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DEPARTMENT OF MECHANICAL ENGINEERING  
DJJ5141  
PROJECT 2

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## PROJECT 2 REPORT (WHEEL SHOVEL)

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**SEMESTER SESSION:** JUNE 2019

# ***WHEEL SHOVEL***

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This report is submitted to the Department of Mechanical Engineering as part of the requirements for the award of Diploma in Mechanical Engineering.

## PROJECT REPORT VERIFICATION

The project report titled "Wheel Shovel" has been submitted, reviewed and verified to meet the requirements and requirements of the Project Writing as specified.

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Date :

"We admit that this work is the result of our own work except for the excerpts, which we have only explained the source of"

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Date :

## **APPRECIATION**

Our deepest gratitude to my supervisor Mrs. Norliza Binti Kasim gave us the opportunity to complete this project for one year and greatly assisted and assisted us in completing the final project work. Without the encouragement and guidance of Mrs. Norliza Binti Kasim we would not be able to complete the work within the time specified by the Polytechnic. All the instructions provided are not only applicable to the final project project but can be applied outside of Polytechnic.

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Last but not least, the friends who helped us both directly and indirectly.

Thank you

## *Absract*

Today's wheel shovel have a lot of types and functions . Each workers used the wheel shovel by its function. There are many workers used shovel to lift up things and get the things in to the sack . So, there are a lot of step and process to do that work and make the users to bending their bodies when doing the lifting works. Our project main objective is a wheel shovel that is used to facilitate the process and able to help the users to lifting things such as sand,coal, cement and other similar things and then getting in the things straight forward in to the sack. It also reducing user's ergonomic when doing lifting works .Our project have two parts part A and part B which is part A is the shovel and part B is the place of sack. The maximum height of the project is 155 m and the maximum wide is 55 m this is because we making this product speacially for the male users in asian. We got this idea based on our observation and our questionnaire that we did. The respondents of our questionnaire including the construction workers, students from civil engineering department and then those who experienced in using the shovel.So, the process to make this project is mainly by using the welding method . This project is usingthree concepts which is pushing, lifitingand as well as upward and downward movements when doing the lifting works. The project is expected to facilitate users of shovels to lift and transfer things in to the sack.

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# *CHAPTER 1*

## *INTRODUCTION*

### *1.0 Introduction*

Today's shovel is very much needed by the general public in various functions. The function of the spades depends on the design of the spades. Usually this shovel is used to absorb sand, lift sand, and then move sand elsewhere for example into sacks. Apart from sand, coal, soil, kernels and the like are also commonly used, raised or excavated by shovels. Workers or individuals living in the interior often use shovels for agriculture as well as construction sites they use. They use this shovel to fertilize the soil, transport the sand, clear the ditch and so on. There are also workers who use this shovel to dig and lift the ground and then put sand into the sack and so on.

From the situation above, we can see that there are many steps and processes involved in making the sand dug into the sack. In addition, it makes users more ergonomic when using shovels because they have to bend their body when doing work.

Shovels have been used in many cultures throughout human history. During the Neolithic Age, people began to farm, build communities, produce goods and trade. Shovels are tools for digging, lifting and transferring bulk materials, such as soil, coal, gravel, snow, sand, or ore. Shovel bar is usually made of hard steel sheet or hard plastic and has a folded seam or hem on the back to make a socket to handle it. This fold also usually gives extra rigidity to the blade. A piece is usually mounted at the end of the holder to help grip and control where the shovel is designed to move the ground and heavy material. The shovel blade also consists of several types of blades such as AMES blades (gardening), RAZOR-BACK blades, Drain blades and blades different sizes and different functions. Now, there are many types of shovels that can be used for a variety of different occupations such as working either digging, lifting, and transferring the same material.

In our project, we plan to create equipment where the project is to make the user of the shovel facilitate their process to lift up the soil , coal and others into the sack for an example . we combining three concepts which is lifting, pushing and moving up and down. We got this concept from equipment like shovels, carts and games that can be found on the children's playground. This makes more easier for the user to lift the sand and then put it in the sack and then move the sand from one place to another. In addition , we also create an equipment to reduce ergonomic users of the shovel when doing work by using the shovel.

## ***1.2 Research background***



Figure 1.1: Workers in construction places

Nowadays , there are a lot of technology have been created by people to facilitate dayli work and at the same thing trying to look at the safety of using , effectiveness and functionality .So in our project here , we are looking for shovels . We are looking for the innovations of shovels nowadays which had a lot of design and functions . The point is we want to having an idea to making a project , to getting a design to build our product for the shovels users out there because we want to helping the shovels users facilitate their works in lifting material.

## ***1.3 Problem statement***

The process of lifting sand using the conventional shovel is inconvenient and tiring the users because the process of lifting sand is done repeatedly.

## ***1.4 Obejctives***

- 1) To designing a tool that can lift and transfer materials.
- 2) To build a tool that can facilitate the shovel users.
- 3) To facilitate and minimize the process of lifting materials.

### ***1.5 Research questions***

For the research questions , firstly is how to make sure that the users of the shovel prevent from bending their bodies when using or doing the lifting woroks .

Secondly , what design is suitable to prevent the users from bending when doing the lifting works.

Lastly , how to minimize the process of lifting method and enhance the lifting methods in workplace to complete one work.

### ***1.6 Scope of research***

- 1) Used to lift small materials only.
- 2) Able to move up to only 120 degrees.
- 3) Used by people with a heightof 160 cm – 175cm.
- 4) Used for individual and small construction workplace.
- 5) Able to move and transfer only one sack at a time.
- 6) Able to lift materials from 6kg – 8kg.

### ***1.7 Significance of research***

The important of this research is because :

- 1) To know how the shovel works and the need of shovels by all of the users through its function.
- 2) To enhance the lifting works method by using a tool which is shovel , wheelbarrow and so on.
- 3) To know the effectiveness of improving a product in market .
- 4) Investigate what will happen when bending bodies repeteadly.
- 5) Creating a product which is suitable with situation and places .
- 6) To creating the best way to produce a product.
- 7) To help the shovels user in workplace and even in their own home.

### ***1.8 Definition of operational term***

Wheel shovel is an idea we have got it when we are looking the workers in the small construction places. They used the shovel to lifting small materials such is sand , small stone, land and other similar things get into the sack and wheelbarrow because to move the sack has been filled to another places .From that situation, we saw that the workers should bending their bodies repeatedly and the process to getting in the material into sack by using shovel is inconvenient. So, we decided to ask some workers there about that issues . We asked a worker because we want to try make them more easier when using the conventional shovel. A few question have been resolved so that we can get the best way creat this product .

A total of 25 leaflets have been printed to further our research . It takes about 2 weeks to complete this research process. Six questions we are dedicated to getting them certain of what problem they most often face . For the result , verity of answers that we got due to the lack of equipment when they used it. One of the average answer is bending bodies when doing the lifting method to another places . They need another method so they can more convient when work . Other than that , step when making 1 work which is from getting the material into the sack until the sack is full filled and then moved it to another place is to many step and they need to do it repeatedly. This is because the function when using of the conventional shovel is like that.

Finally , After we received all of the complaints from them , we decided to creating a product that would address these concern based on this research. We trying to continue with the highly effective design to get the best design to help the shovel users.

### ***1.9 Summary***

From the research we have done ,know we now what is shovel function and all of the design that have been created nowadays we are now got an idea to making what is our product . We also know the needed of the shovels users and all of the details which is problem that they have faced when using the conventional shovel . So from there , we are now trying to build up a project or a product which can used and helping the shovel users.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

By refer to Concise Oxford Dictionary of Archaeology. Shovels are hand tools used for lifting and transferring materials, such as soil, coal, sand or small objects that are similar to sand like cement sand. The shovel is a hand tool consisting of 3 parts which is a wide blade at the tip, at the centre of it is wood, and at the other end is the holder in general, when the blade is placed on the ground, the total length (blade plus shaft and handle) should be approximately to elbow height (when arms are at your side). Spades used for digging holes or cutting turf are usually longer than shovels. Shovel blades are usually made of sheet steel or hard plastics and very strong. Shovel rods are usually made of wood (specific types such as ash or maple) or glass reinforced plastics (glass fibres). Today we know that so much shovel had been created in many form, Today we know that many spades have been made in many forms. Among the changes that have been made to the shovel front are known as blades.

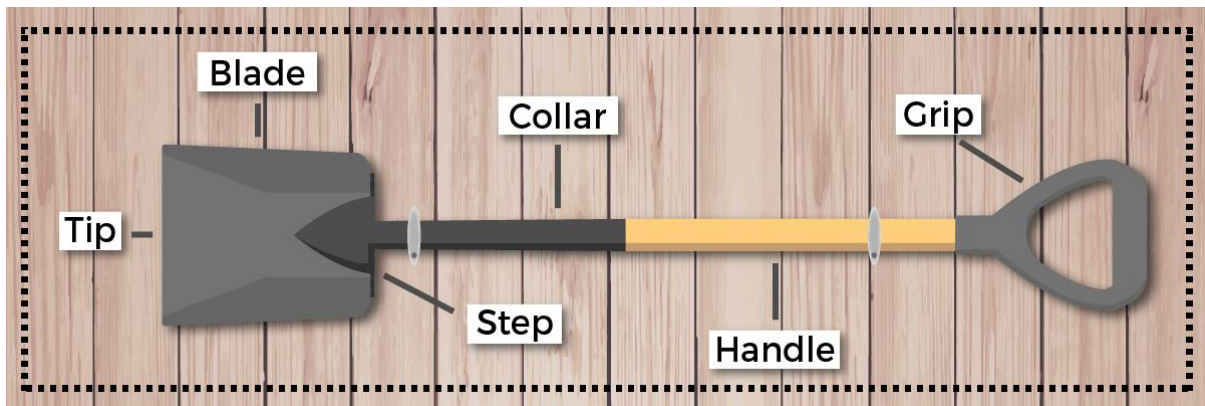


Figure2.1 : Basic shovel

## 2.2 Concept / Theory

Literature review by Zarul Naim Bin Ahmad Yani

(08DKM17F1259)

Humans has been digging in the Earth since the dawn of the Neolithic Revolution, some 12,000 years past. for agriculture in their day, they had to make shovels made from materials of their time. Some of the materials they use are from the bones of the shoulder bones. Then, in time, they advanced from bone to wood, metal and stone to make shovels leading to the development of modern designs of shovels and their special heads were purpose-built, such as shovels to dig in solid soil and shovels to move loose materials like charcoal. stone or grain. There used the girdle bones and shoulder blades of huge animals to create this shovels. cervid ligaments or animal skin straps were connected the bones to picket sticks 3 to four feet long. However, these tools pale move into the center Ages once iron technology appeared.

