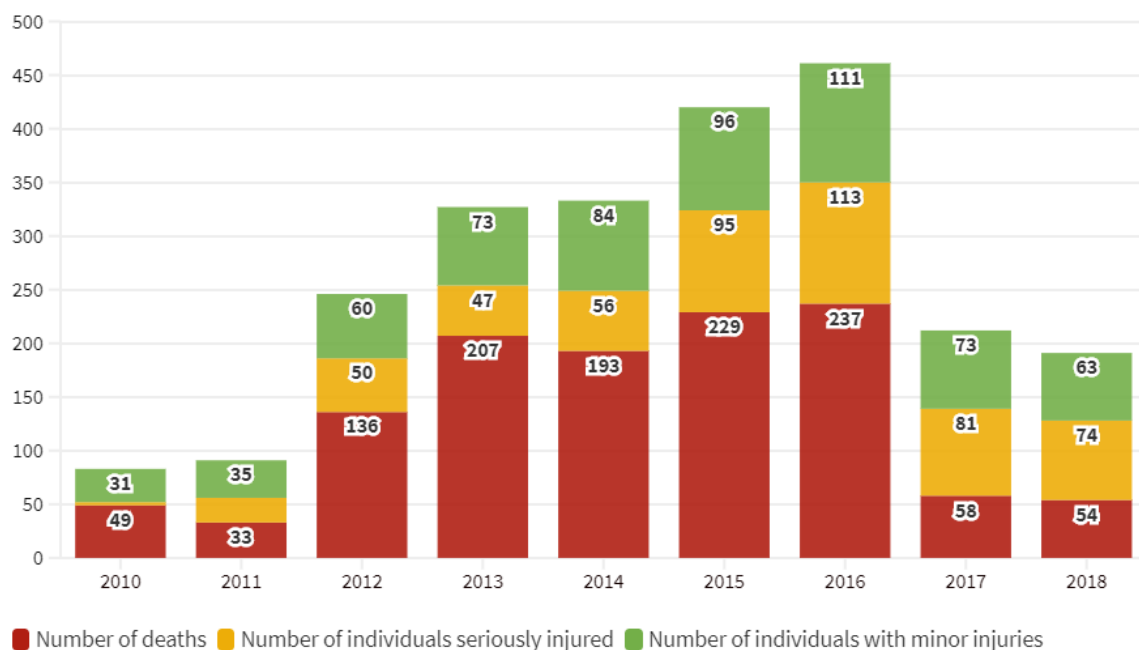


Figure 1: Number of Persons Who Were Injured or Died from Drunk Driving Accidents In Malaysia

Under the former Road Transport Act 1987 drunk driving is subject to Section 45A (1) which provides for a fine of not less than RM1,000 and not more than RM6,000 or imprisonment not less than 12 months. For drunk driving that lead to death, offenders are subject under Section 44 of the Road Transport Act 1987, which carries a maximum fine of RM10,000 and a maximum jail term of 12 months. Yet actually, based on the general opinion, these penalties are seen as ineffective to deter drunk driving.

There are some organizations that are giving out an idea for the Malaysia to reforming the nation's law to give stricter punishment to drunk driver. This is due to the ignorance of drunk driver to current law. However, it is not a convenience way because it takes a long time to develop a new law. Thus, a new solution that are more convenience, time saving and feasible must be used to comply on the third Sustainable Development Goal (SDG) which are to ensure healthy lives and promote well-being for all at all ages.

is it your opinion? but where you get this info.

Understanding the severity of the situation, we from Engineering Team Project Group 23 came together to develop an idea which are a device that attached in a car that can sense alcohol content of the driver. The device called as Smart Drunk Detection targets the sub goals of SDG 3: Ensure healthy lives and promote well-being for all at all ages, specifically target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents.

** citation*

1.2 PROBLEM STATEMENT

There are lot of people dies from the road accident due to drunk driver. This behaviour not just threaten the driver itself but the others innocent life on the road. Current law seems inadequate or ineffective but to reform a new law, it takes a long time and by the mean time there are high possibilities that the rate of road accidents due to drunk driving keep on increasing. Also, the current way of detecting drunk drivers using breathalyser is not effective enough to stop the drunk drivers on the road.

