POLITEKNIK UNGKU OMAR

MODISH WHEELBARROW

NURUL NABILA BT SHAMSUDDIN

(01DKA21F1088)

AFIZ HAFIFI BIN MOHD ROZALI

(01DKA21F1089)

NURSHAZWANIE BT MOHD ZIN (01DKA21F1090)

CIVIL ENGINEERING DEPARTMENT

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AFIZ HAFIFI BIN MOHD ROZALI

(01DKA21F1089)

NURSHAZWANIE BT MOHD ZIN (01DKA21F1090)

This report is submitted to Civil Engineering Department as partial fulfillment of the requirement for the award pf Diploma of Civil Engineering

CIVIL ENGINEERING DEPARTMENT

SESSION I 2023/2024

CIVIL ENGINEERING DEPARTMENT
2023
ACKNOWLEDGEMENT OF AUTHENTICITY AND OWNERSHIP

TITLE : MODISH WHEELBARROW
SESSION : SESSION I 2023/2024

1. I'm **NURUL NABILA BT SHAMSUDDIN (NO IC:030124-02-0300)** is a final year student of **Civil Engineering Department, Politeknik Ungku Omar** located at**, Jalan Raja Musa Mahadi, 31400 Ipoh, Perak**

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3. We agree to release the ownership of the intellectual property of MODISH WHEELBARROW to Polytechnic Ungku Omar to fulfil the needs for the awarding of **Diploma of Civil Engineering** to us.

Made and duly acknowledged by the aforementioned:

NURUL NABILA BT SHAMSUDDIN) ……..
NO IC 030124-02-0300) NURUL NABILA BT SHAMSUDDIN

Supervisor, PUAN NOOR RASHIDAH BT NOORDIN (800802-08-5604)

……..
Supervisor on date of :) NOOR RASHIDAH BT NOORDIN)

CIVIL ENGINEERING DEPARTMENT
2023
ACKNOWLEDGEMENT OF AUTHENTICITY AND OWNERSHIP

TITLE : MODISH WHEELBARROW
SESSION : SESSION I 2023/2024

1. I'm **AFIZ HAFIFI BIN MOHD ROZALI (NO IC: 030629-03-0141)** is a final year student of **Civil Engineering Department, Politeknik Ungku Omar** located at**, Jalan Raja Musa Mahadi, 31400 Ipoh, Perak**

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Made and duly acknowledged by the aforementioned:

AFIZ HAFIFI BIN MOHD ROZALI) ……..
NO IC 030629-03-0141)AFIZ HAFIFI BIN MOHD ROZALI

Supervisor, PUAN NOOR RASHIDAH BT NOORDIN (800802-08-5604)

……..
Supervisor on date of :) NOOR RASHIDAH BT NOORDIN)

CIVIL ENGINEERING DEPARTMENT
2023
ACKNOWLEDGEMENT OF AUTHENTICITY AND OWNERSHIP

TITLE : MODISH WHEELBARROW
SESSION : SESSION I 2023/2024

1. I'm **NURSHAZWANIE BT MOHD ZIN (030603-10-0180)** is a final year student of **Civil Engineering Department, Politeknik Ungku Omar** located at**, Jalan Raja Musa Mahadi, 31400 Ipoh, Perak**

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3. We agree to release the ownership of the intellectual property of MODISH WHEELBARROW to Polytechnic Ungku Omar to fulfil the needs for the awarding of **Diploma of Civil Engineering** to us.

Made and duly acknowledged by the aforementioned:

NURSHAZWANIE BT MOHD ZIN) ……..
NO IC 030603-10-0180)NURSHAZWANIE BT MOHD ZIN

Supervisor, PUAN NOOR RASHIDAH BT NOORDIN (800802-08-5604)

……..
Supervisor on date of :) NOOR RASHIDAH BT NOORDIN)

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ABSTRACT

The Modish Wheelbarrow is an innovative wheelbarrow rather than a regular cart. It is a combination of brake and sensor an innovative wheelbarrow that can facilitate the lifting and moving of objects with safety from place to place over 10-50 meters. First objective this product, which is to produce better wheelbarrow in safety aspect. This Modish wheelbarrow will be test on construction worker, PUO's Staff and student for this Final Year Project learning and training sessions. The purpose of this test is to ensure the invention of the product can carry and lifting the goods with the lancer. From the distribution of the questionnaire and through the google form. Most respondents agreed to the creation of this tool in line with their stated objectives. The results of this study are suitable for use in public and public areas such as in farmer, factories and flat construction sites.

ABSTRAK

Modish Wheelbarrow ialah kereta sorong yang diinovatif dan bukannya kereta sorong biasa. Ia adalah gabungan brek dan penderia kereta sorong inovatif yang boleh memudahkan pengangkatan dan pergerakan objek dengan selamat dari satu tempat ke satu tempat melebihi 10-50 meter. Objektif pertama produk ini, iaitu menghasilkan kereta sorong yang lebih baik dari segi keselamatan. Kereta sorong Modish ini akan diuji ke atas pekerja binaan, kakitangan PUO dan pelajar untuk sesi pembelajaran dan latihan Projek Tahun Akhir ini. Tujuan ujian ini adalah untuk memastikan ciptaan produk boleh membawa dan mengangkat barang dengan lancar. Daripada pengedaran borang soal selidik dan melalui google form. Kebanyakan responden bersetuju dengan penciptaan alat ini selaras dengan objektif yang kami nyatakan. Hasil kajian ini sesuai digunakan di kawasan awam seperti di petani, kilang dan tapak pembinaan .

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The project conducted for Final Year Project is a prototype of a wheelbarrow with an automatic sensor detector and brake system. The Modish Wheelbarrow is a transportation to carry loads with safety and easily in construction from one place to another. This Modish Wheelbarrow works to carry heavy loads easily with safety, and when the load is already reaching the limit the sensor alarms sends a warning. The Modish Wheelbarrow function by stop the wheelbarrow using a brake before the load falling down when the user accidentally hit the hole at the construction work. This can help reduce any accident of the workers at site. This can help facilitate the work of workers or farmers during carrying load, especially when the load already reaches the limit which is 100kg.

This project should be launched and conducted so that the safety of the workers, farmers is more assured, and they do not have to worry with the sudden accident at site or others. On the other hand, his project can also help allows timesaving for lifting and moving heavy loads. This project has never been conducted at all and was also chosen for all workers in areas where seems they need these.

1.2 BACKGROUND OF THE PROJECT

The wheelbarrow has been introduced since the time of ancient Greece. [1] It used by farmers, cultivators, and laborers both in the field of constructions or agriculture to facilitate the work of transporting loads. Where heavy loads can be reduces the weight of the goods or materials being pulled as the load is transferred to the wheel and holder system.

The wheelbarrow has a single wheel component, a pair of holders, a pair of legs and a filler former. The thrusters are usually 2-2.5 feet in diameter consisting of steel rim and a black rubber tire whether it has wind tubes or dead tubes. If using pneumatic tyre that have wind are lightweight but leak easily. When using non-pneumatic tyres, it is quite heavy, and the advantages are not easy to leak and durable.[2]

The main structure of the wheel consists of a strong hollow iron with a pair of holders at the end of the iron. At the bottom of the wheel is a pair of legs made of flattened iron that serves to stabilize the wheel. An important part of the wheelbarrow is the filler former which is placed between the tyre and the filler former. This former is also divided into two plastic filling marks and iron filling marks. Plastic type filling former are lighter and do not rust while iron filling marks can cause rust and heavy.

There are various types of wheelbarrows in Malaysia depending on the specifications of the manufacturer. The price of a unit depends on the type and quality between RM 80.00 - RM 150.00 per unit. Hence, upgrades need to be introduced to provide maximum comfort and convenience to users. Besides identifying the usability, strength, advantages, and disadvantages. This project and helps solve the problem of lifting and moving heavy load with safety. Thus, with this wheelbarrow innovation it will facilitate the user's work.

1.3 PROBLEM STATEMENT

Following a survey of the existing wheelbarrows on the market, several problem statements about the wheelbarrows on the market that need to be upgraded to be easier and safer to use were identified. First, normal wheelbarrows are not very stable because they can easily tip over while carrying heavy loads. In addition, many laborers must be employed. In addition, the market wheelbarrows are less ergonomic because it requires a lot of effort to control and stop it due to the heavy load. which makes it more challenging to go down the slope. Hence, due to poor handling and low quality, these wheelbarrows are also prone to damage, which can lead to losses.

Data from various respondents were collected. This study aims to make it easier for workers and users so that users can use this product properly and comfortably. The study respondents consisted 42 out of 50 people consisting of the age of 20-50 years. The study data was obtained from the distribution of the questionnaire and through google form respondents agreed with the creation of this tool in line with the objectives that have been set. The results of the study found that the respondents mostly agree with this model based on the objectives that have been set, namely as many as 66.7% people agreed with the objective stating that the wheelbarrow need to be innovated.