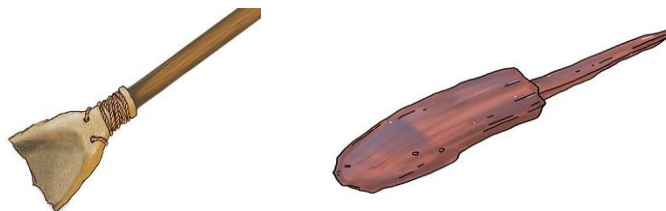
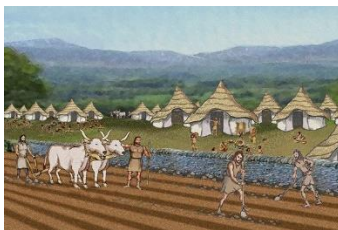


Figure2.2 : Old shovel

By refer Mike Mulligan and His Steam Shovel and other classics by Virginia Lee Burton It wasn't till the Eighteen Nineties that the thought of coming up with different-sized scoops in keeping with the density and texture of the materials being shovelled was introduced. Engineer and business intellectual, Frederick Edward Winslow Taylor, developed the notion of best shovelling apply and subject field to the shovelling, lifting and carrying of significant materials. His ideas impacted workers and the industrial elite significantly. A steam shovel is the earliest type of excavator. Extensive mechanisation of manual labour soon changed commercial management but the principles of the science of hand shovelling can still be applied today.

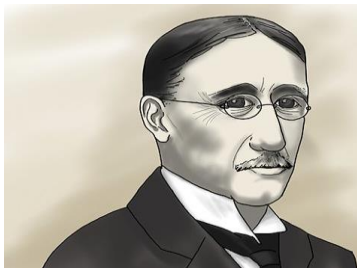


Figure 2.3 : Frederick Edward Winslow Taylor



figure2.4 : steam shovel

## 2.3 BASIC SHOVEL

Today, shovels and spades come in a myriad of shapes, sizes, and functions. Here are a few of the most common types you'll find in your local home improvement store and what they're used for.

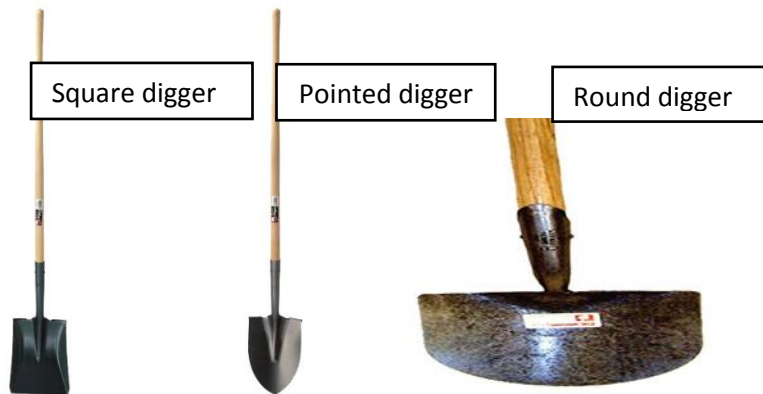


Figure 2.5 : Digging shovel

### 2.3.1 Square digger shovel

- By refer from <https://www.lawnmowersdirect.co.uk/product/bulldog-square-mouth-shovel-no-4-54-inch-long-ash-handle/>. The square digger has a flat packed knife instead of pointing. These shovels can be found useful for bordering and excavation works or transferring shrubs and small bushes. This square-shaped excavator is suitable for digging into hard-rock soils, so it may be suitable for people living in dry areas with solid reasons. The details of this. The No.4 blade meanwhile measures at (L) 342mm x (W) 280mm and has been solid-forged with the open socket from a single piece of steel for excellent durability. The handle meanwhile has been buried deep within the socket for added toughness. Constructed from American & German FSC ash, the handle has also been varnished for protection against the elements.

### 2.3.2 Pointed digger shovel

- By refer from book 'THE SHOVEL by Tom Massey, Baker Fore'. Pointed diggers have blades that return to some extent at the top. this sort of blade will work well in loosely-packed soils that will have dense root systems or rocks. Pointed shovels have a lot of curved blade than sq. diggers, therefore you may be able to scoop soil a lot of with efficiency with this digger.

### 2.3.3 Round digger shovel

- By refer from <https://gizmodo.com/the-8-types-of-shovels-everyone-should-know-5994728>. Rounded diggers have curvilinear blades with a rounded finish, instead of pointed. This shovel is right for transplant shrubs or flowers within the garden since its curvilinear finish doesn't penetrate through root systems simply and may forestall harm to the plants. spherical diggers work best in loose soil.

## 2.4 Literature review

### 1) DRAIN SHOVEL

Drain shovel is one of the modified shovels with a slightly different function than the other shovel. Drain spades are very narrow with slightly curved sides and a rounded tip, which makes them ideal for precise spot work like adding flowers to established beds, clearing existing trenches, and transplanting small shrubs.



Figure 2.6 : drain shovel

This is some of characteristic of drain shovel is heavy-gauge steel blade for digging in any type of ground ,heavy-duty fiberglass D-handle for a solid grip and increased control,16-in blade for digging narrow, deep trenches or clearing ditches, Forward turned steps for added control in wet and slippery conditions, Perfect for the professional contractor, industrial worker, landscaper, and the homeowner project, Long blade also works well in transplanting shrubs, bushes, and small trees.

### 2) TRENCHING SHOVEL

Literature review by Andi Amirul  
(08DKM17F1164)

James E.COX ( Aug 11 , 2010 ) : - trench shovel with a tempered steel blade having a width narrower than its length, and typically has a rounded or pointed front edge for penetrating into the earth, and a transition portion that has extending there from a tubular member for attachment of a handle of rectilinear cross section. The tubular member extends from the transition portion at an angle selected to provide a pre-selected function for the trench shovel. An angle of about 90 degrees or more allows the shovel to be forced with the toes or ball of the foot in the direction of the front edge, while an angle of about 120-150 degrees allows the shovel to be forced with the toes or ball of the foot in a manner similar of conventional shovels, typically against a pair of toe pegs secured to the rear portion of the tubular member or transition portion of the trench shovel.

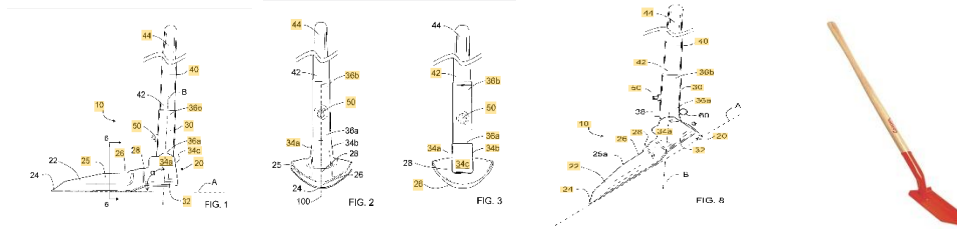


Figure 2.7 : Trenching shovel

Trenches have also been dug by hand, or rock and debris cleaned from a trench dug by machine, using a traditional shovel or a trench shovel. Traditional shovels have a blade width that is significantly wider than needed for burying drainage and water piping, and require the user to remove significantly more earth than necessary. There have been previous attempts to construct a trench shovel, none of which has been completely satisfactory

The present invention relates to a more functional trench shovel. The blade of the trench shovel is generally clamshell shaped, having a width narrower than its length, and typically has a rounded or pointed front edge for penetrating into the earth, which can often be comprised of shale or tightly compacted soil. The clamshell shape of the blade allows scooping of dirt and debris from the bottom of the trench.

(Feb 14 2011) - A trench shovel comprising , a tempered steel blade body comprising (a blade having a rear portion and two opposed sides that taper to a front edge, and having a concave cross section from the rear to the front edge, the blade oriented along a first axis) ,( a transition portion extending from the rear of the blade ) and ( a tubular member extending from the transition portion, having a cross section and a second axis, wherein the first axis is oriented relative to the second axis at an angle between 120° and 150 ).Next, an elongated handle having an attaching end having a cross section configured for insertion into the tubular member, and at least one toe peg extending laterally from at least one side the transition portion or the tubular member.

-Trenching shovels are designed for, you guessed it, digging and clearing trenches.

-They feature a sharp, pointed tip and squared sides to produce clean trench walls and minimize disruption of the surrounding soil.

- They're indispensable for laying irrigation pipes, digging a compost trench, and removing deeply-rooted plants.

-The narrow blade has very little in the way of a place to put your foot to drive it the ground, and the majority of force will come from your arms and torso. These are most often used by landscaping professionals and gardeners.

### 3) NOVEL HAND-HELD SNOW SHOVEL SYSTEM

Joseph Faraci ( Apr 15 2014 ) - A hand-held Snow shovel system features an 'A' shaped shovel frame having a “V” shaped angular lower handlebar and a linear upper handlebar. The system features a shovel assembly having a first shovel blade and a second shovel blade. The blades each comprise a curved first blade end tapering to a linear second blade end. The linear first blade end of the first shovel blade is pivotally attached to the linear first blade end of the second shovel blade. The first shovel blade is pivotally located on a frame first side at a frame bottom end. The second shovel blade is pivotally located on a frame second side at the frame bottom end. The shovel assembly can be affixed into a position having the first shovel blade and the second shovel blade in-line or at an angle with respect to one another.