1.3 OBJECTIVES

Smart Drunk Detection aims to achieve following objectives:

- Reduce road accidents ~~by reducing the number of drunk drivers on the road.~~ *caused by*
- Ensure the safety of people on the road. *?*
- Provide a device that are accurate and user-friendly that are convenience. *?*
- Utilise the artificial intelligence technology to ~~replace the conventional~~ drunk detection mechanism. *in*

what it means here?

How you determine the accuracy of the device -

2.0 Design Thinking

2.1 LITERATURE REVIEW

According to Drunk Driving Penalties in Malaysia, drunk driving is a contributor road trauma in Malaysia. No matter where you are in Malaysia, drunk driving is treated as a serious offence and any person who is found to be operating a vehicle over the legal limit, may face penalties ranging from the suspension, disqualification or cancellation of their licence, fines, or imprisonment for more serious drink driving offences.

one of or main?

legal limit or drunk driving?

In all states of Malaysia, the legal blood alcohol concentration (BAC) limit for drivers is below 0.08 that mean 8%. In addition to that, it's also an offence for a person to refuse to undergo a Breathalyzer test for either alcohol or drugs if requested by the police.

of?

According to section 43 of the The Road Transport Act 1987, it states that a person who drives "without due care and attention or without reasonable consideration for another person using the road" is considered guilty of an offence. According to this section, drunk driving is punishable, and if offenders are found guilty, they can expect to pay a fine of up to RM 10,000 and a maximum period of imprisonment of 12 months.

~~citation~~

Remember that alcohol impairs one's ability to control a vehicle. Research suggests that at a blood alcohol concentration (BAC) of 0.08%, the risk of being involved in a traffic crash is double that of a person who has not been drinking at all.

Laws are there to protect the road users. However, it is not sufficient to protect all the users and drivers. As shown in the previous section, drunk driving is an issue that must be addressed. However, the way to detect drunk driver in this point of time is still ineffective. The police officers are not able to instantly detect a drunk driver on road. In most of the time, the drunk driver is spotted after the occur of accident. Even other driver is spotted the drunk driver, the only thing can the driver do is calling for police.

The way that a police officer identifies a drunk driver is by observing the strange behaviours of a vehicle. The strange behaviours include accelerating or slowing down quickly, almost hitting an object or other vehicle, drifting (moving in a straight-line at a slight angle to the roadway), driving in the centre or on the wrong side of the road, erratic braking, looking drunk (face close to windshield, drinking in the vehicle, etc.) and slowly reacting to traffic signals.

When a drunk driver is spotted by another driver, the other driver would not try to stop or interfere with the vehicle, break any laws to keep the vehicle in view, follow the vehicle too closely (it may stop suddenly) or try to detain the driver if the vehicle stops. This situation occurs because people do not want to risk their life to stop the drunk driving. The only thing that can the driver do is to call the police officers.

From the above evidences, it is clearly shown that we need a drunk detection system that can instantly detect drunk drivers and stop them from being on the road. The use of breathalyser will not be sufficient in reduce the drunk drivers on the road.

① Not comprehensive enough - jumping from here and there.

② no citation. LR should have a citation that leads to your project.

2.2 DESIGN THINKING TOOLS

a) Analogous Inspiration

According to “Analogous Research” (2018), analogous inspiration is defined as *“a way to look for solutions in different contexts that may be applicable to your challenge or inspire an idea that is.”* With a source of inspiration, analogous inspiration is able to trigger ideas in sectors different to the original inspiration.

Our team started with a brainstorming session. We have identified that the drunk driving is a very serious issue in Malaysia. We established a consensus that we want to focus on improving the current drunk detection system, which is by using a breathalyser by police. Our team started to figure out how to automate the breathalyser in a car by fixing the breathalyser inside the car. The driver would be required to use pass the breathalyser test before they can start the car engine.