Solution

To solve those problems we overcome with, Modish wheelbarrow are more balanced and difficult to overturn wheelbarrow. This is due to the Modish Wheelbarrow's with weight load sensor , which control the user carrying heavy load more than 100kg.

In addition to that, wheelbarrows do experience difficulties when controlling and stopping the wheelbarrow in addition to hilly areas. Unlike the Modish wheelbarrow, it is easy to handle even on slopes. This is because the Modish wheelbarrow has a brake that allows you to control the speed of the stroller when going downhill and can save manpower.

Article & Pie Chart of questionnaire

1. Berita Harian ,22 October 2013. there was an accident about the explosion of a wheelbarrow tire that happened due to the load being placed too heavily. the victim was seriously injured.

Journal of Medical Case Reports

Wheelbarrow tire explosion causing trauma to the forearm and hand: a case report

Mark Lenz*, Ralf Schmidt, Thomas Muckley, Torsten Doniche, Reinhard Friedel and Gunther O Hofmann

Figure 1.1: Berita Harian, 22 October 2013

2. Sinar Harian, 2022 the wheelbarrow is torn due to careless use

Figure 1.2: Sinar Harian, 2022

3. Metro,01 December 2020. The wheelbarrow split in two due to too much cement being placed on the wheelbarrow.

Figure 1.3: Metro, 01 December

Pie Chart of questionnaire

1. Based on the pilot study we created, a majority 66.7% of the 42 people strongly agreed with the proposed improvement on wheelbarrow. While the other of 31% responded agree.

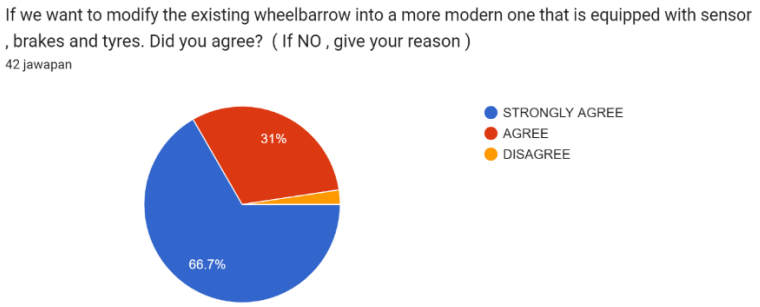

Figure 1.4: Pie chart "Agree & Disagree".

1.4 OBJECTIVE OF THE PROJECT

1. To design a stylish Modish Wheelbarrow using sketch up software and drawing.

2. To produce a Modish Wheelbarrow of better quality that was equipped with sensors, pneumatic tyres, and a brake than the previous wheelbarrow.

3. To test functionality Modish Wheelbarrow once it is operational and available for construction worker.

1.5 SCOPE OF THE PROJECT

This study focuses on the prototype model of the Modish Wheelbarrow. The materials used in the prototype models of the Modish Wheelbarrow are pneumatic tyres, tray, filling site, hollow steel. The location that is available to run this model is located at Ungku Omar Polytechnic, construction site. Google Forms Questionnaire is a data collection tool. The number of respondents is 42 out of 50, and all the respondents are construction worker, PUO's staff & students. The software used for this project was Sketchup, and Microsoft Excel was also used for data analysis. The other tools that are used to run this project are a bike handbrake, load weight sensor, wheelbarrow.

1.6 IMPORTANCE OF THE PROJECT

This study has several implications. Among them is Reducing the level of danger compared to conventional lifting by pushing the wheel manually. Next, facilitating the transfer of goods from one place to another while employees are working. Finally, enables time savings for lifting and moving heavy items.

1.7 SUMMARY

Nowadays, the use of a wheelbarrow can facilitate work with the help of equipment or machines is a good and useful action to all parties. This project can be used in places like construction sites, factories and so on. Specifically, this chapter discusses and explains the introduction, background of the research, problem statement, objective of the of the research, scope of the research, research interest, definition of terms and summary in this study. In conclusion, these factors are very important in the success of a product. This review is important to get the details that need to be reviewed, updated and taken into account for the success of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In the early stages of the project, literature studies are carried out studies on previous includes studies from sources such as the internet, newspaper clippings, magazines and related resources Modish Wheelbarrow is running. Collection of information from literature review is especially important as a preliminary step in the study. In implementation of a project, various steps must be taken from the initial stage until the completion of the project. Problems encountered with the product studied and refurbished to get a better product.

2.2 BACKGROUND OF WHEELBARROW

2.2.1 Other Innovation Wheelbarrow

A combination of a hoverboard and a stroller innovated which can facilitate the work of leaving and moving goods from one place to another at a distance of about 10-50 meters, this is the first objective of creating this product, which is to be able to save consumption labour. The second objective of creating this product is to save time long distance travel. For example, a manual pushchair is very suitable for long distances which is close only when at a long distance it takes a long time if the load in the stroller is quite heavy. With the use of a capable hoverboard move a weight of 70kg.

2.2.2 History of Wheelbarrow

The study begins by examining the history of the existence of the wheelbarrow. The study initial studies show that the wheelbarrow has existed since Ancient Greek times again that is in the form of a single-wheeled car. They use this wheelbarrow as a medium for lifting weights just like the use of a stroller in this er

Figure 2.1: Example of a wheelbarrow in Ancient Greece

In the past, the Chinese civilization has used a stroller that is assisted by one large wheel in the centre that holds the entire load assisted by one large wheel in the centre that holds the entire load that is being lifted and assisted by wind thrust using a sail that was mounted on the stroller.

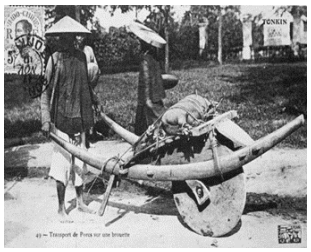

Figure 2.2: Wheelbarrow in Chinese Civilization

Finally, has shown on figure 2.3 these wheelbarrows in Europe around 1170 and 1250 which generally had one wheel on the front.

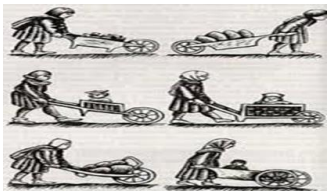

Figure 2.3: Wheelbarrow in Europe

2.2.3 History of Brake

A brake reduces the speed of a vehicle or prevents it from moving. The three main types are rim brakes, disc brakes, and drum brakes. Most brake systems consist of three main components, a mechanism for the rider to apply the brakes, such as brake levers or pedals; a mechanism for transmitting that signal, such as Bowden cables, hydraulic hoses, rods, or the bicycle chain and the brake mechanism itself, a calliper or drum, to press two or more surfaces together in order to convert, via friction, kinetic energy of the bike and rider into thermal energy to be dissipated.

Karl Drais included a pivoting brake shoe that could be pressed against the rear iron tyre of his 1817 Laufmaschine.[1] This was continued on the earliest bicycles with pedals, such as the boneshaker, which were fitted with a spoon brake to press onto the rear wheel.[2] The brake was operated by a lever or by a cord connecting to the handlebars. The rider could also slow down by resisting the pedals of the fixed-wheel drive.

The next development of the brake for bicycle, the penny-farthings, were similarly braked with a spoon brake or by back pedalling. During its development from 1870 to 1878, there were various designs for brakes, most of them operating on the rear wheel. However, as the rear wheel became smaller and smaller, with more of the rider's weight over the front wheel, braking on the rear wheel became less effective. The front brake, introduced by John Kean in 1873, had been generally adopted by 1880 because of its greater stopping power.[3]

Some penny-farthing riders used only back pedalling and got off and walked down steep hills, but most also used a brake.[2] Having a brake meant that riders could coast downhill by taking their feet off the pedals and placing the legs over the handlebars, although most riders preferred to dismount and walk down steep hills.[3] Putting the legs under the handlebars with the feet off the pedals placed on foot-rests on the forks had resulted in serious accidents caused by the feet getting caught in the spokes.[2]

An alternative to the spoon brake for penny-farthings was the caliper brake patented by Browett and Harrison in 1887.[4] This early version of caliper braking used a rubber block to contact the outside of the penny-farthing's small rear tyre.

The 1870s and 1880s saw the development of the safety bicycle which roughly resembles bicycles today, with two wheels of equal size, initially with solid rubber tyres. These were typically equipped with a front spoon brake and no rear brake mechanism, but like penny-farthings they used fixed gears, allowing rear wheel braking by resisting the motion of the pedals. The relative fragility of the wooden rims used on most bicycles still precluded the use of rim brakes. In the late 1890s came the introduction of rim brakes and the freewheel.[2]

With the introduction of mass-produced pneumatic tyres by the Dunlop Tyre Company, the use of spoon brakes began to decline, as they tended to quickly wear through the thin casing of the new tyres. This problem led to demands for alternative braking systems. On November 23, 1897, Abram W. Duck of Duck's Cyclery in Oakland, California, was granted a patent for his Duck Roller Brake (U.S. Patent 594,234).[5] The Duck brake used a rod operated by a lever on the handlebar to pull twin rubber rollers against the front tyre, breaking the front wheel.[6]

In 1898, after the advent of freewheel coasting mechanisms, the first internal coaster brakes were introduced for the rear wheel. The coaster brake was contained in the rear wheel hub, and was engaged and controlled by backpedalling, thus eliminating the issue of tyre wear. In the United States, the coaster brake was the most fitted brake throughout the first half of the 20th century, often comprising the only braking system on the bicycle.

