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FINAL REPORT OF :

SMART TROLLEY

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DECLARATION OF AUTHENTICATION AND OWNERSHIP

TITLE : SMART TROLLEY
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ABSTRACT

This project is applied based on observations on the current manual method of movement and transfer of items by using bare hands and human energy. The objective of this project is to design an equipment which is capable to move and transfer items for the use of small-sized industry for all sectors. In addition, there are a number of scopes for the research which are fixed in this project. This product only limits for 150 kilograms weight, uses the concept of hydraulic jack to ease the movement of items and the product was made to compete the current manual method. All of these are set to address some of the problems that arise with the use of existing methods such as the difficulty of transferring the item, using a lot of bare hands and less safety factors that cause injuries from the heavy item. The material of this project has a priority feature that prevents corrosive and makes the product long lasting, based on the literature review that has been running, and stainless steel is the most suitable for this project. While for the component formation process, the methodology studies is used to plan the process of project production with a flow chart as a guide for project planning and testing. The overall result of this project was achieved with an average saving of time compared to the traditional method of 50%. Based on these results, the analysis and discussion that have been carried out, it can be concluded that this Smart Trolley has achieved the objectives discussed. In addition, this product has been proven to save time compared to traditional methods.

Keyword: electronic hydraulic jack, comfort, quick

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The Smart Trolley idea stood out from many ideas presented by the team based on how the idea would be developed into an interesting technology product which is convenient, easy to use and efficient, including it being an add-on service for the hydraulic system. As the concept was based on technology, it was important to get the insight of consumers for which the idea was designed. The Smart Trolley idea is based on the observation of small industries that use a lot of lifting and moving items. The concept is designed into a size of study table. This is to ease the movement of the Trolley .

This Smart Trolley is installed with a hydraulic jack. A jack is a mechanical device used to lift heavy loads or apply great forces. A hydraulic jack is a jack that uses a liquid to push against a piston. This is based on Pascal's Principle. The principle states that pressure in a closed container is the same at all points. If there are two cylinders connected, applying force to the smaller cylinder will result in the same amount of pressure in the larger cylinder. However, since the larger cylinder has more area, the resulting force will be greater. In other words, an increase in area leads to an increase in force. The greater the difference in size between the two cylinders, the greater the increase in the force will be. A hydraulic jack operates based on this two cylinder system.

1.1.1 Design Principles of Smart Trolley

The Smart Trolley applied the concept scissor lift and hydraulic jack as shown in Figure 1.

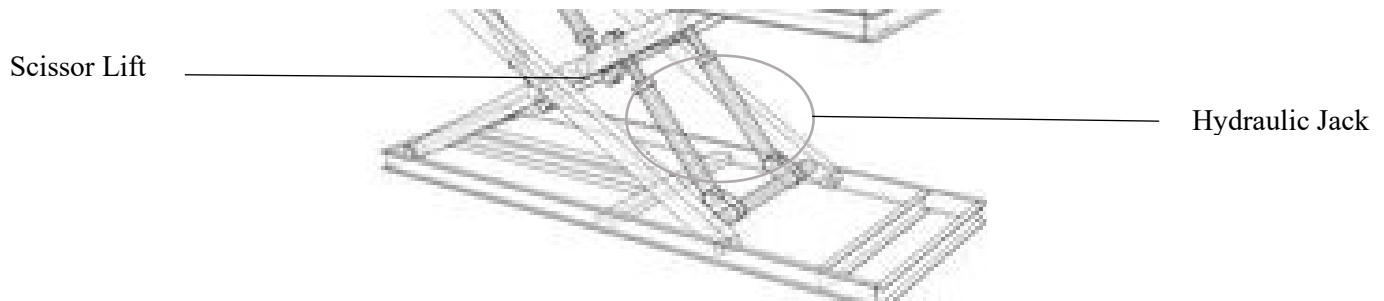


Figure 1.1 : Concept of scissor lift and hydraulic jack

The Smart Trolley applied the concept of scissor lift and hydraulic jack. A motorized vehicle with a railed platform that can be raised straight up is known as a scissor lift. A scissor lift is comprised of a base, a series of interlocking accordion-like metal struts and platform that allows to safely work. Scissor lifts can be powered by petrol, mains electricity or both in the case of a hybrid model.