Figure 2: Breathalyser

However, a drunk person might not know how to use a breathalyser due to the unconscious mind. This makes the use of breathalyser impractical. Our team utilise the analogous inspiration and we got a more advanced and suitable idea from the field of infrared and artificial intelligence (AI).

We have used the concept of analogous inspiration and we got the idea of utilising the use of AI to identify drunk driver. We also thought of using a nondispersive infrared (NDIR) sensor to detect the alcohol level of the air inside the car. This would further increase the accuracy of the detection system.

b) Survey

Our team members decided to publish a survey to gain more insights for your project and validate our problem statement. We have received a total of 92 responses from the survey. The results are as follows.

1. Do you know what is drunk driving?

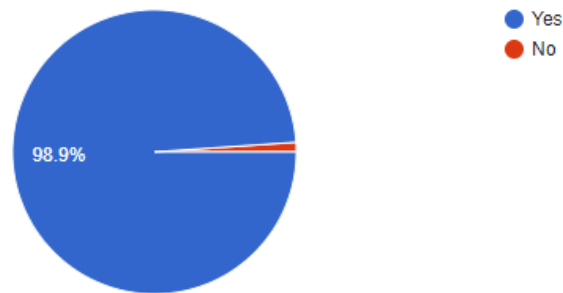


Figure 3: Public Knowledge on Drunk Driving

From the survey, 98.9% of the respondents know what drunk driving is. This helped us to validate our problem statement. The recent news displayed a lot of cases on drunk driving and this might be the reason for the public to know more about it.

2. Have you encountered drunk drivers?

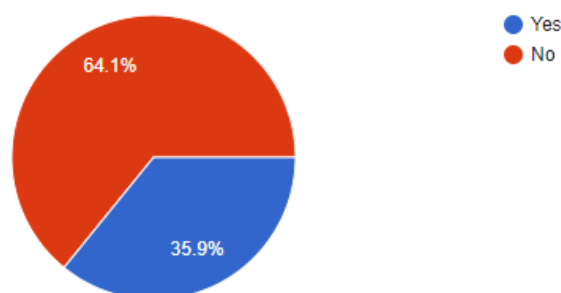


Figure 4: Does the Public Encounter Drunk Drivers

From these responses, we can see that 35.9% of the respondents personally encountered drunk drivers. This is a serious situation as drunk drivers can put the other drivers in danger. This is also an evidence that drunk driving needs to address.

3. Do you think a smart drunk detection system can protect you from road accident?

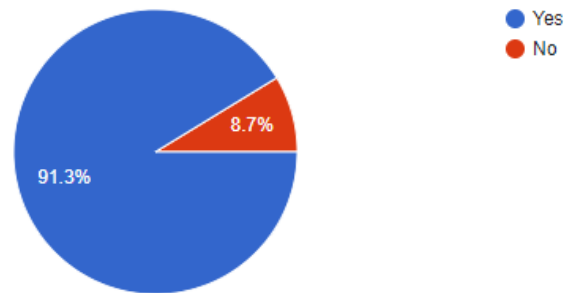


Figure 5: Public Confidence on Smart Drunk Detection System

From the survey, we can observe that 91.3% of the respondents are confident that Smart Drunk Detection system can protect them from road accident. This is a good sign for your team to develop the project as it will be helpful to the people especially drivers.