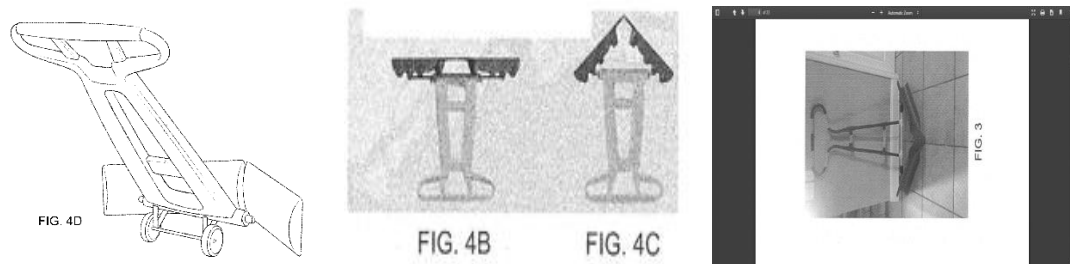


Figure 2.8 : Hand-held snow shovel system

This project is The present invention relates to snow shovels and hand held Snow removal systems. Snow shovels have been used for clearing accumulated Snow for many years, perhaps since the origination of the shovel itself. A typical snow shovel is equipped with a generally flat blade constructed from plastic or metal with a centrally located handle attached to the back side. While generally effective, the common Snow shovel requires significant physical effort for use leading to premature fatigue and Sometimes pain for the user. The present invention features a hand-held snow shovel system for facilitating effective removal of accumulated Snow via an angularly adjustable blade assembly.

Any feature or combination of features described herein are included within the scope of the present invention provided that the features included in any such combination are not mutually inconsistent as will be apparent from the context, this specification, and the knowledge of one of ordinary skill in the art. Additional advantages and aspects of the present invention are apparent in the following detailed description and claims.

The present invention features a hand-held snow shovel system for facilitating effective removal of accumulated Snow via an angularly adjustable blade assembly. In Some embodiments, the system comprises an 'A' shaped shovel frame. In some embodiments, the shovel frame tapers from a frame bottom end to a frame top end.

In some embodiments, the system comprises a “V” shaped angular lower handlebar. In some embodiments, the system comprises a linear upper handlebar located on the frame top end. In some embodiments, the lower handlebar is located between the upper handlebar and a cross member.

- Facilitating effective removal of accumulated snow via an angularly adjustable blade assembly.
- For snow removal system

#### 4) Snow Shovel

All snow shovels consist of a [handle](#) and a scoop. Sometimes there may be a shaft connecting handle and scoop, while in other snow shovels, the handle is extended and attaches directly to the scoop. Most snow shovels are designed for either pushing snow or lifting snow, although some are crossovers which can do either job. Some snow shovel scoops have sharpened blades which can chip away and lever up slabs of ice. Handles may be straight or bent. Straight handles make the pushing angle easier to adjust and snow throwing easier compared to a bent handle. Long handles enable the user to leverage their weight for pushing snow, but shorter handles make tossing snow easier. Plastic and fiberglass handles are lightweight, while wood handles are heavy. Metal handles conduct heat away from the hands more readily than other kinds of handles, so they feel colder. Some handles include a D-shaped grip or padded grip at the end of the handle. There may also be extra grips in the middle of the handle to assist with the snow shovel's lever action when lifting snow. Snow shovels designed for lifting snow generally have smaller scoops than snow shovels designed for throwing snow. A typical push-type shovel scoop would be about 24 inches across with a wide, blunt blade, while a lift-type shovel scoop may be half that size. A narrower scoop makes the removal of deep, wet, or heavy snow easier. Scoops with a large curve can carry more snow, while those with a shallow curve are intended to push snow rather than carry it. Metal scoops are sturdier than plastic but heavier, and they also require more maintenance. Steel and steel-edged scoops are heavier than aluminum or plastic, but are also more durable. Although they are very good for dealing with ice, they can also damage delicate outdoor home surfaces.

Many homeowners who deal with large amounts of snow have multiple snow shovels for different types of snow. If lifting is a concern, then they may choose separate shovels for lifting versus pushing. Otherwise, users may wish to have a shovel for fresh light snow and another one to manage icy hard snow.

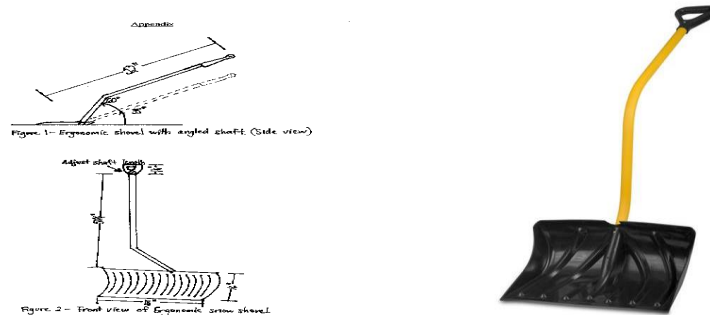


Figure 2.9 : Snow shovel

Carter , 1997 - The ergonomically correct shovel will also have an angular shaft to keep the body more upright and minimize stress on the back when shoveling. Shovels with the shaft angled decrease the resulting maximum spine compression and shear forces when lifting the loaded shovel from the ground. The shaft should be angled at 60 degrees towards the bottom of the shaft, and at 35 degrees for the upper portion of the shaft. For each shovel, the bend in the shaft should occur at the 2/3 mark of the shaft when measuring from the top of the handle (see Figure 1 ).The handles of the shovels will allow the user to grip the handle with mittens. Cushioned "D" grip handles provide the best grip and comfort. In addition, the handles will be made of fiberglass. Fiberglass handles are up to three times stronger than wood handles for the most demanding shoveling. And because they are water-proof, fiberglass handles won't splinter, warp, or dry rot (Ames Lawn and Garden, 1997).




Hansson & Oberg , ( 1996 ) - In most situations when working with a shovel, the empty load is pushed into the material that is to be moved, for example snow, and then lifted in order to place the material on a higher level and/or to move the material also in the horizontal plane. The hard part of the job is when the blade is loaded and especially if the handled material is heavy. Handling heavy material with a shovel results in disc compression and shear forces that may be harmful to the operator. The normally repetitive nature of the work compounds the problem. A shovel with a longer shaft than normal decreases the operator's trunk flexion when beginning to lift the shovel from the ground. The maximum shear forces at the spine are also decreased. The lateral moment loading the trunk is, however, increased and the maximum force at the right erector spinae muscle is also increased. Shovels with the shaft angled decrease the resulting maximum spine compression and shear forces when lifting the loaded shovel from the ground. When lifting the shovel, the load on the spine and on the back muscles is much greater for a tall person and heavy operator when compared with the load on a short and light person.



5) Electric snow shovel

Danielle Mcleod - An electric snow shovel is a machine that is powered either by a cord or battery pack to provide power to a turning auger that helps push and throw smaller amounts of snow out of your way. These are popular tools to use on decks, patios, stairs, sidewalks, and small driveways due to their lightweight and smaller width. Unlike a regular snow shovel, an electric snow shovel does not require you to lift or throw the weight of the snow you are moving and can clear snow much more quickly, and with a lot less stress. Larger snow blowers require room to store and maneuver, is of a much heavier weight, and needs regular maintenance. An electric snow blower is compact, lightweight, and fairly powerful, plus it can get into areas a snowblower cannot.

An electric snow shovel works in a similar manner to their larger, more powerful, snowblower counterparts. The power you run to your machine turns an auger which sucks up and throws snow to the side, or forward, and out of your way. Typically they are around 12 inches wide and can cut snow 6 to 8 inches deep, making them compact enough to store easily indoors or out and be kept on hand to get the job done quickly. They receive electrical current either from a power cord you can run to your closest outdoor outlet, or through a rechargeable battery pack. Corded versions usually run much more powerfully, but are limited by their cord length. Cordless, battery powered versions can go anywhere you need it too, but may not have the same strength as a corded version.

Types of electric snow shovel	Description
	<p>Shovels with power cords usually provide the most amperage to run the engine since you have a direct line to a power outlet. These machines can work with a extension cord, but will be limited by the length of cord you use them with. You also need to take care to keep the line clear of the auger to avoid getting it tangled, or even cut.</p>
	<p>Some shovels are cordless and run with a rechargeable battery pack. Obviously you will not be limited by distance, but you may be limited in power, as well as in how long you can run your unit between charges.</p>
	<p>This is always a nice feature to have. If your shovel has an adjustable handle it makes it much more easily used by a wider variety of people due to their height, reach, and personal preferences.</p>


	<p>Back wheels are pretty standard on electric snow shovels. One version is considered a manual push shovel that requires you to drive it forward with the help of the auger which does provide some pull as the snow feed through it. Although this sounds like it might be difficult, it truly isn't and is very much the standard design.</p>
	<p>Self propelled shovels have a rear-wheel drive system for further maneuverability, and combined with the pull of the auger make cutting through snow a simple task. These are great choices for anyone who struggles with any sort of manual labor as the snow removal is pretty much done for you in models that boast this feature.</p>
	<p>Occasionally you may find a model that will light up your way with a single, bright, headlamp. These are especially helpful on those dark, cold winter mornings when cleaning off your walkway is a must in order to get to your garage. They also can illuminate your steps and are a nice, built in, safety measure.</p>

Table 2.1 : Types of electric snow shovel





Although an electric snow shovel isn't built for incredibly heavy loads of snowfall, it is an awesome choice to help you cut your shoveling time in half with very little physical effort on your part. Whether corded, or battery powered, they are strong enough to toss what ever snowfall you do have well out of the way to keep your decks, porches, stairs, and walkways clear and safe.



-For snow removal using types of snow shovel machine.