2.2.4 History of Load Sensor

A load cell converts a force such as tension, compression, pressure, or torque into an electrical signal that can be measured and standardized. It is a force transducer. As the force applied to the load cell increases, the electrical signal changes proportionally. The most common types of load cell are pneumatic, hydraulic, and strain gauges.

In the broadest definition, a sensor is a device, module, machine, or subsystem that detects events or changes in its environment and sends the information to other electronics, frequently a computer processor. Sensors are always used with other electronics.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base, and in innumerable applications of which most people are never aware. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure [1] and flow measurement,[2] for example into MARG sensors.

Analog sensors such as potentiometers and force-sensing resistors are still widely used. Their applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. There is a wide range of other sensors that measure chemical and physical properties of materials, including optical sensors for refractive index measurement, vibrational sensors for fluid viscosity measurement, and electro-chemical sensors for monitoring pH of fluids.

A sensor's sensitivity indicates how much its output changes when the input quantity it measures changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, its sensitivity is 1 cm/°C (it is basically the slope dy/dx assuming a linear characteristic).

Some sensors can also affect what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors are usually designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantag

Technological progress allows more and more sensors to be manufactured on a microscopic scale as microsensors using MEMS technology. In most cases, a microsensor reaches a significantly faster measurement time and higher sensitivity compared with macroscopic approaches.[3][4] Due to the increasing demand for rapid, affordable and reliable information in today's world, disposable sensors—low-cost and easy-to-use devices for short-term monitoring or single-shot measurements—have recently gained growing importance. Using this class of sensors, critical analytical information can be obtained by anyone, anywhere and at any time, without the need for recalibration and worrying about contamination.[5]

2.2.5 Wheelbarrow in Market

There are many wheelbarrows in Malaysia where these wheelbarrows are differentiated according to the material used. Among the materials used are the type of tire pneumatic or un pneumatic tires, former filling type plastic or iron and differences the wheelbarrow frame itself. In addition, the characteristics are different colours, diameter width and height are also different.

The importance of the design and materials of the wheelbarrow is to reduce the cost as well as saving energy. So, to get a suitable concept and design appropriate design is important to solve the problem if there is a defect on the design can even identify the advantages and disadvantages of the design that has been produced.

Table 2.2: Characteristic of wheelbarrow

TRAY	TIRES	FRAME
Plastic	Pneumatic	Plastic
Iron	Semi-Pneumatic	Hollow iron

The wheelbarrow has long been created and used from time to time even contributing to innovation to meet current needs. Now what is found in the market is like the following:

1. Manual Wheelbarrow

Figure 2.4: Manual Wheelbarrow

Table 2.2: Specification of wheelbarrow

MATERIAL	Tray - Plastic and iron Tires - Pneumatic and semi-pneumatic Frame - Plastic and hollow iron
TYRES	1 tyre
CAPACITY	Maximum load to carry 150 kg
PRICE	RM80 - RM150

There is a disadvantage of wheelbarrow in market, user place excessive load which can cause rapid wear and damaged on the wheelbarrow as soon as possible. Regular wheelbarrow users also they have lack safety whenever carrying the things from one place to another.

2.3 CONCEPT OF WHEELBARROW

Wheelbarrow is a simple machine. A simple machine here is a mechanical device that allow us to lift or move a load by changing the direction of movement or increasing the value or distance of power applied to the load. In simpler terms, a simple machine uses a single applied force to perform work onto the load. A simple machine can be classified into several categories namely: i) Lever ii) Pulley iii) Wheels and Axles iv) Inclined Plane v) Screw

The compact machine found on the conveyor consists of wheels and axles, second class levers and an incline unit.

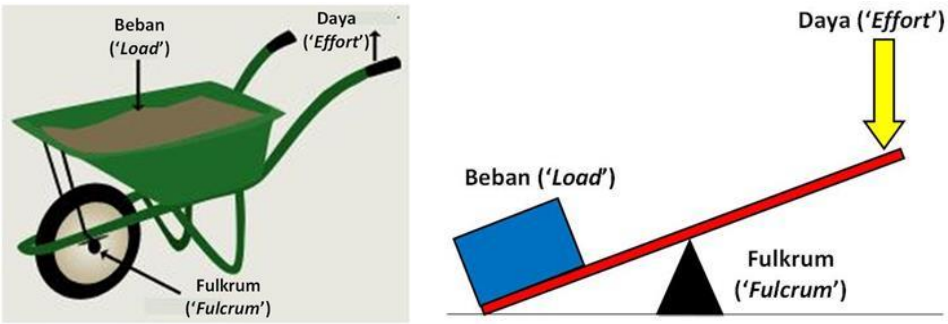

Figure 2.5: Lever of Wheelbarrow

Load(N) x Distance of load from fulcrum(m) = Power(N) x Distance of power from fulcrum(m).

The stroller is a second-class lever, the fulcrum is at one end opposite the power. The load is in the middle and the power is at the other end.

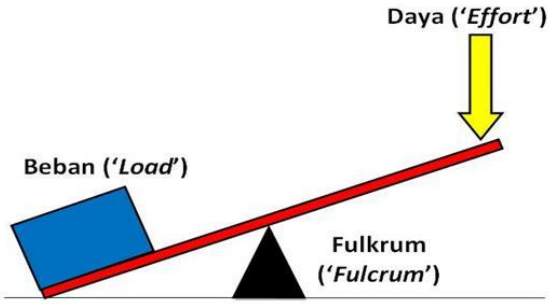

Figure 2.6: How levers work

The main advantage in using the inclined plane is that it requires less power to push the object through the inclined plane than it does to lift it up directly. less force to push the object through the inclined plane than if it were lifted upright. In addition, the inclined plane facilitates work by only needing to apply only a small amount of force.

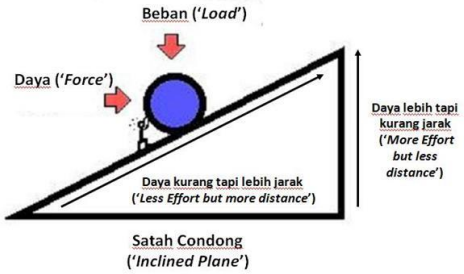

Figure 2.7: Show how power and loads

2.4 REVIEW OF MATERIAL USED

2.4.1 Pneumatic tyres

The materials of modern **pneumatic tires** are synthetic rubber, natural rubber, fabric, and wire, along with carbon black and other chemical compounds. They consist of a tread and a body. The tread provides traction while the body provides containment for a quantity of compressed air. Before rubber was developed, the first versions of tires were simply bands of metal fitted around wooden wheels to prevent wear and tear. Early rubber tires were solid (not pneumatic). Pneumatic tires are used on many types of vehicles, including cars, bicycles, motorcycles, buses, trucks, aircraft. Metal tires are still used on locomotives and railcars, and solid rubber (or other polymers) tires are still used in various non-automotive applications, such as some casters, carts, lawnmowers, and wheelbarrows.[1]

Figure 2.8: Pneumatic tyres

2.4.2 Bike Hand Brake

Brake levers are usually mounted on the handlebars within easy reach of the rider's hands. They may be distinct from or integrated into the shifting mechanism. The brake lever transmits the force applied by the rider through either a mechanical or hydraulic mechanism.

Bicycles with drop handlebars may have more than one brake lever for each brake to facilitate braking from multiple hand positions. Levers that allow the rider to work the brakes from the tops of the bars, introduced in the '70s, were called *extension levers*, *safety levers* [1] or, due to their reputation for being unable to actuate the full range of travel of the brake, *suicide levers*. Modern top-mounted brake levers are considered safer and are called *interrupt brake levers* due to their mechanism of action which "interrupts" the cable run from the primary lever and actuates the brake by pushing the cable housing downward instead of pulling the cable.[2] This type of lever is also known as a "cross lever" due to its popularity in cyclo-cross.

The mechanical advantage of the brake lever must be matched to the brake it is connected to in order for the rider to have sufficient leverage and travel to actuate the brake. Using mismatched brakes and levers could result in too much mechanical advantage and hence not enough travel to properly actuate the brake (v-brakes with conventional levers) or too little mechanical advantage, requiring a very strong pull to apply the brakes hard (v-brake levers with other types of brake).

Figure 2.9: Bike Handbrake

2.4.3 Hollow Steel

Hollow steel is a mechanism that transfers rotation power. Hollow steel is used to replace the solid steel for weight reduction. Tork is worn around the circumference of the rod. As a result, tork becomes a transfer point at the empty point of the rotation axis. When using hollow steel, the tork generated is less than solid steel.