4. What matters the most when it comes to a drunk detection system?

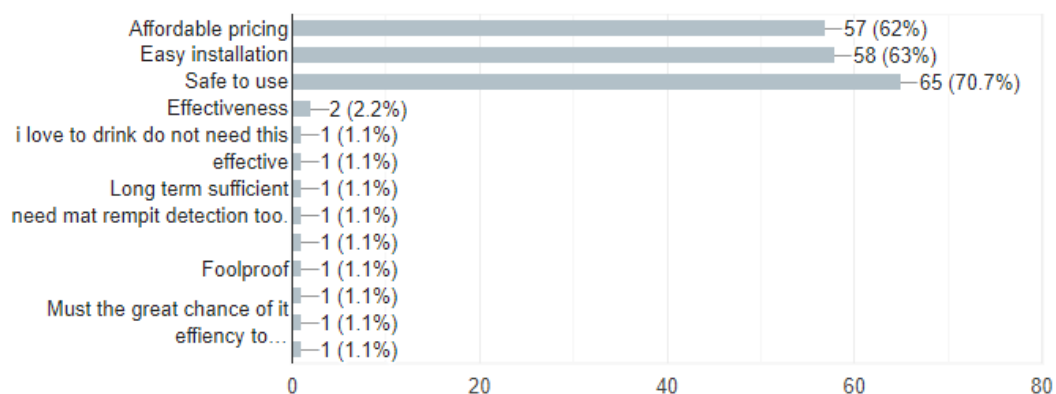


Figure 6: Aspect That Matter the Most by The Public

As expected, the public are most concern about the safety of the product. This is exactly the problem that we wanted to solve as the use of breathalyser is not effective enough at this point of time. The public also wish to have a device that can be easily installed and does not cost them a lot.

With this information, our team can build a drunk detection system that is affordable, reliable and safe to use. In short, we can conclude that our product will have a good market value as it can help to reduce the risk of drivers being expose to road accidents caused by drunk drivers.

3.0 DESIGNING

To fulfil its purpose, Smart Drunk Detection requires the following:

1. An Infrared Light sensor to detect the alcohol level
2. Internal circuitry to determine the alcohol level and to control the output

3.1 ALTERNATIVE DESIGN

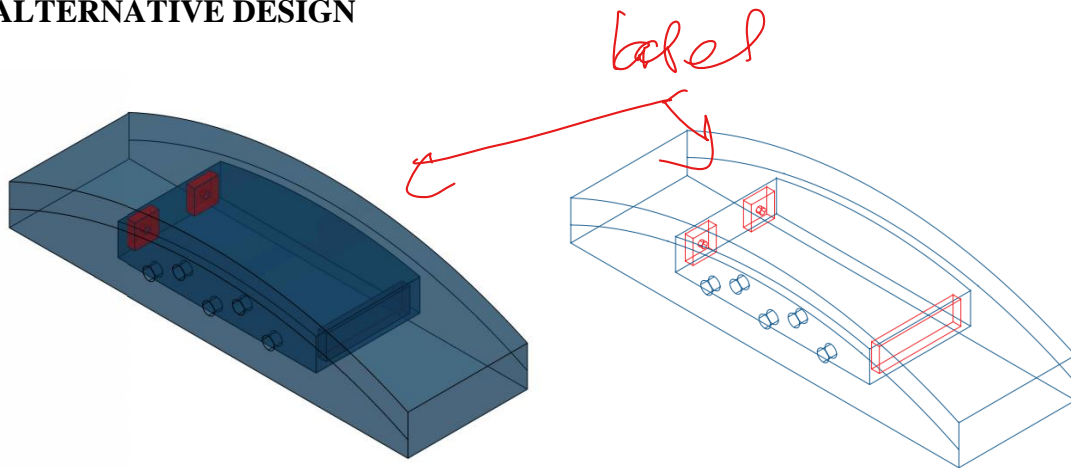


Figure 7: First Alternative Design

The first design is as shown in Figure 7. At the front side of the device, there are 5 holes that will act as an inlet and outlet for the air molecules to enter and exit the device. The two red boxes will be the source of the infrared light and the plate at the other end will act as the infrared light detector. This device is designed with a curved shaped at the top to blend well when it is put on a steering wheel.

After deeper analysis, we have decided that this design wont fully meet our needs such as the accuracy of just one drunk detection device. The box-shaped chamber is not very suitable for the existing NDIR sensor in the market. Therefore, this design needs some major adjustments to be made to fully optimize the needs of this device.