## 2.4 Summary

In conclusion, shovels have various shovels that have been created and have many other functions. However, the creation of shovels of this type still has some disadvantages or problems when using the shovel. So we as an innovation group will try to make existing shovel innovations a better way of solving problems. Some innovative ideas have been discovered through a combination of products that can help users better solve this problem. Helps users use the shovel more efficiently and can reduce the processing of goods from one place to another. Based on our research, we have found that good and robust design will have a positive impact on users when using this tool. Therefore, we have found that the rear wheel drive design is integrated into the front which acts as a shovel which is our innovation to make shovels more efficient or better known as wheel shovels.

Table advantages and disadvantages of shovel :

 <ul style="list-style-type: none"> <li>• <b>OLD SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Can use to lift up material</li> <li>• Easy to create</li> </ul>	<ul style="list-style-type: none"> <li>• shovel rods can be solved or bending if we lift too much load</li> <li>• non-durable</li> </ul>
 <ul style="list-style-type: none"> <li>• <b>DRAIN SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Deeper scoop.</li> <li>• Best for digging.</li> <li>• Strong wood handle</li> </ul>	<ul style="list-style-type: none"> <li>• Take more effort to use</li> <li>• Wobbling socket</li> <li>• Cannot used to lift up to much load</li> </ul>
 <ul style="list-style-type: none"> <li>• <b>DIGGING SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Easy to use</li> <li>• easy to find and buy on the market</li> </ul>	<ul style="list-style-type: none"> <li>• Use a lot of energy to use</li> <li>• shovel rods can be solved or bending if we lift too much load</li> </ul>
 <ul style="list-style-type: none"> <li>• <b>TRENCHING SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Can use by people</li> <li>• Can use to clean the trench .</li> </ul>	<ul style="list-style-type: none"> <li>• Should bending bodies when using it</li> </ul>

 <ul style="list-style-type: none"> <li>• <b>SNOW SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Can clean the snow</li> <li>• Strong material</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy to lift the material ( snow )</li> </ul>
 <ul style="list-style-type: none"> <li>• <b>ELECTRIC SNOW SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Can clean the snow</li> <li>• Can use in dark place or in night</li> <li>• Fast in working</li> </ul>	<ul style="list-style-type: none"> <li>• Only for winter season</li> <li>• Havier weight</li> </ul>
 <ul style="list-style-type: none"> <li>• <b>WHEEL SHOVEL</b></li> </ul>	<ul style="list-style-type: none"> <li>• Can lift up so much load</li> <li>• Can use just like wheelbarrow</li> <li>• can be used to fill the material directly into a container or sack</li> </ul>	<ul style="list-style-type: none"> <li>• heavy</li> </ul>

***Table 2.2 : TABLE OF ADVANTAGE AND DISADVANTAGE OF CONVENTIONAL SHOVELS***

## CHAPTER 3

### METHODOLOGY

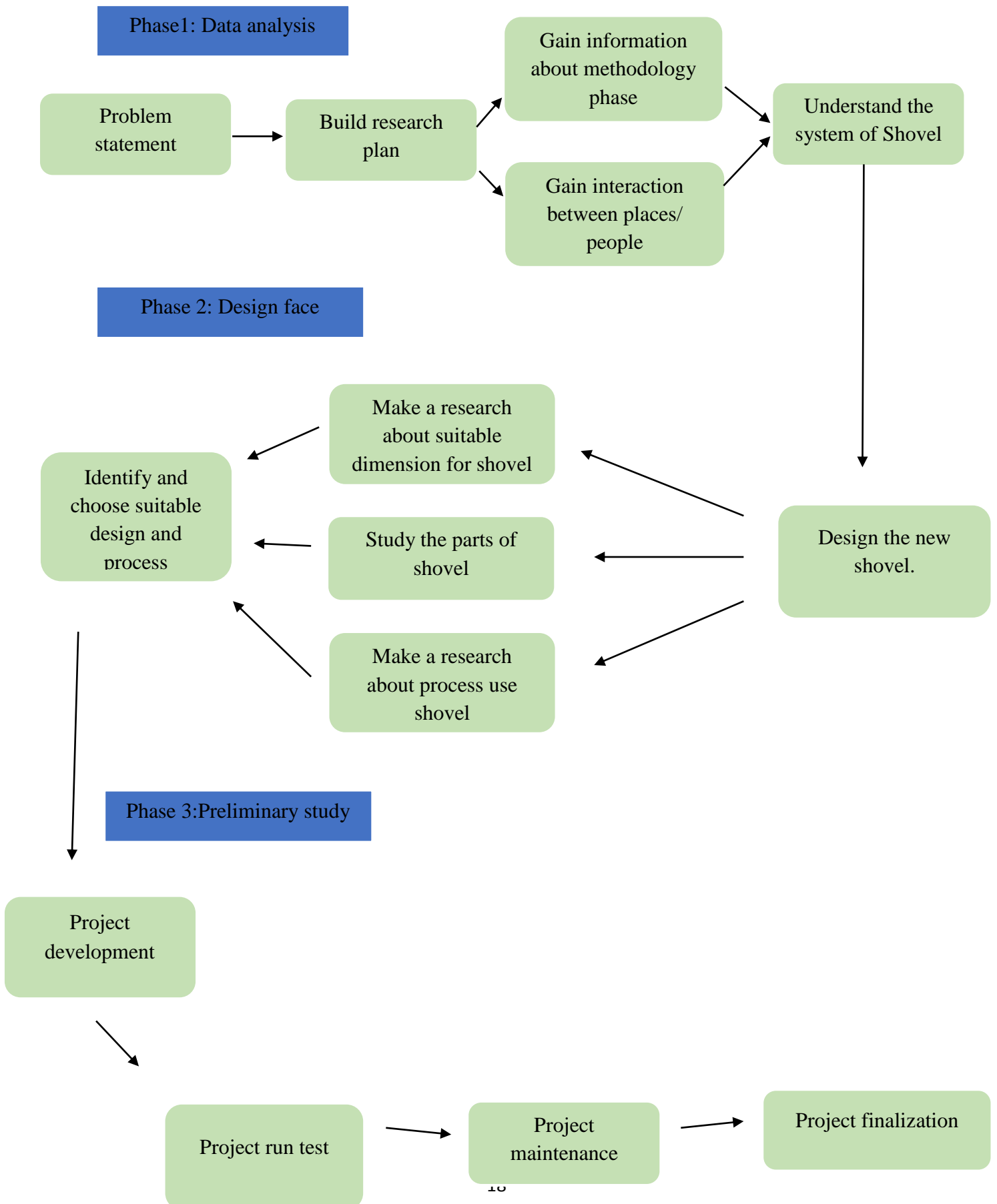
#### **3.1 INTRODUCTION**

Methodology is the method and technique of designing, collecting, analyzing data in order to produce evidence supporting a study. Methodology explains how a problem is investigated and a problem can be solved and explains the procedure to facilitate the implementation process of the project.

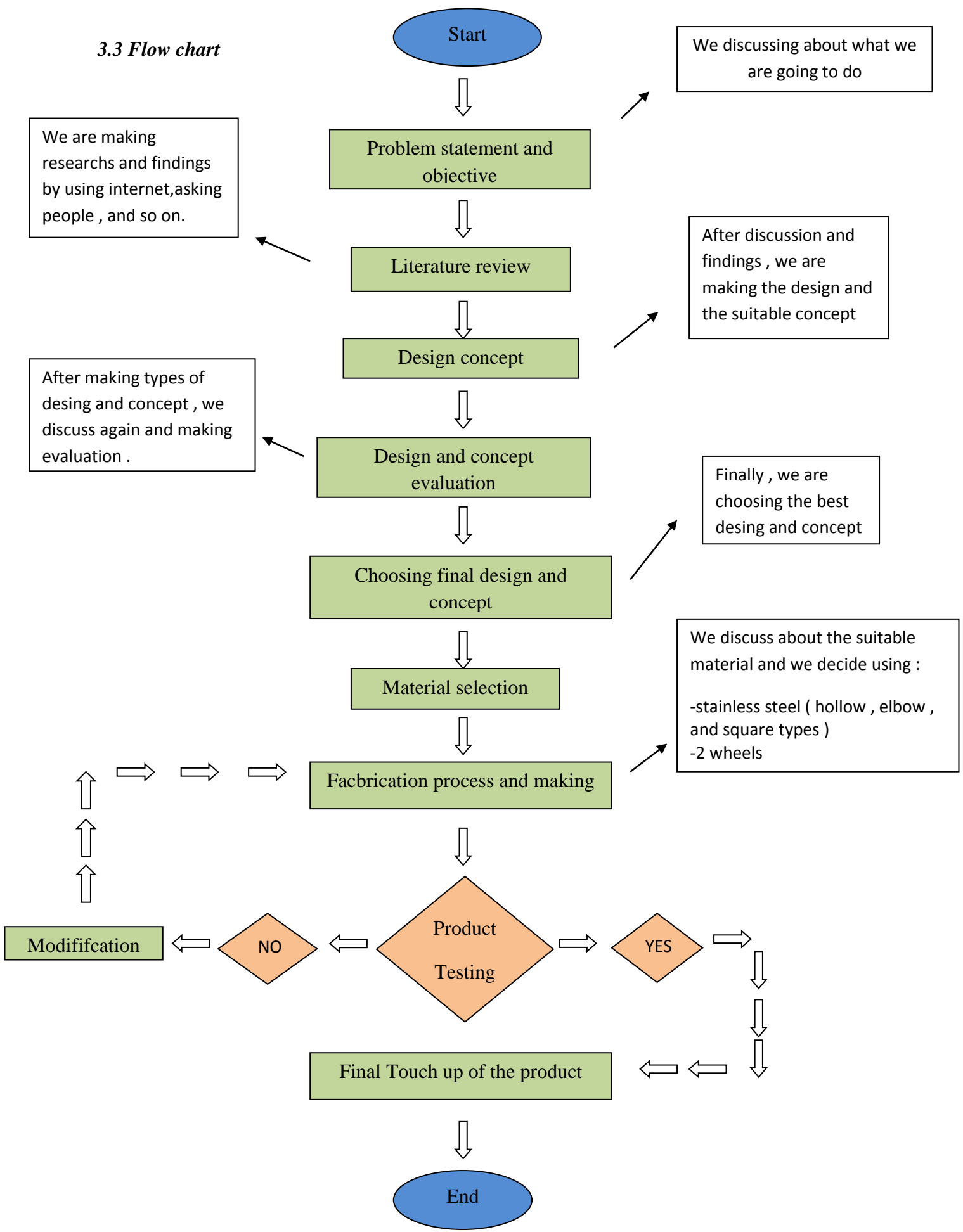
The design of this wheel scop is its own design based on the suggestions and discussion of the members of the group. Our innovations must take into account the original aspects and theories in building this project. The resulting designs should not be so complicated, flexible and easy to use. The component selection is based on the study and testing so that the project works well and perfect. Security and comfort specification is also preferred

- Questionnaires were distributed to 50 respondents for our research to identify the needs of upgrade to new shovel design.
- Questionnaire with two section consists of 6 question.