Figure 2.10: Hollow steel

2.4.4 Load Weight Sensor

A weight sensor is type of transducer. It converts an input mechanical force such as load, weight, tension, compression, or pressure into another physical variable, in this case, into an electrical output signal that can be measured, converted and standardized. Structurally, a weight transducer is made of a metal body (also called flexure) to which foil strain gauges are bonded. The sensor body is usually made of aluminium or stainless steel, which gives the sensor two important characteristics: (1) provides the sturdiness to withstand high loads and (2) has the elasticity to minimally deform and return to its original shape when the force is removed.

When force (tension or compression) is applied, the metal body acts as a "spring" and is slightly deformed, and unless it is overloaded, it returns to its original shape. As the flexure deforms, the strain gage also changes its shape and consequently its electrical resistance, which creates a differential voltage variation through a Wheatstone Bridge circuit. Thus, the change in voltage is proportional to the physical force applied to the flexure, which can be calculated via the load cell circuit voltage output.

Figure 2.11: Load Weight Sensor

2.5 FINAL REVIEW

Based on the known problem statement there must be various new ideas that are effective and can be used in innovating the product to new ones to solve the problems faced by the users. By such things, ideas that provide benefits and benefits need to be sparked in order to deal with problems when doing work.

Table 2.3 Types and Material used for innovation.

Material	Types/Quantities	Advantages
Pneumatic tyre	1	- Facilitates movement and balance - Not easy to leak
Tray	Plastic	- Light - Not easy to rust
Frame	Stainless steel	- Not easy to rust - User friendly
Filling site	Stainless steel	- Various uses - Ergonomics
Iron	Hollow steel	- Easy to use - Weld-resistant

After the ideas and sketches of the new product are finalised, there are some functions that need to be added to produce a better product and more user-friendly product. This innovative wheelbarrow needs to make it easier for the user in the process of lowering the load and lifting the load with the use of minimum human labour. In fact, this innovative wheelbarrow can be found at a much cheaper cost with better equipment comparable to other countries that use the same concept.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is one of the chapters that describes the activities that can be done to solve a problem. Methodology selection for building a project is an important aspect of ensuring that a project is built according to organised and systematic steps. Thus, this chapter will describe the steps taken to solve the “Modish Wheelbarrow” problem. For a clearer understanding of its implementation, the methodology will be shown in the form of a flow chart. The design of this Modish Wheelbarrow is self-designed based on suggestions and group expert discussions. This innovation must consider aspects and original theories in building this Modish Wheelbarrow that can function perfectly. Even the aspects of safety and comfort are also prioritised.

3.2 FLOW CHART

To make this project successful, several steps need to be taken and need to be followed to ensure that the project will be smooth and successful. If there are any problems, this flow chart needs to be referred to help before or during the project. With this flow chart in place, it encourages the use of time that is more organised and systematic because it can follow all instructions precisely and perfectly. Among the steps that need to be followed are as follows:

FLOW CHART OF PROJECT IMPLEMENTATION STEPS

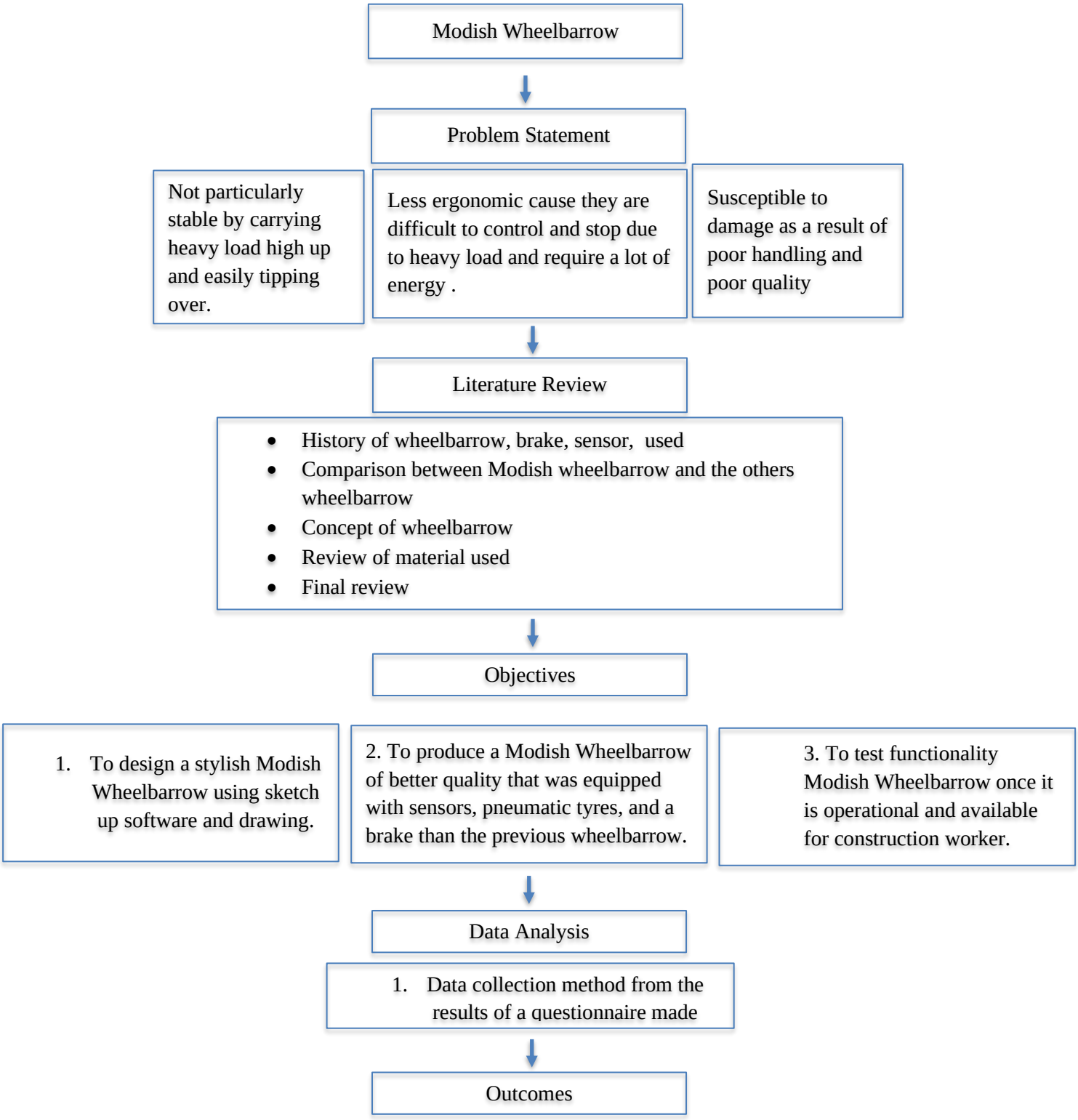

Figure 3.1: Methodology Flow Chart

3.2.1 Flow Chart Explanation

To make this project successful, several steps need to be taken and also need to be followed to ensure that the project will be smooth and successful. If there are any problems, this flow chart needs to be referred back to help before or during the project. With this flow chart in place, it encourages the use of time that is more organised and systematic because it can follow all instructions so precisely and perfectly. Among the steps that need to be followed are as follows:

a) Problem statement:
Knowing why and how this project was chosen.

b) Selecting a suitable title:
Choosing a suitable title for the project by creating a discussion in a group with the supervisor.

c) Making a study of the project:
Finding suitable materials such as filling former, hydraulics and tires.

d) Testing:
Materials that are ready to be installed need to be tested to find out if they are strong or weak.

e) Report:
On completion of the project, a final report is mandatory for each group.

f) Finishing:
Submit the report and make arrangements for the presentation of the project.

3.3 DESIGN PROJECT

3.3.1 Sampling

Questionnaires for this study were distributed among the respondents, namely 42 construction site workers and Puo's staff. The technique used for this sampling is purposive sampling. The purpose of this questionnaire is to get support and suggestions for improvements to the wheelbarrow project that will be produced. It is also to make it easier for students and workers so that users can use this product properly and comfortably. Several questions have been prepared together with 3D sketch-up drawings to make it easier for respondents to understand the project that will be produced. Based on the observation of the pilot study that has been made, most of the respondents gave very good support from students and gardeners. A total of 16 people between the ages of 41-50 strongly agreed with the proposal to improve the brakes and sensors on wheelbarrow. Based on objective 1, we have succeeded in achieving the objective, which is to design a stylish Modish wheelbarrow using sketch-up software and drawing.

3.3.2 Data analysis method

This study was carried out using a quantitative method through the use of a questionnaire. Questionnaires are distributed to respondents online. Every piece of information obtained must also be analysed first so as to be in accordance with the method carried out. We use Google Forms as a platform to collect data and information from respondents. By using a Google Form, we can also analyse the number and percentage of respondents who agree to give information. Indirectly, it can help us do research with the public about the production of Modish wheelbarrows.

3.3.3 Data Collection method

Data collection required in this project is collected through websites, references from books, and data collection. Data collection from the results of a questionnaire made through "Google Form". Every piece of information obtained must also be analysed first to be in accordance with the method carried out. We also use Google Scholar as our platform to gather information through journals, articles, and others.