3.2 FINALIZED DESIGN & JUSTIFICATION

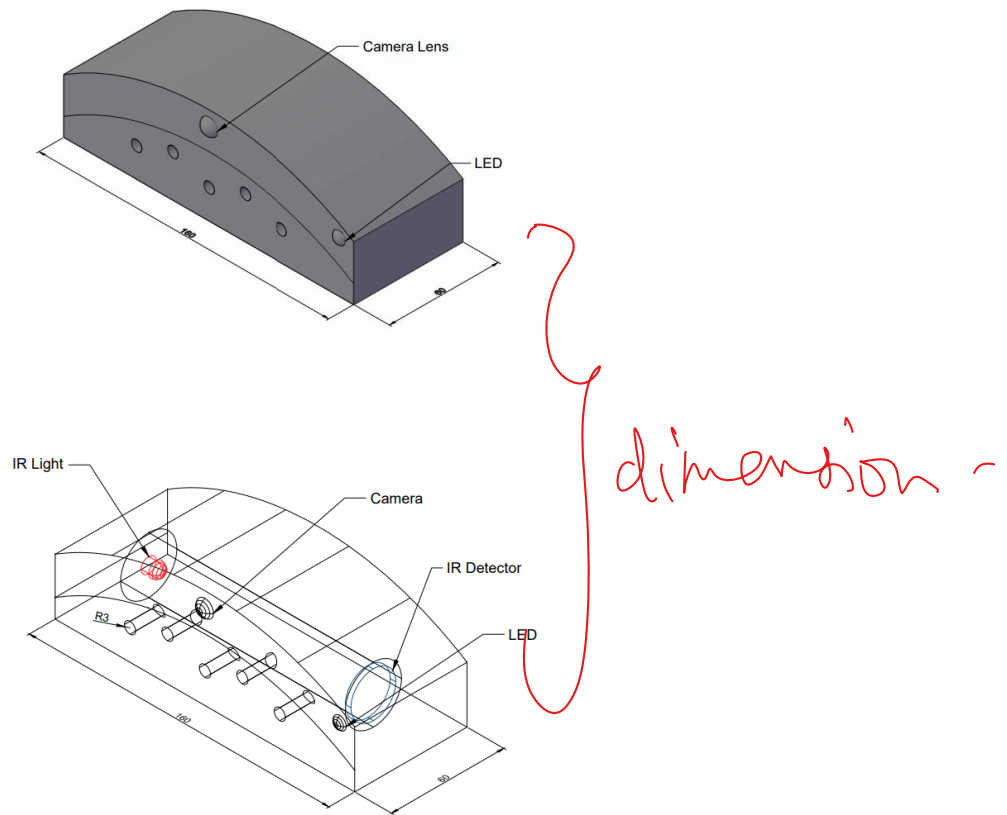


Figure 8: Finalized Design

The finalized design is as shown in Figure 8. The initial shape of this design is kept as it is to maintain its sleek shape to blend well with the steering wheel. The location and number of inlet and outlet holes are also kept as the initial design.

From the previous design, we have made a few changes. The first major change is the new additional feature to this device which is a camera. This camera works as a facial recognition camera to add another drunk detection device for additional accuracy. The second change made is the addition of LED light that will warn the driver if the IR sensor sense alcohol presence when the car is already driving on the road. The last change made is the shape of the chamber where the Infrared sensor and Infrared detector is located. We have decided with a cylindrical chamber as most NDIR sensors in the market are tube shaped.

4.0 PROJECT MANAGEMENT PLANNING

4.1 TASK LISTING AND DISTRIBUTION

Tan Li Tung (17002803)	
<ul style="list-style-type: none">• Project Director• Organize and coordinate team meetings• Supervise project progress according to Gantt chart• Lead the designing of electrical circuits• Identify items and prices of electrical components• Compile and proofread reports• Compile the programming work	

Nur Fathiah Zolkifli (17004851)	
<ul style="list-style-type: none">• Secretary• Conduct literature review• Ensure each member submit the reflection form• Take attendance at each meeting and keep track of all deadlines• Prepare relevant documentation (eg. minutes of meeting)• Conduct survey and questionnaire	

Nazrul Aiman Mat Akher (17005555)	
<ul style="list-style-type: none">• Technical Director• Conduct research on analogous inspiration• Handle the exterior design of project• Researching items and prices for construction of prototype• Advise on choice of materials• Conduct research on tools and software used in designing	