### 3.2 METHODOLOGY PHASE



3.3 Flow chart



### 3.4 EXPLANATION OF FLOW CHART

#### (i) Literature Review

The flow chart is very important to illustrate the sequence of operations to complete the work. It uses symbols to represent processes. Each step in the process is represented by a different symbol and contains a brief description of the process step. The top of the flow chart will start with the beginning. Then it was followed by a literature review. In this step it will discuss the use of current methods. It collects with a shovel and puts it in a sack. In addition, there is a list of the advantages and disadvantages of each method. By doing so, find out which ones are efficient and which take a short time in the collection.

#### (ii) Conceptual Design

Next is conceptual design. At this stage, it is necessary to design four products that work to collect loose fruit. At this stage also, the advantages and disadvantages of each design are listed. The advantages and disadvantages are with the design and some criteria such as portability, ease of use and ease of maintenance.

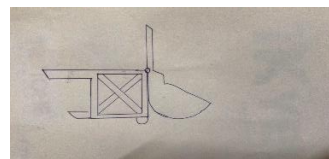
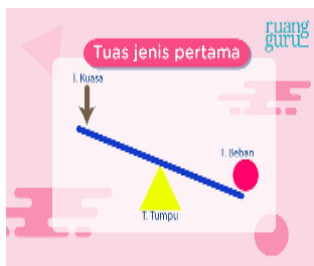


Figure 3.4.1 : first concept level

figure 3.4.2 : first design

The idea came from the wheelchair idea. The concept uses a concept such as a trash bar located in a children's playground or better known as the first type of lever concept where the fulcrum will be in the center and the load or force will be at opposite ends.

On the other hand, there are several advantages that are easy to use and easy to operate. This is because it has wheels that are easy to move anywhere. In addition, this concept is easy to use. But as a result of our discussions with our advisers, we needed to change the front structure of the project that was working as a shovel because our advisers thought the structure was inappropriate and did not achieve the objective.



### **(iii) Concept Evaluation**

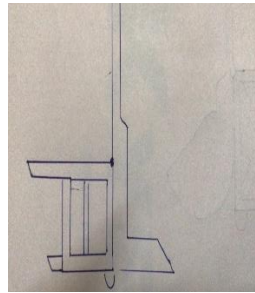


Figure 3.4.3: evaluation concept

we were asked to change the structure of the structure to the front of the project that worked as a shovel. So we changed the bottom of the shovel from a curved shape to a 90 degree shape. As a result of the structural changes on our front we also had to change the structure on the back of the j that worked like a cart. This is because the structure was originally built specifically for the structure when the structure of the building changed so everything changed. For safety we shorten the shovel blades to the front to reduce the load.

### **(iv) Choose Finalize Concept**

After researching and discussing with our advisor. we decided to choose this design and concept because it is very accessible and not too difficult to build. Changes only occur to the amount of iron bars that support the structure and length of the shovel.

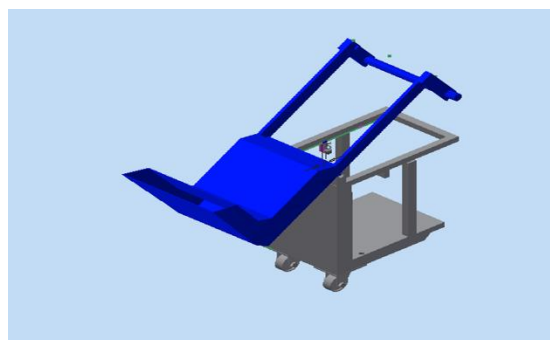


Figure 3.4.4 : Finalize Concept and design

#### (iv) Material selection and costing

The correct component selection is important in designing the project to avoid the misuse of the materials or components used. In addition, in the selection of components, the safety aspect should also be emphasized as the project produced must be used safely. The component is used:

##### 1) (mild steel)

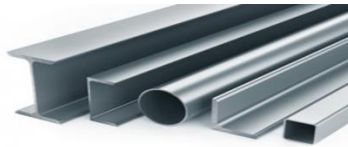


Figure 3.4.5: mild steel

Carbon steel is sometimes referred to as 'light steel' or ordinary carbon steel. This steel has a small percentage of carbon. This steel is strong and hard but not hard, this is the most common form of steel because the price of steel is lower than other steel. Lightweight steel contains carbon between 0.05% -0.25% with reference (Engineering basics on low carbon steel) making it easy to form and durable. Other features of this steel are its low tensile strength, low cost, and easy to manufacture. Surface hardness can increase through carbides. The corrosion resistance of carbon steel is low, so they should be used in corrosive environments unless a protective form is used. This steel is used to create the project framework according to its hardness and strength.

##### 2) (stainless steel)

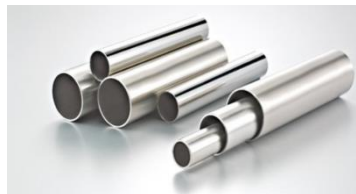


Figure3.4.6 : stainless steel

Stainless steel is also known as oxide steel. It contains the highest percentage of iron, chromium, and nickel, with at least 10.5% of chromium content by mass and 1.2% by mass. Stainless steel has high corrosion resistance. The corrosion resistance of steel can also be increased with increasing chromium content in steel. The additional molybdenum also improves corrosion resistance in reducing acidity and against pitting attacks in chloride solution. In addition, there are many grades of stainless steel with a variety of chromium and environmentally friendly molybdenum content that must be maintained. Stainless steel resistance to corrosion and staining, maintenance is low, and shiny surfaces usually make it an ideal material for many applications. We use this iron to make the holder, according to the round design we choose.

### 3) ( WHEEL)



Figure 3.4.7 : wheel

The heavy duty wheel is selected for this project as it has high durability. Additionally, the innovation of this project allows the wheel to be 2 seeds on each side so the resistance will also increase as the load can be divided on both wheel on each side.

### 4) ( BOLT AND NUTS)



Figure 3.4.8 : bolt and nut

Nut are a type of binder with threaded holes used to make connections. Nut must be used together with mating bolts to bind some parts together. Both couples are paired with their yarn friction combined, slightly stretched bolts, and compression parts to be jointly assembled.

### 5) (PLATE STEEL)



Figure 3.4.9 : Plate steel

Plate Steel is commonly used to strengthen foundations and to maintain heavy mass units such as bridges. As an alternative, it provides the foundation for the construction of larger materials and unworkable parts. We use this type of iron to close the front of the project so that the sand doesn't get out of the drain.

### (v) Fabrication Process

- 1- In the early stages we took pre-made iron and brought it to the workshop for welding. Before welding we examine the project sketch again before starting the project. For the early stages we cut the tip of the iron to 45 degrees to allow for a smooth connection.



Figure 3.4.10 : cutting process to 45 degree

- 2- After 45-degree iron cutting, the iron-bonding process can begin. For the first step we will be welding steel to make the back frame.

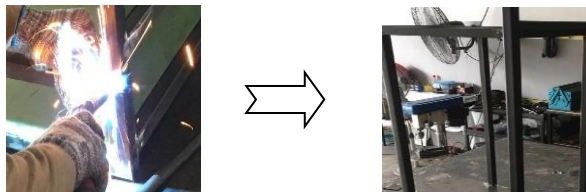


Figure 3.4.11 : welding for back part

- 3- Once we have finished the frame on the back of the project, we move on to the front of the project. The front part of the project is a bit difficult as it requires good welding



Figure 3.4.12: welding for front part

- 4- After finishing the frame on the front and back. We need to put some finishing touches on the welding part of the project to look neat and detect the defects in the steel during welding. We use a grinder machine to clean the welding area. We used magic flap slip to clean the welding area.

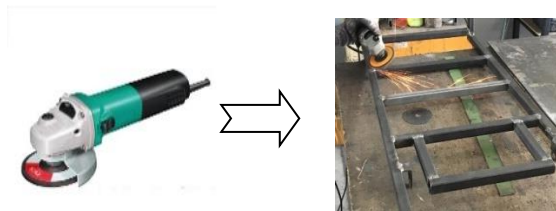


Figure 3.4.13 : Clean project by use grinder

- 5- When ready to make skeletons. The next step is to install the steel plate on the project frame. Before that we had to measure the iron plate according to its size before connecting it to the project frame. We focus for the back part to install steel plate.

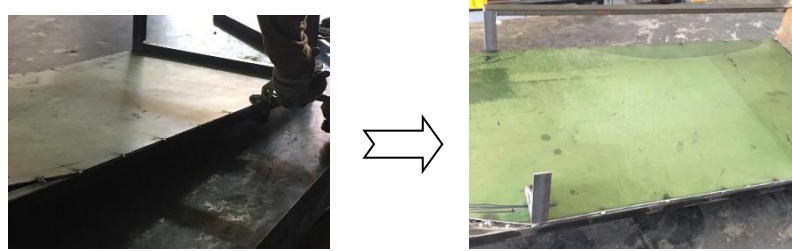


Figure 3.4.14 : installing plate

- 6- After making the plate connection, The last part for back part we continued the joy of connecting the tires using bolts and screw. After install wheel we had finish for the back part.