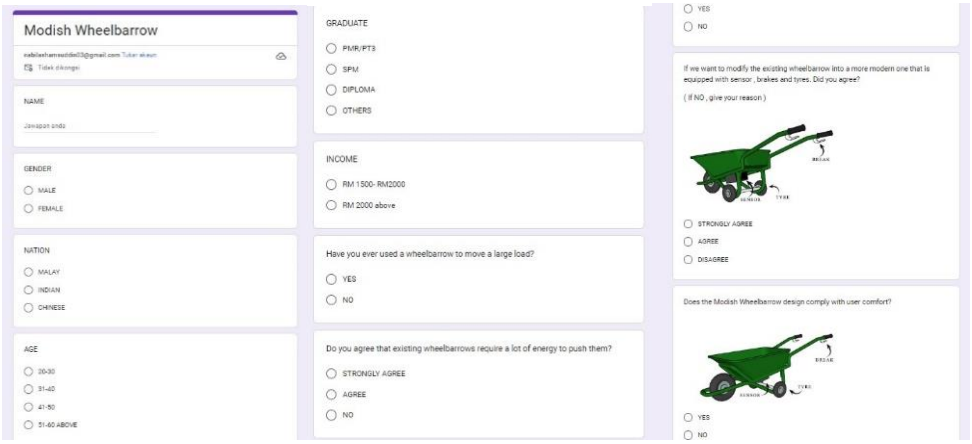

Figure 3.2: Data collection from the results of a questionnaire made through "Google Form".

3.4 RESEARCH DESIGN

A detailed drawing of the smart wheelbarrow design will explain more clearly the layout of parts or design components in this form. Even the location of each component on this stroller can be identified based on the size of the components and their suitability. It is connected and placed. Here, the initial design planning is done before the selection is made.

3.4.1 Sketch & Computer- aided drawing

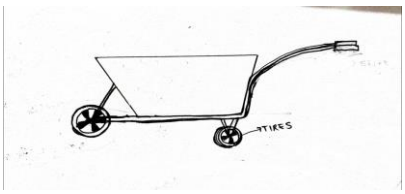

Figure 3.3: First sketch

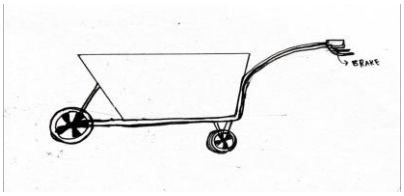

Figure 3.4: Second sketch

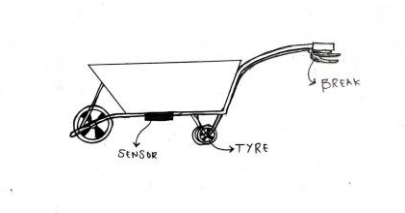

Figure 3.5: Third sketch

3.4.2 Computer-aided Drawing

Here is a picture of a computer-aided drawing. Drawing helps this computer uses Sketchup Pro 2019 software. We agree to choose the first design through evaluation and selection.

Figure 3.6: Side view

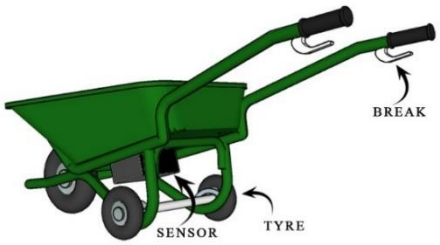

Figure 3.7: Front view

3.5 SELECTION OF COMPONENTS

The selection of the right components is very important in designing Modish wheelbarrows to avoid any misuse of materials or components. Among the components used are:

a) Pneumatic Tire

The use of this pneumatic tire is because it is suitable for use by laborers who work in a flat land structure, not hilly or peat land, because this tire has the advantage of being hard and not easy to leak.

Figure 3.8: Pneumatic tyres

b) Iron filling container

This iron filling container is more durable than plastic filing containers.

Figure 3.9: Iron filling container.

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a) **Hollow Iron**

Hollow iron is lighter and is particularly suitable for use in project frameworks that make it more user-friendly.

Figure 3.10: Hollow iron

b) **Screws**

Screw are used as frame fasteners along with filling containers because of strengthens the position of the filling container and are able to be opened without any modifications.

Figure 3.11: Screws

3.6 RESEARCH INSTRUMENTS

Tools used in this project:

1) Grinding Machine

Figure 3.12: Grinding machine.

Refer to figure 3.12 it shown that the grinding machine is a machine tool with an abrasive wheel that is used to achieve fine finishes or light cuts on metals and other materials. It is a machining operation that is used to improve the accuracy of a product that has previously been machined.

Grinding is used to finish workpieces that need a high level of surface quality and accurate form and dimension. It removes relatively little metal, roughly 0.25 to 0.50 mm in depth. Grinding machines come in a variety of shapes and sizes with various types of grinder wheels. Their wheels are constructed of numerous stones, diamonds, and other inorganic materials and vary in size and texture.

2) Disc cutter

Figure 3.13: Disc Cutter

Refer to figure 3.13 it shown a disc cutter. Disc cutter is a specialised, often hand-held, power tool used for cutting hard materials, ceramic tile, metal, concrete, and stone for example. This tool is very similar to an angle grinder, chop saw, or even a die grinder, with the main difference being the cutting disc itself (a circular diamond blade, or resin-bonded abrasive cutting wheel for a disc cutter vs. an abrasive grinding wheel for an angle grinder). This tool is highly efficient at cutting very hard materials, especially when compared to hand tools.

3) Hand Drills

Figure 3.14: Hand Drills

Refer to figure 3.14 it shown a Hand Drills Information. Drills are hand-held tools with rotating drill bits used to fabricate holes in multiple materials. They are widely used in construction, carpentry, metalworking, assembly, and maintenance. Most drills used today are powered and use a chuck to grip the bits.

4) Bolt and nut

Figure 3.15: Bolt and Nut

Refer to figure 3.15 it shown a bolt and nut. It is used to bind two or more components. Have a variety of sizes and fits to be used to fasten components. It can be removed easily, compared to welding bonds.

CHAPTER 4

DATA ANALYSIS

4.1 INTRODUCTION

After all the data and information is obtained, the analysis is done to see the effectiveness of the Modish Wheel Barrow that has been tested in several places around Polytechnic Ungku Omar and Kinta . The decisions made in this chapter are obtained as a result of questionnaires and experiments conducted in study area. Data obtained from experiments in the study area are analyzed in more detail to draw conclusions based on the objectives of the study that has been stated. The study was conducted using 60 respondents from Kinta citizens. There are several aspects that are the main focus, namely:

4.1.1. Respondent Particular (email, age, gender, race, occupation, work experienced)

4.1.2. Design of our Modish Wheelbarrow

4.1.3 Analysis on innovation of weight load sensor and brake

4.1.4 Functionality of Modish Wheelbarrow

I. Design

II. Material used

III. Advantages

IV. Function

4.2 STUDY FINDINGS

4.2.1 Site Survey Data

Data collected during the study will be evaluated on the basis of stability and effort required to deliver the loads using Modish Wheelbarrow. These data will eventually be displayed in the form of tables and graph of stability of the wheelbarrow carrying the loads using Modish Wheelbarrow and common wheelbarrow. Areas will be classified according to the condition of the place such as tar, uneven road, hilly areas and so on. In addition, the weight of the load will be displayed in schedule provided.

4.2.2 Analysis Survey Data

The process of analyzing the study data will be shown in the form of graphs, tables and chart. The analysis of this Modish Wheelbarrow is covering the stability of the wheelbarrow and weight tested on sensor. As a result from the analysis survey and the data obtained will be presented in the form histogram. Method of lifting load on wheelbarrow is used manually and is tested several times to obtain data.

4.2.3 Questionnaire Survey

To further strengthen this research, questionnaire method is done involving the citizens of Polytechnic Ungku Omar and Kinta. The data obtained will be in the form of pie chart to facilitate the information related to the survey that has been carried out. Review of existing products.

4.3 PROFILE OF RESPONDENTS PARTICULAR

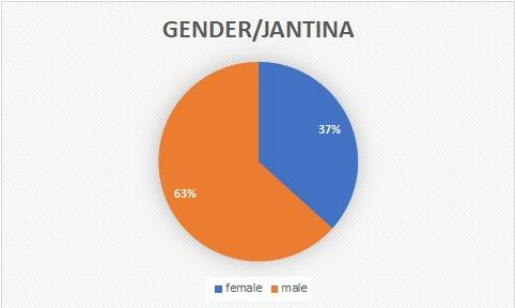

Figure 4.1: Respondent's Gender

Figure 4.1 shows the number of people around Kinta and Polytechnic Ungku Omar who give response to the survey conducted. 63% of respondents are a total of 40 male while 37% respondents are a total of 20 women. The highest number of male respondents due to the most of respondents are engaged in construction work.