Danial Hariez (17004263)	
<ul style="list-style-type: none">• Creative Director• Conduct research on similar products on market• Handle the interior design of project• 3D drawings with AutoCAD• Select and compare alternatives in materials• Conduct research on related articles to support fabrication process	

Wong Xian Wan (16003946)	
<ul style="list-style-type: none">• Simulation Director• Prepare Gantt chart• Conduct background research on problem statement and objectives• Conduct research regarding the current solution• Create methodology and workflow of the project• Conduct simulation for the project• Evaluate the functionality of the project	

4.2 GANTT CHAT (ACTIVITIES AND MILESTONE)

Task Details	1/6	8/6	15/6	22/6	29/6	6/7	13/7	20/7	27/7	3/8	10/8	17/8
	7/6	14/6	21/6	28/6	5/7	12/7	19/7	26/7	2/8	9/8	16/8	23/8
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
ETP briefing												
First supervisor consultation												
Design thinking workshop												
Meeting with supervisor												
Individual reflection												
Brainstorming (SWOT analysis)												
Finalization of Project Idea												
In-depth Project Research												
Marketability review & research												
Problem statement and solution												
3D modelling												
Schematic design												
Simulation												
Extended proposal first draft												
Proposal draft review												
Extended proposal final submission												
Development of design concept												
Design concept draft												
Simulate design concept												
E-poster presentation preparation												
Video presentation preparation												
Demonstration of design concept												
Group & individual video presentation												
Evaluation of design concept												
E-Poster evaluation												
Submission of Final Report												
Submission of Peer Evaluation Form												
Individual contribution												

Legend	Complete	Due	Overdue
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4.3 FEASIBILITY OF PLAN

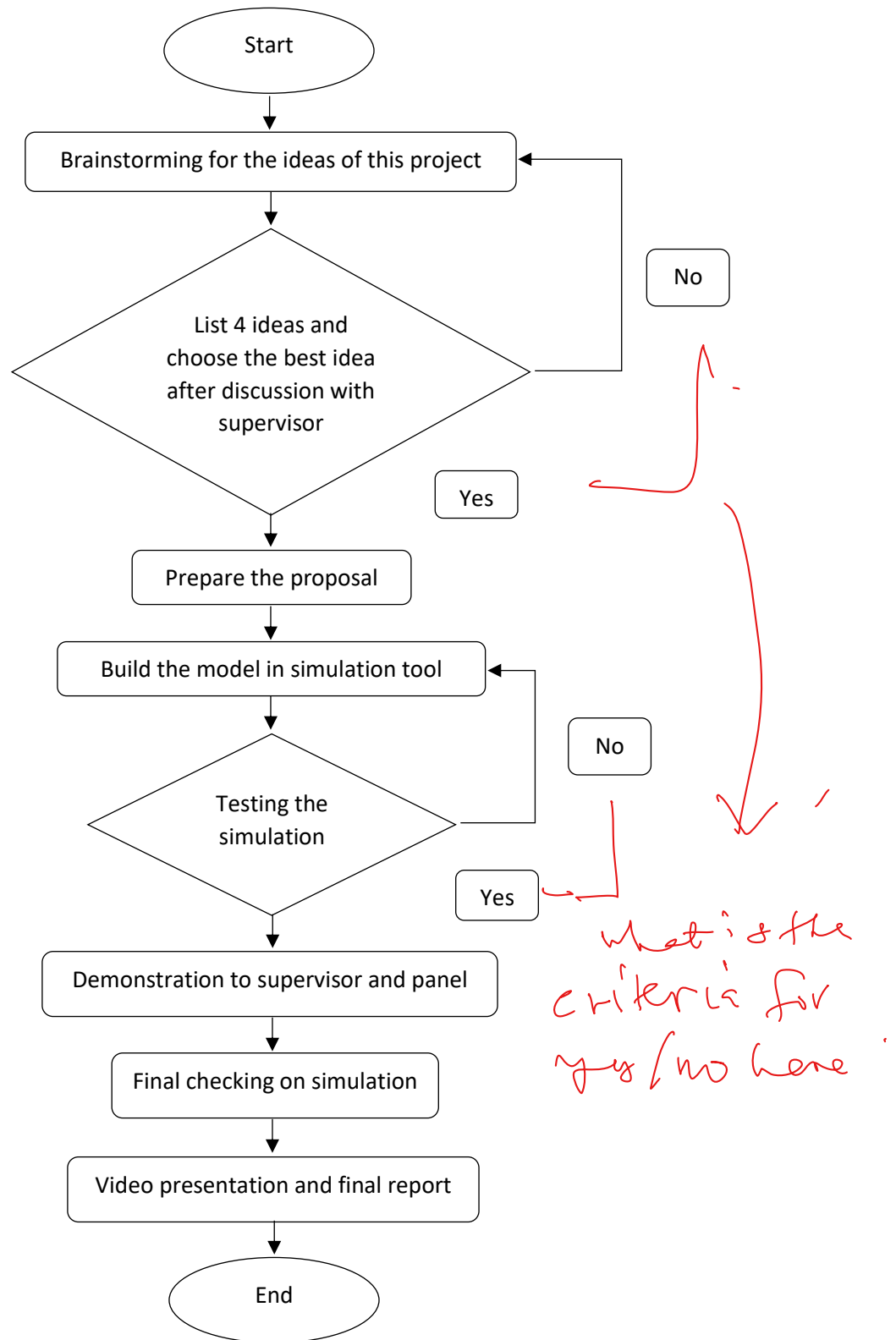
The finalized design has been done and presented to the supervisor. We are approved to proceed with the project. Large amount of research has been carried out to ensure the product uses cost-effective materials so that it is affordable to everyone. There are plenty of online resources that can help us in the simulation and also preparation of design concept.