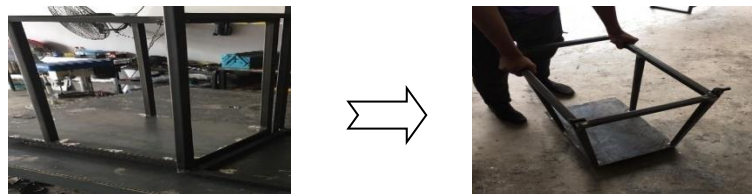


Figure 3.4.15 : connecting the tire

- 7- After finishing the back. We continue our project with the front end. We connected the project using the MIG machine and used iron plate to cover the front of the project. Before making the connection we need to create a frame for the plate connection, this is because in the absence of a plate frame it can be curved.



Figure : 3.4.16 : create a frame for plate connection

- 8- Creating a connection point for the front and back. This part needs to be welded a little thick as it is very important to support when lifting the front



Figure 3.4.17 : Creating a connection for front and back part

- 9- Make a place for the hooks. This place needs to be placed in the right position because when the hook position is not in place it can cause sand to not get into the pouch.

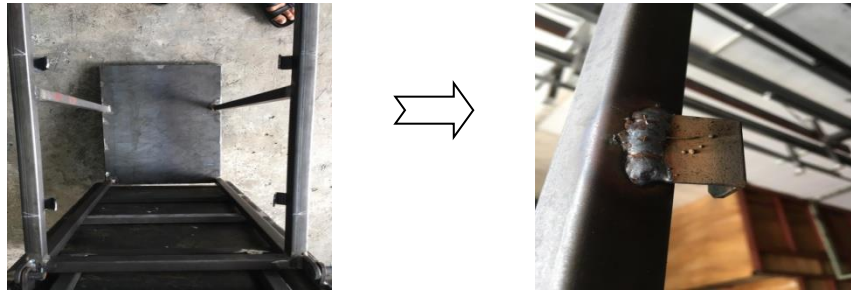


Figure 3.4.18 : Make a place for hooks

- 10- Project complete



Figure 3.4.19 : Project complete

- 11- We are making testing product and modification

We found that our hook have problem because the measuring is wrong and the part A is still make the users bending their bodies when doing the work. So , we decide to Solve the problems by :

- 1) Solution for Bending's of the user :



Figure 3.4.20 :Solution for bending of user

2 ) Solution for the hook :



Figure 3.4.21 solution for the hook

12- Touch up and final result of the project

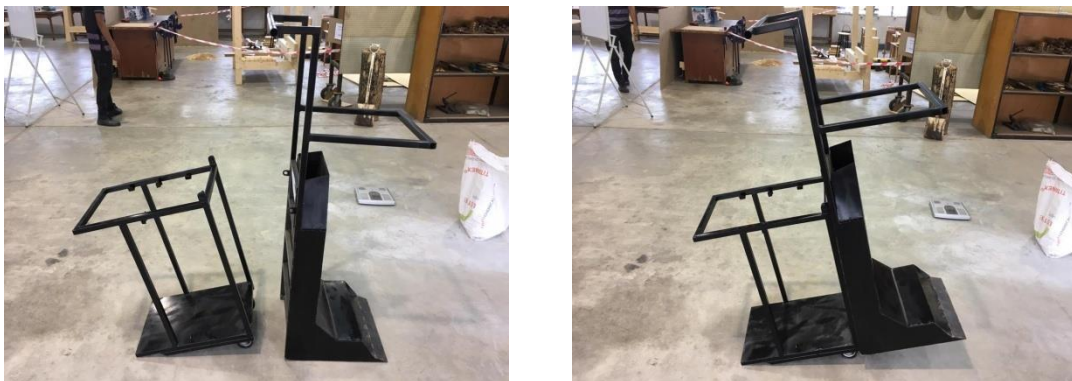


Figure 3.4.22 : Touch up and final result of project

### **3.5 Summary**

From the flow of this chapter, we can conclude that every work should have a planning before start. According to the flow chart that we have got , we are succed build up our project with following the flow chart . Even we have problems when we almost done our project , we still have an extra time to complete it because of planning schedule. The material that we choosed is probably should be like that because we need a product which have good quality and strength to prevent any lack and problem when doing product testing in the future . SO, from all of this we are feeling gratefully that finished our project on time where as in schedule .



## **CHAPTER 4**

### **FINDINGS**

#### **4.1 Introduction**

This chapter discusses about data analysis finding based on predefined data analysis. Data obtained from 50 questionnaire. Respondent are given the opportunity to used this tool. The first part which is part A is based on descriptive statistic that touches on the background of respondents and their occupation. Then the second part which is part B we focused on those who were directly involved in the work of transporting sand into the sac. The respondent was given the opportunity to use the wheel shovel product. There are many commend and suggestion provided by users based on data. It is possible to do the data improvement process. We also collect additional data through public surveys that have been run randomly to the public through by questionnaire method. In addition we had opportunity to interview construction around Shah Alam area before and after used wheelshovel.

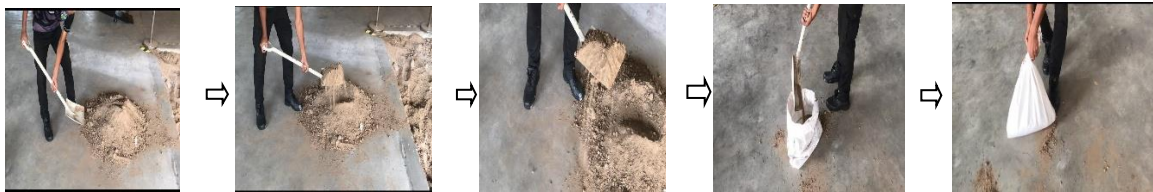


Figure 4.1 : Show users need to do a lot of work to put sand into the sac using a regular shovel

#### **4.2 Respond Rate**

The response rate we receive is very important from the small industry and students from civil engineering. As a result of our study, we found that many public students or construction workers face similar problems when using this existing shovel. Among these are fatigue in the process of putting sand into the sack. Besides, they are also tired as they carry the load in the sack to move to their desired place. Some people also have spinal pain during the process of transporting sand into the sac using a regular shovel because they need to bend their bodies down. For example, a worker is asked to fill up a sack up to 20 kg and to move the container containing 20 kg to the desired place. Here we can see that the worker will face two problems - the first is the problem of lifting sand into the sack, this is because the worker has to repeat the same movement many times until the sack is full and causes fatigue to the worker. The second problem is that the worker will have difficulty moving a sack weighing 20kg. In this situation we can see that they need a convenient product to transport sand into the sac and to move the sac containing 20 kg.

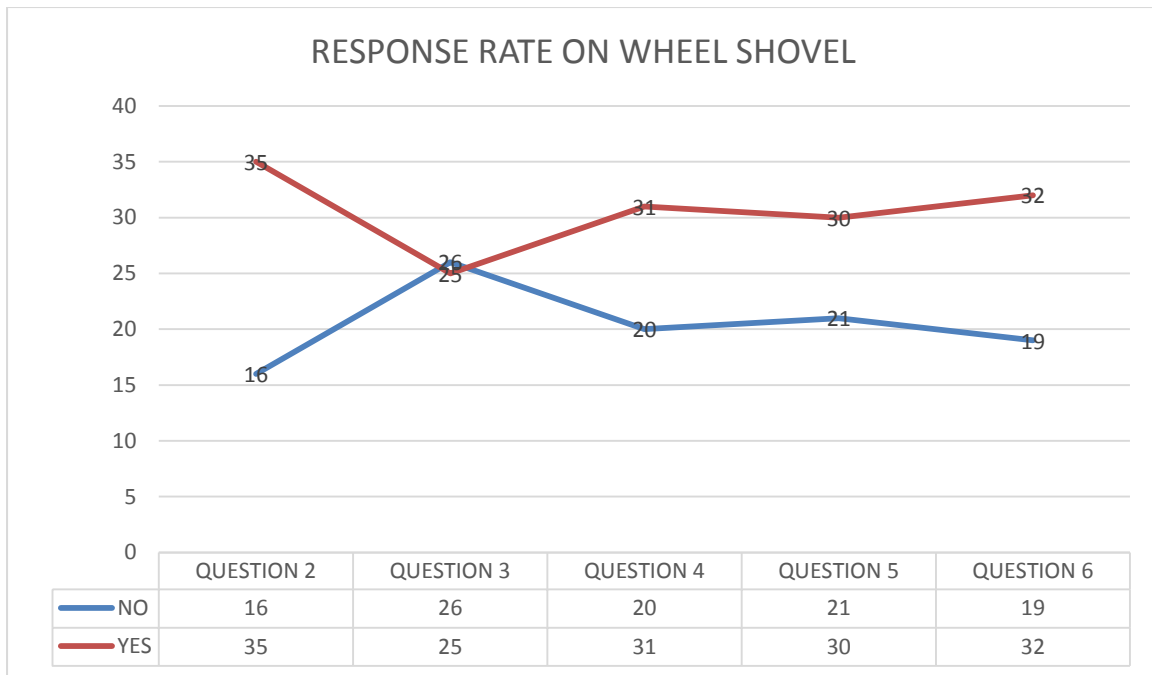


Table 4.2: Respondents on wheel shovel

#### 4.3 DEMOGRAPHY PROFILE RESPONDENT

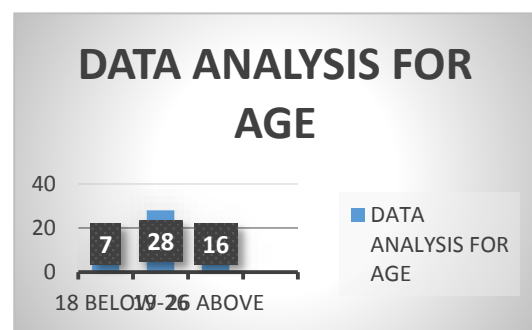
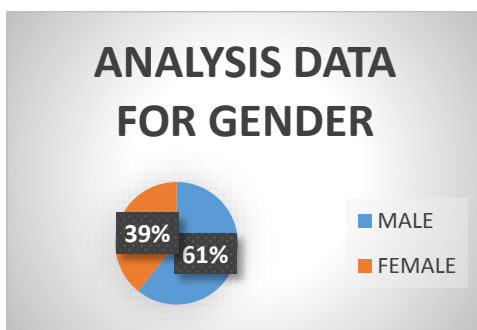
<b>CATEGORY</b>	<b>YES</b>	<b>NO</b>
2) Do you feel tired when using spades in a short period of time?	69%	31%
3) Based on your observation and experience, is the use of a spade tool took time for a long time to move the workpiece to the place where you want to put?	49%	51%
4) Does the use of spades give joint pain to your limbs or part of your body while using them?	61%	39%
5) If this shovel tool is coupled with the concept of the stroller, do you agree?	59%	41%
6) If the equipment is designed to accelerate and facilitate users in employment such as construction do you agree?	63%	37%