The main concept behind a scissor lift is that it will provide the ability to vertically raise the platform to a desired height by extending its built in. . Criss-crossing metal supports that elongate as the platform is raised are the basic feature of scissor lifts that distinguishes them visually from other equipment used to work in higher elevations. The electric that is mounted on folding arms is used to provide elevated work areas or to help raise or lower unit loads. Scissor lifts are also portable. They can easily navigate an area via the controls at the top or the bottom. Once you have reached the desired location, the brakes will be applied in order to lock the entire unit firmly in place.

A hydraulic jack is a jack that uses a liquid to push against a piston. This is based on Pascal's Principle. The principle states that pressure in a closed container is the same at all points. If there are two cylinders connected, applying force to the smaller cylinder will result in the same amount of pressure in the larger cylinder. However, since the larger cylinder has more area, the

resulting force will be greater. In other words, an increase in area leads to an increase in force. The greater the difference in size between the two cylinders, the greater the increase in the force will be. A hydraulic jack operates based on this two cylinder system. These hydraulic jack is connected to scissor railed to move the platform upward and downwards controlled by push button.

1.2 PROBLEM STATEMENT

In any physical working environment, employee safety should be the top priority. Many employees develop back pain over extended periods of heavy lifting. The repetitive motion wears on their muscles and joints and can take years to fully recover. Employees under these conditions can also suffer sudden injury. This can happen when the body is tired or one uses an incorrect form to lift something. The injuries are lasting, painful experiences and may cause an employee to be out of work or an employer to deal with worker's comp. All of this can be easily avoided when a table does the lifting.

Many labor jobs require employees to work on-site, and locations often vary based on the project. Having a lift table in your mobile toolbox can transform the way you operate on a site. It brings all the benefits mentioned above right to the place where your work matters most. Moreover, those who plan to use their hydraulic lift table as a working space will be pleased to see the new angles they have access to. The machine can handle heavy weight for extended periods of time, and it only takes a push of a button to adjust its height and angle. This means you can bring whatever you are working on as high as you want for inspection and lower it back down to get to work. You may find this new perspective opens doors in your creativity when welding or your precision in construction cuts.

In addition, a table can usually get the lifting done much quicker than an employee. If you are working in construction, this means you can get more material up on the structure rather than loaded around the site. For welding or assembly areas, the ability to easily adjust your working space can significantly boost how many pieces you work on per day. The machine is not here to replace your people. Rather, it can ease everyone's physical workload and be an effective tool to make a job go by smoother.

1.3 OBJECTIVES OF THE PROJECT

Here are the objectives of the study that can be listed:

- i. To design a equipment for a new technique of lifting items activities.
- ii. To fabricate Smart Trolley that can increase the productivity and reduce time taken .
- iii. To achieve workers satisfaction towards the new technology which proves that it bring more advantages to them.

1.4 SCOPE OF THE PROJECT

To ensure that this project runs smoothly and achieving the desired objectives, several scopes need to be followed among others:

- i) The first limitation is the small industries . Our product is limited to the small industries only. Small scale industries are those industries in which manufacturing, providing services, production are done on a small scale.
- ii) The second limitation of this study is the size of the trolley. The size of the trolley is the same size of table study. Small surface would not enable length equipment.
- iii) Affordable to all parties

1.5 CONTRIBUTION

During lifting activity, Smart Trolley are perfect to those who are involves the activity of lifting goods. This can helps them decrease the burden of lifting goods without using a lot of energy. Beside, this Smart Trolley are user friendly because the portable size make it easy to bring it anywhere.