*can within the
four - than it makes our
plan is feasible support your
idea.*

Based in the Gantt chart, two weeks would be spent working on design concept and simulation as these steps take longer time. This will also provide rooms for the project improvement. One week after the design concept and simulation would be used to prepare the video presentation and E-poster presentation. There are lots of resources and tools online that can help us to complete the design concept and simulations. Therefore, we believe that the plan is feasible, and our team would be able to finish the project within the designated time frame.

5.0 METHODOLOGY

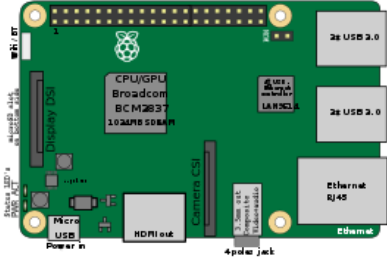

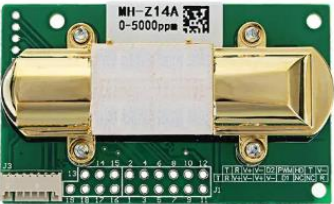

5.1 PROJECT WORKFLOW





*in final reporting -> this methodology should reflect the methodology of the device, how it works

5.2 IDENTIFICATION OF SUITABLE TOOLS AND SOFTWARE

The tools and software used in this project are listed as below:

No	Item	Purpose
1	Raspberry Pi 3 Model B+  <p><i>justify why using this is</i></p>	Microcontroller of the device
2	Mini USB Camera 	To take image of the driver
3	NDIR Sensor 	<p><i>ex</i></p> <p><i>help in the project</i></p> <p>To detect the alcohol concentration in the air in the car</p>
4	3.7V Rechargeable Li-ion Batteries 	<p><i>not using the car battery?</i></p> <p>Power supply for the device</p>

5	LED 	<p>To alert the sleepy driver</p> <p><i>How LED alert the sleepy driver?</i></p>
6	Buzzer 	<p>To alert the sleepy driver</p>

The software used in this project are as below:

No	Software	Function
1	AutoCAD	To model the prototype in 3D
2	Online schematic tools	Design circuit schematics

→ The ~~selected~~ selection can be based on the built prototype - you choose it as it's within the budget -