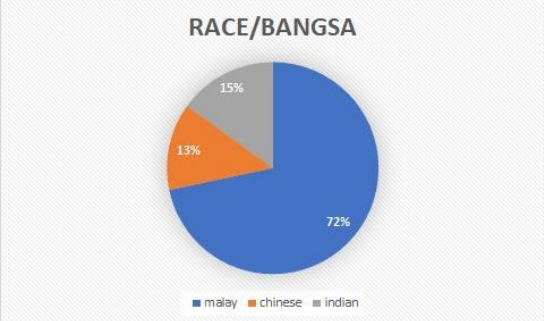

Figure 4.2: Respondent's Race

Figure 4.2 shows the survey found that 72% of respondents were the Malays answered this question. This is because most of them are students, staff and active construction workers who work in a field where there is a need to use wheelbarrow at work. In addition, a total of respondents namely 15% the Indian nation. Lastly, a total of respondents, which 13% consisted of Chinese.

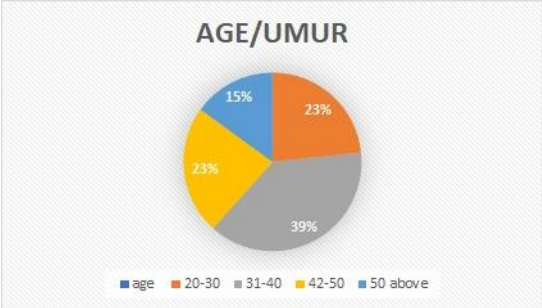

Figure 4.3: Respondents Age

Furthermore, the results of the study on figure 4.3 found that a total of respondents age, namely 39% which 31-40 year olds are more likely to answer this question. This is due to they consists of construction worker and so on. Most of them use the wheelbarrow most of the time in their workplace. On the other hand, respondents about 23% are age 20-30 years and 42-50 years. Most of them are construction workers and students. While total of 15% consisting of the range of 50 above.

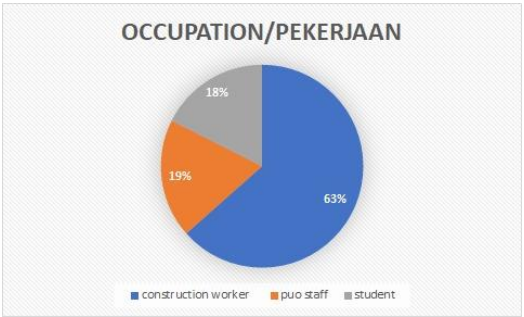

Figure 4.4: Respondent's Occupation

The survey on figure 4.4 shown the respondents occupation, found that 37 respondents were 63% are the construction worker because wheelbarrow is one of the important transport to easily carry load in site. In addition, a total of 10 which is 19% Puo staff who used to carry garbage or other things. On the other hand, respondents about 18% are students.

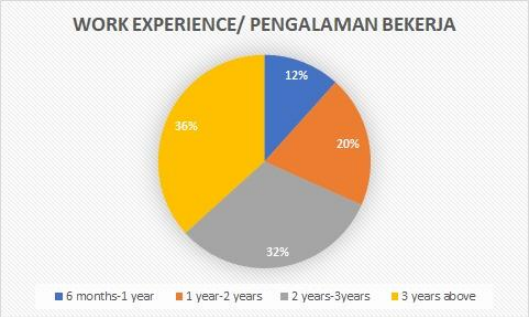

Figure 4.5: Respondent's Work Experienced

From figure 4.5, the results of the work experienced survey found that a the highest total is 3 years and above from the older in the construction worker and Puo staff because they have been working about 3 to 10 years in site and as a staff. The second one highest 2-3 years about 32% , also working as construction worker. Lastly the less is about 20% and 12% which is 1-2 year and 6 months to 1 year.

4.4 DEFINITION OF ANALYSIS DATA

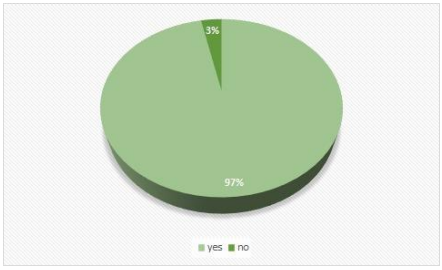

Figure 4.6: The accuracy of the Modish Wheelbarrow design with safety and comfort features at your workplace has been observed.

Figure 4.6 shows for a detailed description of the Modish Wheelbarrow fulfill the characteristic at their workplace. From analysis 97% of respondents said yes. While, the other 3% among respondents choose for no.

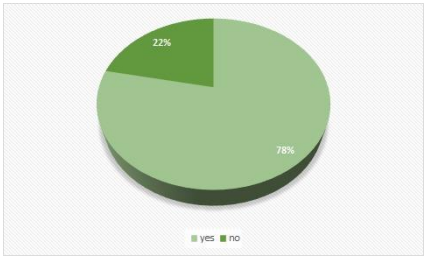

Figure 4.7: The wheelbarrow needs to be added with a brake and sensor function.

Figure 4.7 shows the analysis of Modish Wheelbarrow thought the wheelbarrow needs to be added with a brake and sensor function. In this survey, 78% respondents answered yes while 22% people answered no

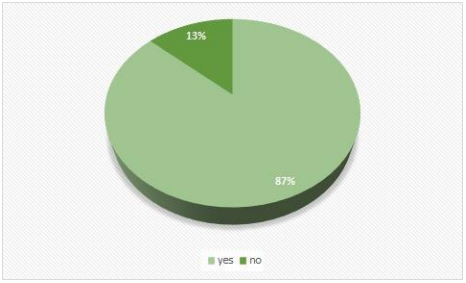

Figure 4.8 : The longevity of battery life, sensor, and brake functionality in this Modish Wheelbarrow is believed to be considerable..

Figure 4.8 Determine whether the battery sensor and brake is last long to use when doing work. According to the study 87% answered yes means they confirm and agree with the last long in terms of battery sensor and brake. While 13% respondents answered no and did not agree with the last long battery sensor and brake.

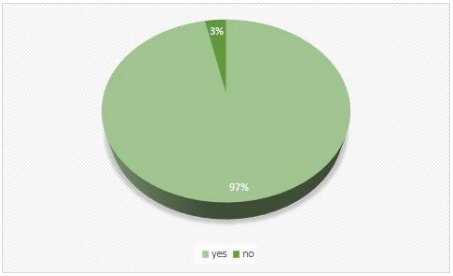

Figure 4.9: Modish wheelbarrow has the potential to reduce accidents when carrying heavy loads in the workplace.

Figure 4.9 shows from the analysis a total of 97% respondents answer yes because they strongly agree the Modish Wheelbarrow can reduce accidents in their workplace. The other percents respondents answered no.

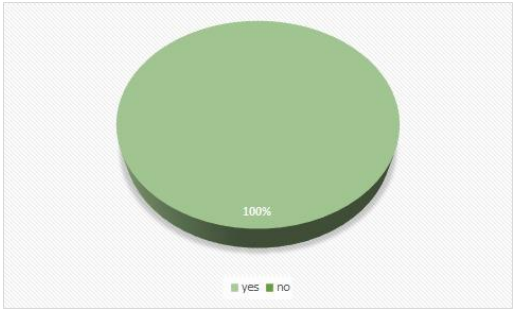

Figure 4.10 : It is possible for control to be maintained when placing a heavy load and carrying it in a hilly, uneven area.

From figure 4.10, the analysis a total of 100% (60 respondents) answered yes and possible the wheelbarrow able to control with brake when carrying heavy loads at uneven area, hilly and so on.

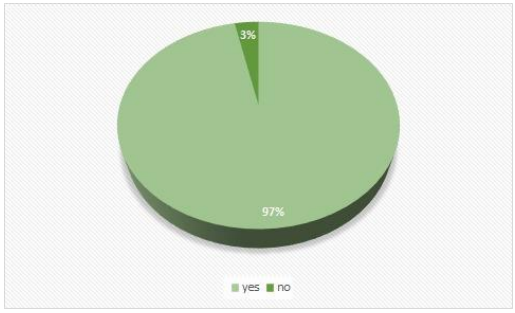

Figure 4.11: The suitability of this Modish wheelbarrow design for today's construction site, for PUO staff, and students is being considered.

Figure 4.11 is shown to see if Modish Wheelbarrow design suitable for today’s construction site, staff and student. In the analysis, 97% of the respondents answered yes while the other respondents answered.

b) Design studies

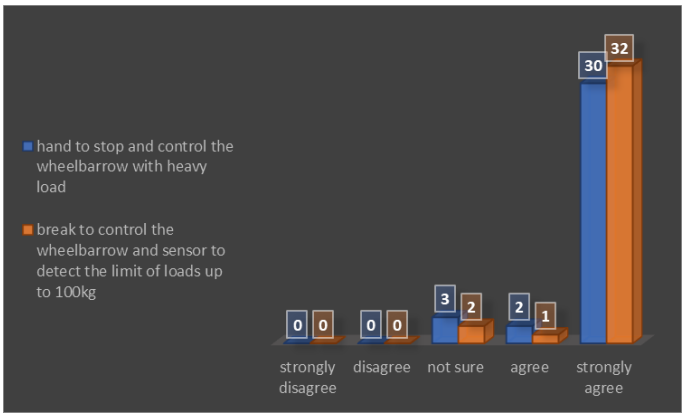

Figure 4.12 : The choice of the type of facility required for the Modish Wheelbarrow is being considered.