Table 4.3 : shows the demography profile respondent of wheel shovel

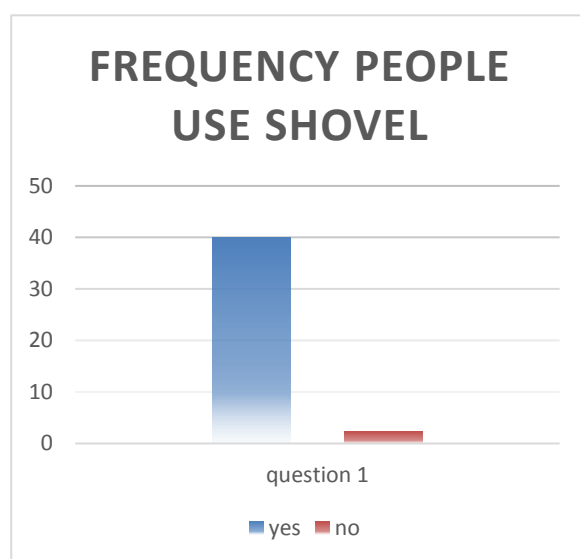
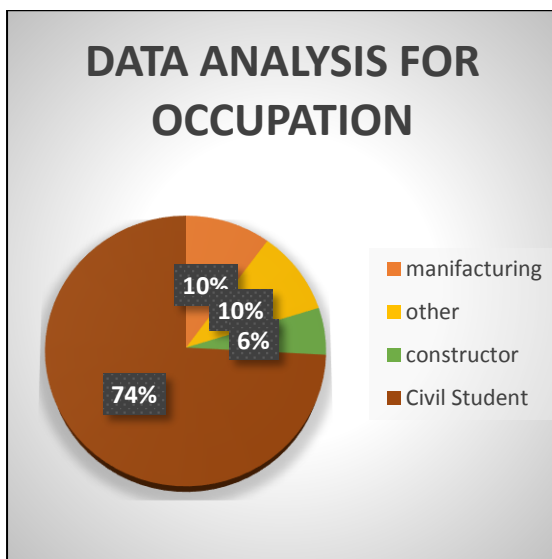
#### 4.4 RESEARCH FINDINGS

After all of our research , we found that the product we brought could solve or solve some of problems in the process of shoveling sand into the sac. It helps users to solve minor problems typically during the process of lifting sand into the sack and the process of relocation. This will speed up the transfer process. Based on the question on section B, there are 51 persons have answered all the questionnaire. Some of them have answered (YES) and some of them have answered (NO) because of their own opinion or experience. We found that many of the respondents pick (YES) for all the questions. Based on the questionnaire, there are some of the respondents give us a suggestion and ideas to improve our product. The common suggestions are, they want our product to be capable to use in all types of factory use it and make a better handling method. However, it is advantageous to see this as a disadvantage to this product. Therefore, we can come up with some ideas for how this product can meet consumer satisfaction.

##### Data of respondent for part A



##### Number of respondent frequency use shovel and occupation



#### ***4.5 SUMMARY***

In conclusion, our study found that many employees or users use this shovel for everyday use. This proves that shovel equipment is very important in construction work and agriculture. However, as we know from the results of our survey form, we find that the current shovel is still defective. An example of a deficiency in this shovel is that the shovel can break if it is too heavy. Also, the shovel user has to bending their body slightly to lift the heavy load. This means that the existing shovel needs to be upgraded and further enhanced the effectiveness of the use of the shovel so that the deficiencies of the previous shovel can be resolved. As a result, We Innovative team has created a tool that can solve the problems of existing shovels. This device is called a wheel shovel.

## CHAPTER 5

### DISCUSSION & CONCLUSION

#### 5.1 Introduction

In this chapter , we are discussing about the problem happened after we are finishing up our product , we found that our product after finishing it still not achieve the objectives that we want. So, we decide to modifacating our product until we achieve our objective's product.

#### 5.2 Discussion

Once our project is fully completed, we attempt to experiment with the project for its functionality. We've found that:

##### 1) About the shovel

1 ordinary shovel = 5.7 kg can be clipped and needs to be lifted and carried for entry into the sack.

Using 37 second for making 1 work.

1 project shovel = 7.5 kg can be clipped and straight forward into the sack.

Using 36 second for making 1 work.

##### 2) About the project for part A

1- We find that user ergonomics is too sluggish when pulling a shovel  
To slide the sand to get into the sack.

The solution: We are welding new steel to create a single place Holder to reduce  
User's ergonomic

2- We find sand dust easy to reach to users faces

The solution: We weld the new iron described above Welding it to a small length  
so that the User does not get too close to sand.



Figure 5.1 : Solution for ergonomics

3) About the project for part B

- 1- We find that the distance between the two pairs of the horn hooks is so far from each other that make the sack cannot be attached to the hook.  
The solution : We built new hooks and welded the new hooks at Project part B

1) The measure of the old hook place :

- 16 cm ( back hook )
- 45 cm ( front hook ) ( maintained )
- Measured from the back



Figure 5.1.2 old back measured

2) The measure of the new hook place :

- 30 cm ( back hook ) ( changed )
- 45 cm ( front hook ) ( maintained )
- 30.7 cm the place where sand fall in
- Measured from the back



3) The measure of the new hook :

➤ cm , 5 cm , 4 cm



Figure 5.1.3 New hooks has add

The result is :

<u>Conventional shovel</u>		<u>Wheel shovel</u>
<u>0.37s</u>	<u>Time to finish 1 work</u>	<u>0.36s</u>
<u>5.6 kg</u>	<u>Weight that can be lift 1 time</u>	<u>7.5 kg</u>
<u>yes</u>	<u>Sand dropped when getting it into the sack</u>	<u>no</u>
<u>yes</u>	<u>Bending bodies</u>	<u>no</u>
<u>3.7 kg</u>	<u>Weight of the product</u>	<u>29.7 kg</u>

Table5.1 result



Figure 5.1.4 Project complete

### ***5.3 Conclusion***

The innovation we're doing is aimed at making it easier for users to use shovels to make their performance while using them they can make it stable. So, we hope that our innovations will solve the problems faced by consumers, saving consumers' time and hoping that our innovation can be used for a long time without maintenance. We also hope that our innovation can be marketed out there. So, here is the recommendation for the future upgrade for the product :

### ***5.4 Recommendation***

- 1) Converts materials like iron used to another more types of iron or even plastic which is Lightweight and durable for example is build the project using pvc plasctic.
- 2) Adding new functionality to this innovation as it holds the base holder stripping the iron to hold it to prevent the user's hand injured.
- 3) Convert this innovation system from manual system to control system.
- 4) It can carry 2 guns or more sand at one time because before, the innovation can only carry 1 sack only at one time.
- 5) Make this innovation able to replenish the workpiece that has been lifted.
- 6) Changing the size of the wheel to become more bigger to make the movements Of the product more smooth .
- 7) Making the size of the product to become more smaller and effective.

### ***5.5 Summary***

After we had modified the product , we have made product testing to gain the details about our product and the conventional product . We got a lot of differences about the both products, also learned on how to catch up when had a problems in built up the product . Our product is working with its function and our objectives is achieved.



## Reference

### BOOKS :

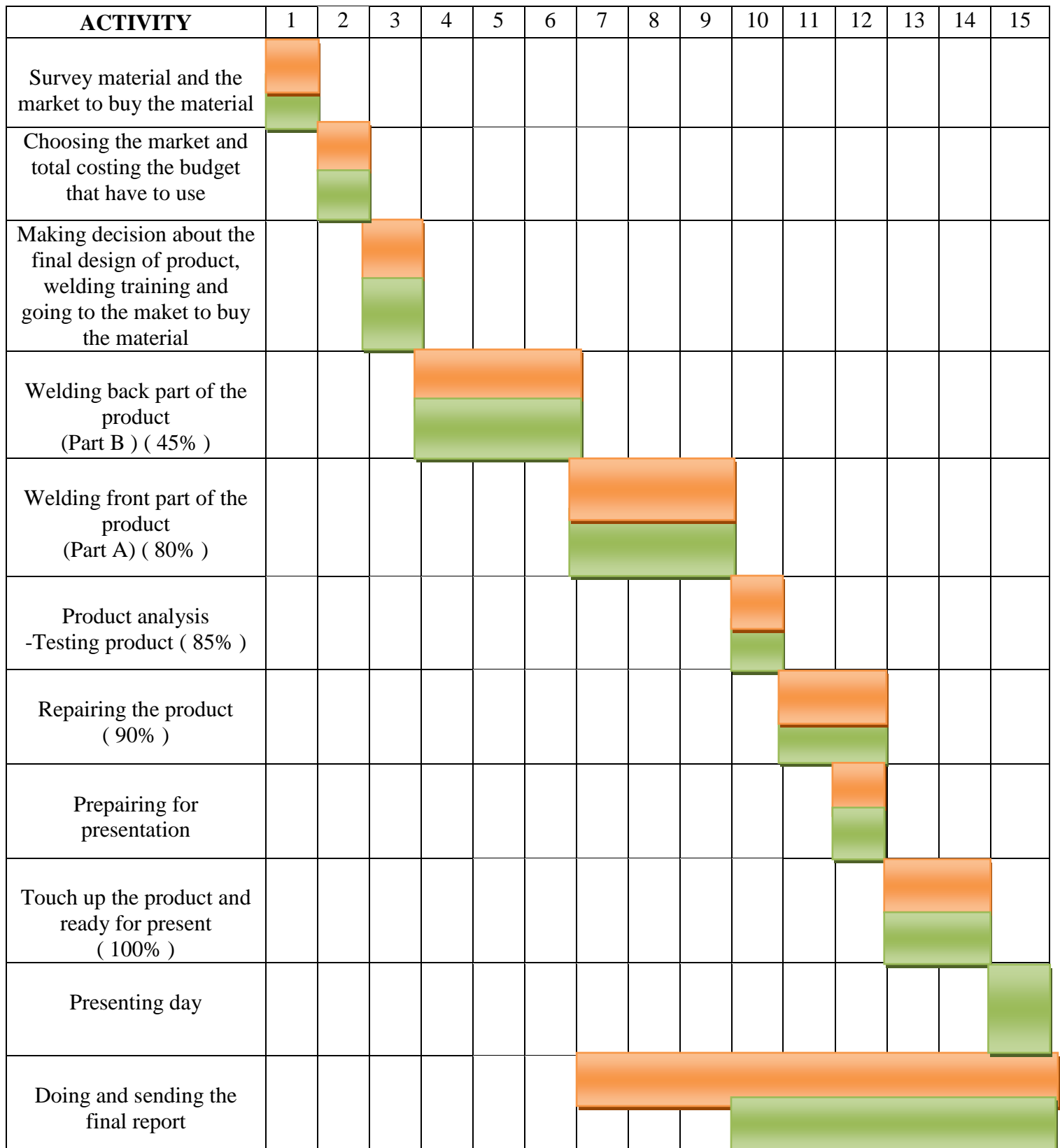
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**APPENDICES A ) Gantt chart**