5.3 JUSTIFICATION OF FABRICATION CHOICES

For the prototype, plastic is chosen for the overall material. Plastics are derived from organic, natural materials such as coal, salt, natural gas, cellulose and also crude oil. As plastics are known to be good insulators, it is the most reasonable choice of material to be chosen for our prototype. As our prototype is built around a number of electrical components such as NDIR sensor and camera, material with good electrical insulator is best used to avoid current leakage throughout the whole prototype to prevent further problems. *is such a* Plastics are also widely produced making our prototype very cost effective considering the cheap price of plastics today. Aside from that, the material chosen has to be very light as our prototype needs to be attached to the steering wheel. An abundance of weight means that the steering wheel will be heavier causing discomfort to the driver. Plastic is a perfect material for this as it is very light (“The Properties of Plastic”, 2018).

6.0 ECONOMICAL/ BUSINESS CONSIDERATION

6.1 CAPITAL COST CONSIDERATION

This capital cost needed for the project are as below. The cost listed is the estimated cost as the project is conducted fully online.

Item	Unit Price (RM)	Quantity	Subtotal (RM)
Raspberry Pi 3 Model B+	120.00	1	120.00
Buzzer	1.00	1	1.00
LED	0.10	1	0.10
Resistor	0.05	1	0.05
Jumper Wire	2.50	1	2.50
NDIR Sensor	90.00	1	90.00
Camera	40.00	1	12.00
3.7V Li-ion rechargeable battery	3.90	2	7.80
Battery Holder	5.20	1	5.20
Plastics sheet	10.00	1	10.00
Total (RM)			248.65

6.2 OPERATIONAL COST CONSIDERATION

Since the project is carried out online, there is no cost involved in the fabrication process. In UTP, students are able to fabricate the product at the Engineering, Prototyping and Innovation Center. Once the product is commercialised, the fabrication process would be carried out in a factory which can reduce the cost as the production are usually in bulk.

The Smart Drunk Detection System is advisable to run using the power supply outlet in the car itself. However, there will be a backup battery which can back up the system in case of power supply shortage.

6.3 ALTERNATIVE MATERIALS

Plexiglass can be used to replace plastic as an alternative material. Plexiglass is a transparent petroleum-based material often manufactured in sheets as lightweight and shatter-resistant alternative to glass ("What is Plexiglass", 2019). The most important characteristics of plexiglass is that it is an electrical insulator which can prevent current leakage in the system of the prototype. Plexiglass is an easy material to fabricate, bonds well with adhesive and solvents which means it will not cost much to create the prototype. The lightweight that this material offer is excellent for the prototype. It also has superior weathering properties compared to other types of plastics which means it will last a long time.

→ can put the picture of the plexiglass here

→ this maybe can add more high end camera to have better image of the drunk driver —

→ maybe add more accurate sensor.

7.0 CONCLUSION

Drunk driving is a threaten to the safety of people on the road especially in Malaysia. This issue needs immediate attention and action to resolve it. There are lot of possible solution that can be implemented such as from the perspective of law, automotive and even technologies. The feasible solution for now is based on technologies perspective compared to the others.

After thorough research and studies, our group has come out with a device that combine sciences and technology to be the possible solution of this problem. Smart Drunk Detection is a device that come up with nondispersive infrared (NDIR) sensor that can detect the alcohol content of the driver along the period time of driving. The project will also utilise the technology of artificial intelligence (AI), specifically machine learning (ML) algorithm to enhance the accuracy of the detection. This is very useful because it keeps on observe the driver and can also alert the driver. Our product has great features and system that can be on the market of automotive industry in order to cope with the drunk driving issue.

For the next action, we will do the animation on how Smart Drunk Detection will works in certain circumstances to give better view or idea on our product. It is a simple animation yet informative and neat so it can be delivered well. Our team will also start to work on the simulation of the model to support the feasibility of the project.

In conclusion, this project is capable of avoid as many as possible drunk driver on the road by locking the car engine and alert the sleepy drivers. Thus, it can help in reducing the road fatalities due to the drunk driving. We hope this product will be implemented in cars to add safety features in it.

8.0 REFERENCES

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