In figure 4.12 indicates what types of facility option required on the Modish Wheelbarrow, there are using hand to stop and control the wheelbarrow with heavy load and has a break to control the wheelbarrow and sensor to detect the limit of loads up to 100kg. For question using hand to stop and control the wheelbarrow with heavy loads, a total of 30 people broadcast strongly agree (85.7%). Meanwhile, a total of 2 people agree (5.7%) and 3 people not sure (8.6%). Moreover, for questions has a break to control the wheelbarrow and sensor to detect the limit loads up to 100kg, some of the respondents were mixed 91.4% (153 people) strongly agree. 2.9% (1 people) of respondents answer agree. 5.7% (2 people) are note sure type of facility required for Modish Wheelbarrow.

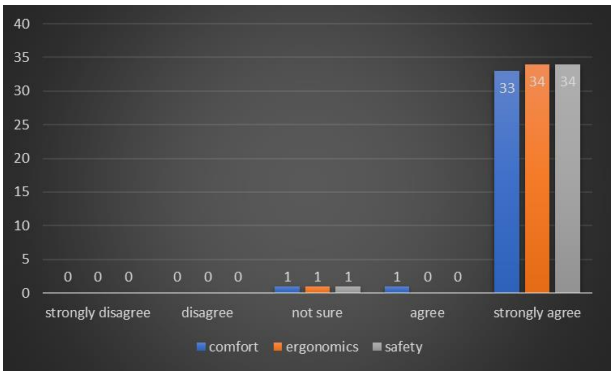

Figure 4.13: The characteristics of the Modish Wheelbarrow are being examined.

In figure 4.13 shows what characteristic are available on Modish Wheelbarrow, there are three options namely comfort, ergonomics, safety. In terms of comfort, 33 people strongly agree (94.2%). On the other hand, 1 people agree (2.9%) and 1 person is not sure (2.9%). In addition, for ergonomic aspects, a total of 34 people showed strongly agree (97.1%) and 1 people is not sure (2.9%). Next is safety, total of 34 people broadcast strongly agree (97.1%) and 1 person answer for not sure (2.9%)

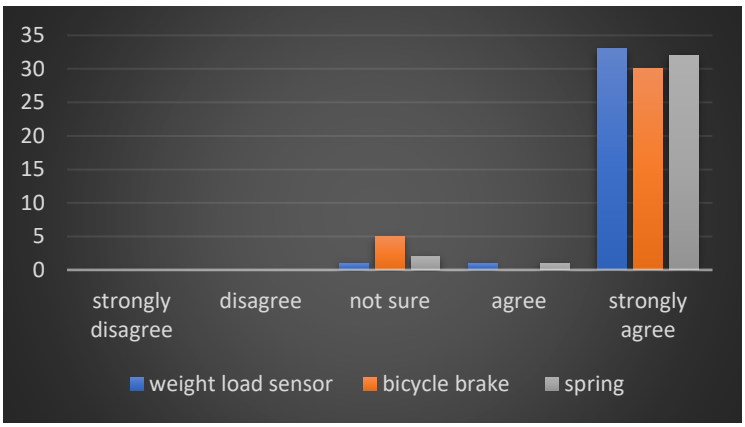

Figure 4.14: The suitability of the material used in the design of the Modish Wheelbarrow is being assessed.

Figure 4.14 indicates the material being used compatible in Modish Wheelbarrow design. There are 3 types of material which is, weight load sensor, bicycle brake, spring. For weight load sensor, a total of 33 people strongly agree (94.2%). On the other hand, 1 people answered for agree (2.9%) and 1 people answered for not sure (2.9%). In addition, for bicycle brake total of 30 people strongly agree (85.7%) and a total of 5 people expressed not sure (14.3). On the other hand, for spring a total of 32 people broadcast strongly agree (91.4%), while 1% agree (2.9%) and 2 people answered for not sure (5.7%).

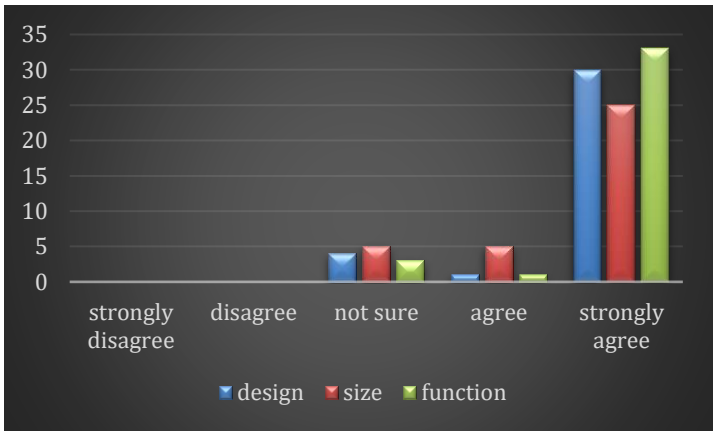

Figure 4.15 : The application of the following aspects to the product is being considered

In figure 4.14 shows the aspects of conforming to product requirements on the Modish Wheelbarrow, there are three options in terms of design, size, function. As for the design aspect, a total of 30 people answered for strongly agree (85.7%). Meanwhile, a total of 1 people answered for agree (2.9%) and 4 people answered for not sure (17.2%). In terms of size, 25 people strongly agree (71.4%) and 5 people answered for agree (14.3%), while 5 people answered for not sure (14.3%). In addition the functionality, a total of 33 people performed strongly agree (94.3%) and a total of 1 people answered for agree (2.9%) and 3 people answered for not sure (3.8%).

The questionnaire conducted on the citizens of Kinta is to find out general views information about the study. From the results of the study obtained, can be known that:

I. 85.7% stated that the types of facilities required on Modish Wheelbarrow is brake and sensor capable control the wheelbarrow of pushing loads up to 100kg.
II. 97.1% stated that safety features are on the Modish Wheelbarrow
III. 94.2% indicate that functions available on Modish Wheelbarrow conform product conditions.

4.4.1 Testing the Modish Wheelbarrow

i. Testing our Modish Wheelbarrow for the first time on Friday, 6 October 2023.

Figure 4.16: Testing Modish Wheelbarrow for the first time

Table 4.1 Modish Wheelbarrow data

Type	Place	Stability	Time
Testing brake	Small hilly & uneven road	Stable	-

.

ii. Testing our Modish Wheelbarrow for the first time on Saturday, 11 November 2023.

Figure 4.17 : Testing Modish Wheelbarrow for the second time

Table 4.2 Modish Wheelbarrow data

Type	Place	Stability and functionality	Time
Testing sensor and brake	Polytechnic Ungku Omar	Stable and function	-

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CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

For this chapter, the decision made is based on the results of the surveying, testing and discussion in chapter 1,2,3,4. In this chapter, the objective as well suggestions for future research. In addition, the conclusion was already done for this test.

5.2 DISCUSSION

For the Modish Wheelbarrow, stability tests were conducted throughout the process. The tests were carried out according to the placed load weight, with the maximum weight being 100kg in the pushcart. The results of these stability tests have also demonstrated that the pushcart provides an audible response if the load exceeds 100kg. This product has been tested by contractor personnel, laborers, office staff, and many others. Furthermore, our study indicates that the use of this pushcart is stable and balanced when performing any activity on it.

Moreover, the time taken while using the Modish Wheelbarrow is evaluated based on the total weight capacity and the terrain conditions. The Modish Wheelbarrow has also been tested on sloping and uneven roads to assess the effectiveness of the brakes installed on it. The results of this study show that the brakes on the Modish Wheelbarrow function well and provide stability.

5.3 CONCLUSION

The main objective of this study is to design and build " Modish Wheelbarrow" that aims to facilitate work to lift, move and deliver safely. Data collection and information about Modish Wheelbarrow is through Google Forms, and other information on the site. The data obtained from authorities will be evaluated together data from the site survey. Site review is to prove that Modish Wheelbarrow is effective and help them lift the heavy loads safely. In this study the effectiveness of Modish Wheelbarrow is more focused on the weight of the load and the stability of wheelbarrow while carrying the load on uneven road. Most materials or load that can be accommodated are composed of cement, concrete, gas barrels and others. As a result of the study, the overall Modish Wheelbarrow conforms to the specified design features. In addition the labor required in the manufacturing process of this product is 3 people. Modish Wheelbarrow is able to lift weights in all places, hilly, uneven road, stairs, grassy area. Modish Wheelbarrow also needs to be changed the battery of sensor if it runs out, the battery only capable for 1 to 2 months but according to the condition of the place and daily use. In general overall, Modish Wheelbarrow can also help construction worker use this as a starting point for a transporting and moving heavy loads. It can make it easier for employee carrying loads quickly, safely and reduced accident.