*B ) Estimation of cost*

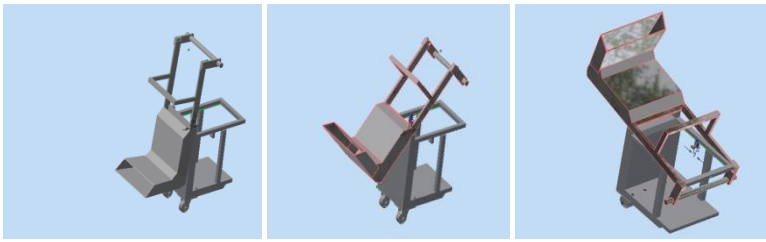
<i>Item</i>	<i>Quantity</i>	<i>Price</i>
<i>Mild steel ( square ) ( 1x1 )</i>	<i>400 cm ( 100 cm = Rm 45 )</i>	<i>Rm 180</i>
<i>Plat steel ( thick ) ( 0.5 cm )</i>	<i>90 cm</i>	<i>Rm 28</i>
<i>Plat steel ( light / thin ) ( 0.2 cm )</i>	<i>100 cm</i>	<i>Rm 45</i>
<i>Mild steel ( elbow ) ( 0.2 cm )</i>	<i>30 cm</i>	<i>Rm 18</i>
<i>Wheel</i>	<i>2</i>	<i>Rm15</i>
<i>Mild steel ( hollow )</i>	<i>15 cm</i>	<i>Rm 24</i>

COST

Total = RM 310.00



*C) Drawing*



*Project drawing*

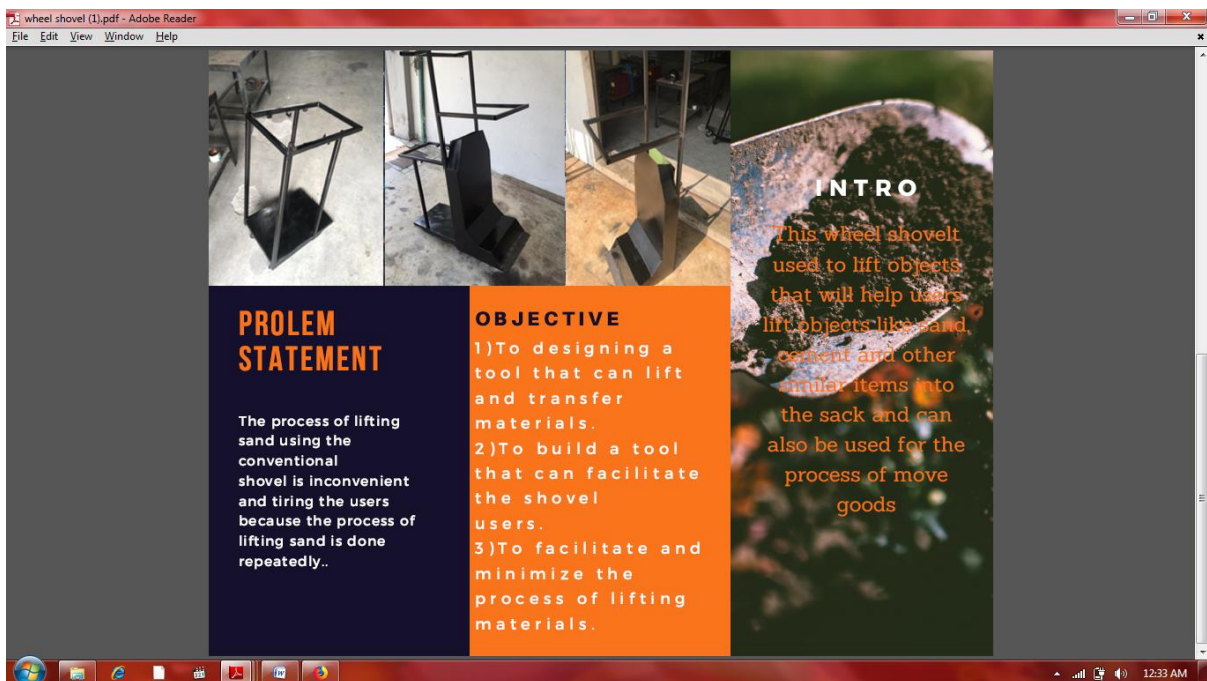
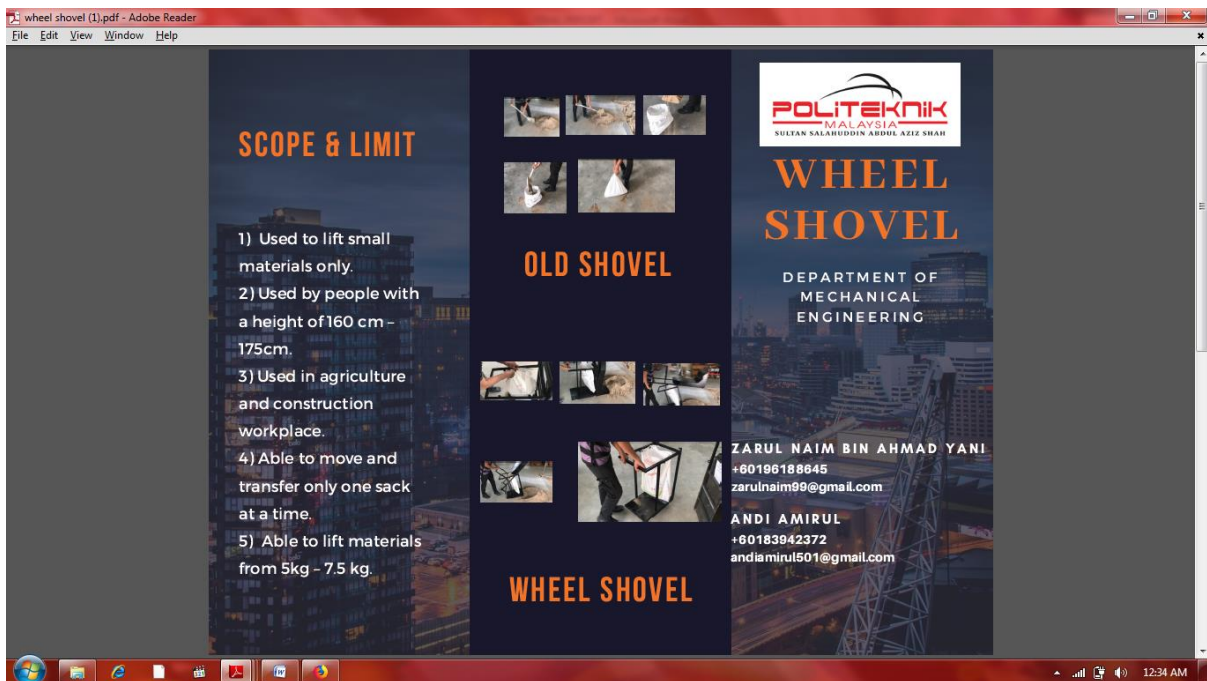


*Technical drawing*



*Wheel shovel*

## D) Brochure



## ***E) QUESTIONNAIRE***

### **POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH MECHANICAL ENGINEERING DEPARTMENT QUESTIONNAIRE FORMS TOOLS FOR SAND**

This form is intended to carry out the subject of the Final Year Project. Working materials such as sand, cement and so on are often used in development. We create tools that allow users to move the work things to places they want to put.

**Instructions:** Please read each of the statement below and tick (/) in the space provided

#### **Part A: Information Respondents**

Men: Male  Female

Age: 18 and below  19-25  26 and above

Occupation: manufacturing  others  constructor  civil students

#### **Part B: Project alerts**

1) Have you ever used a shovel?

YES  NO

2) Do you feel tired when using spades in a short period of time?

YES  NO

3) Based on your observation and experience, is the use of a spade tool took time for a long time to move the workpiece to the place where you want to put?

YES  NO

4) Does the use of spades give joint pain to your limbs or part of your body while using them?

YES  NO

5) If this shovel tool is coupled with the concept of the stroller, do you agree?

YES  NO

6) If the equipment is designed to accelerate and facilitate users in employment such as construction do you agree?

YES  NO

**THANK YOU FOR YOUR COOPERATION**