5.4 RECOMMENDATIONS

The use of wheelbarrow is designed to help reduce the reliance on human energy when lifting and moving heavy objects from one place to another. Here are some suggestions to further enhance the study that will be conducted on the smart wheelbarrow to determine its effectiveness:

1. Suggesting Trolleys as a Replacement for Wheelbarrow:

   Proposing the use of trolleys as a replacement for pushcarts due to the possible inadequacy in the smoothness and width of wheelbarrow.

2. Details of the Proposed Modish Wheelbarrow:

   Supporting the idea of using the smart wheelbarrow with the following proposed details which is must prioritize the safety of users operating it and capable of saving time and energy for workers using the product.

5.5 SUMMARY

The main objective of this study is to produce a Modish Wheelbarrow of better quality that was equipped with sensors, pneumatic tyres, and a brake than the previous wheelbarrow. Data and information collection regarding the Modish Wheelbarrow involved distributing online questionnaires to contractor workers and others. The data obtained from authorities will be assessed together with site study data. Site studies were conducted to demonstrate the effectiveness of the smart wheelbarrow in facilitating the lifting of heavy goods.

In this study, the effectiveness of the Modish wheelbarrow is primarily focused on the weight of materials that can be carried by the wheelbarrow. Most of the items that can be accommodated include cement, concrete, gas cylinders, and more. Overall, based on the assessments made, the Modish wheelbarrow is effective and meets the specified design criteria. Additionally, the manpower required in the product manufacturing process is three individuals.

The Modish wheelbarrow is capable of lifting loads in various locations, including areas with peat soil. It is equipped with a sensor that can limit the load weight to 100kg. The sensor functions well, emitting a sound if the weight exceeds 100kg. Overall, the presence of the Modish wheelbarrow can assist laborers in using it as a platform to initiate work, especially for lifting and moving heavy items. It facilitates quick and efficient transportation of goods while maintaining the wheelbarrow's lifespan.

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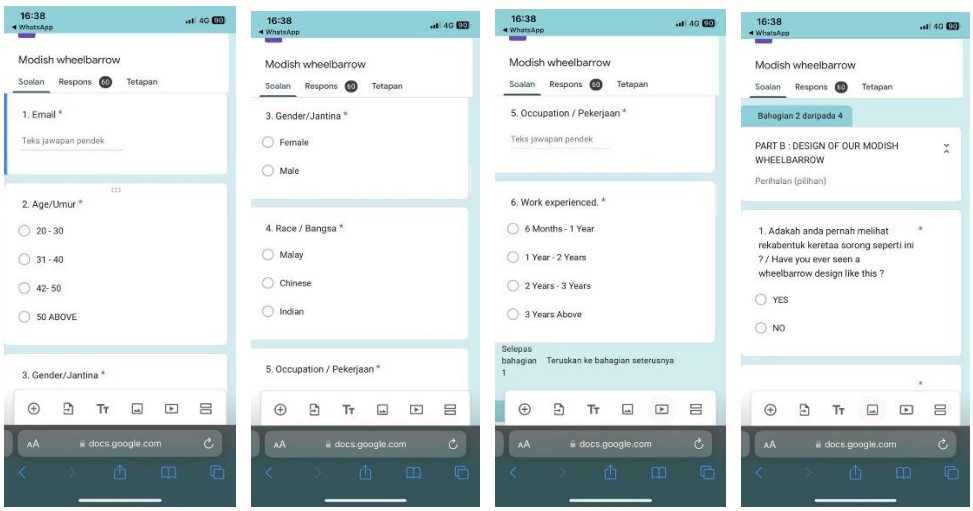
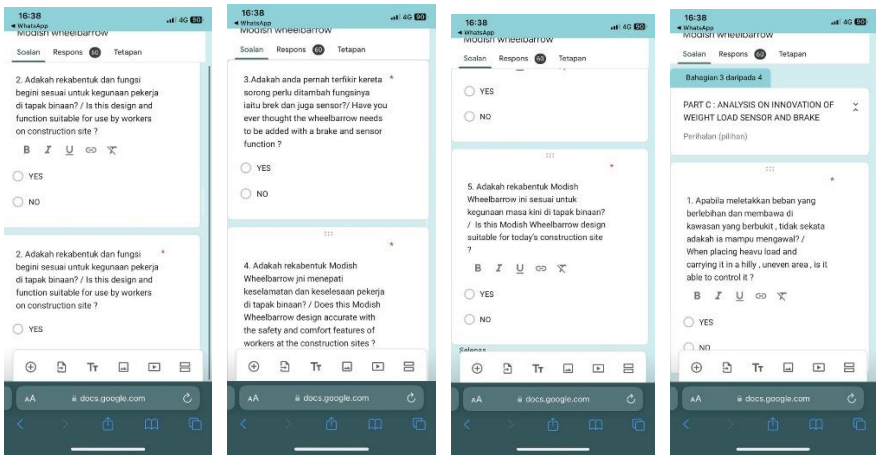
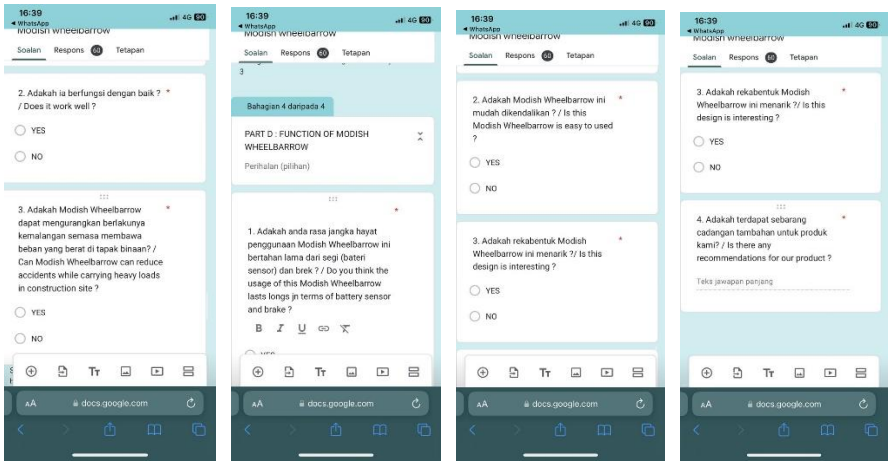
APPENDIX

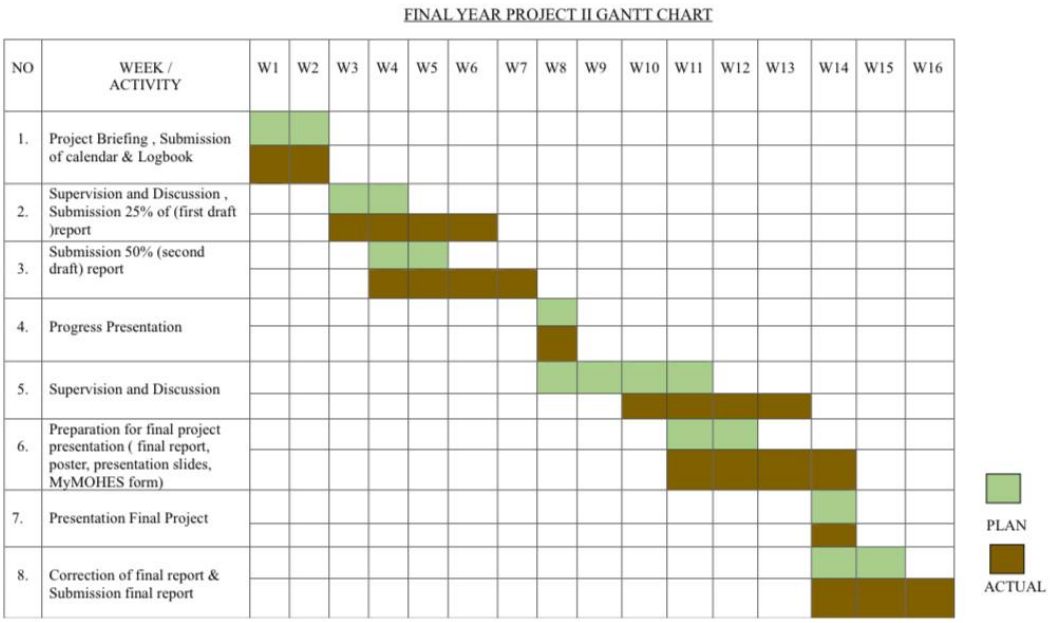
a. Questionnaire







b. Gantt Chart



c. Cost of Material

Bil	Materials	Quantity	Price per unit	Total
1	Wheelbarrow	1	RM 75	RM 75
2	Hollow steel	2 metres	RM 16	RM 32
3	Brake	1	RM 65	RM 65
4	Pneumatic Tyre	2	RM 18	RM 36
5	Sensor	1	RM 87.90	RM 87.90
6	Cutting edge	2 pieces	RM 2	RM 4
			Total	RM 299.90