1.6 SUMMARY OF THE CHAPTER

In conclusion, the advantages of Smart Trolley includes easy to use and only need one person to manage the machine. Beside, the table plate can be adjust according to desire height. The adjustable part make it easier to move the items. The material is strong as well as resistance to corrosion, so it is safe and can be used for a long time. The release of Smart Trolley project will greatly benefit all parties including small industries. May this project be utilized for mutual benefits workers who do a lot of lifting will able to contribute more creative and innovative ideas in future projects.

CHAPTER 2 LITERATURE RIVIEW

2.1 INTRODUCTION

This Smart Trolley describes the design as well as analysis of a hydraulic scissor lift. Conventionally a Smart Trolley is used for lifting to lift the body to appreciable height, and many other applications Also such lifts can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in the study is developed keeping in mind that the lift can be operated by mechanical means by using pantographs so that the overall cost of the scissor lift is reduced. In our case our lift was needed to be designed as a portable and also work without consuming any electric power so we decided to use a hydraulic jack pump that is powered by batteries. Also such design can make the lift more compact and much suitable for medium scale work. Finally the analysis of the Smart Trolley was done in Ansys and all responsible parameters were analyzed in order to check the compatibility of the design values.

The conventional method of using rope, ladder lift getting a person to a height encounter a lot of limitation of time and energy consumption, comfortability, amount of load that can be carried etc. also there may be a risk of falling down in case of ladders hence Smart Trolley is designed to overcome all these difficulties. The main aim of this study is design and analysis and to construct a multipurpose lifting to make the activities efficient. Also the equipment should be compact and cost effective. With ceaseless development of science and technology, more and more new technologies are applied to lifting appliance design. This project aims at making equipment multifunctional, easy to use/operate, cost effective and portable so that it will be used conveniently at home and may be used in hospitals, hotels and other common places. All safety considerations are taken into account while designing equipment. Smart Trolley mechanism is designed to lift a person to desired height. A scissor lift mechanism is a device used to extend or retract a platform by hydraulic means. The Extension or displacement motion is achieved by the application of force by hydraulic cylinders to one or more supports. This force results in an elongation of the cross pattern. Retraction through hydraulic cylinders is also achieved when lowering of platform is desired.

2.2 PREVIOUS RESEARCH

Elevated work platforms are mechanical devices that are used to give access to areas that would previously be out of reach, mostly on buildings or building sites. They are also known as Aerial Work Platforms (AWPs). They usually consist of the work platform itself often a small metal base surrounded by a cage or railings and a mechanical arm used to raise the platform. The user then stands on the platform and controls their ascent or descent via a control deck situated there.

Some forms of aerial work platform also have separate controls at the bottom to move the actual AWP itself while others are controlled entirely on the platform or towed by other vehicles. Most are powered either pneumatically or hydraulically. This then allows workers to work on areas that don't include public walkways, such as top-story outdoor windows or gutters to provide maintenance. Other uses include use by fire brigade and emergency services to access people trapped inside buildings, or other dangerous heights. Some can be fitted with specialist equipment, for example allowing them to hold pieces of glass to install window panes. They are temporary measures and usually mobile, making them highly flexible as opposed to things such as lifts or elevators.

However generally they are designed to lift fairly light loads and so cannot be used to elevate vehicles, generators or pieces of architecture for which a crane would more likely be used. In some cases however elevated work platforms can be designed to allow for heavier loads. Depending on the precise task there are various different types of aerial work platform which utilize separate mechanisms and fuel sources. The most common type is the articulated Elevated Work Platform, (EWP) or 'hydraulic platforms' (and also known as boom lifts or cherry picker). A pantograph is connected in a manner based on parallelograms so that the movement of one pen, in tracing an image, produces identical movements in a second pen. If the first point traces a line drawing, an identical, enlarged, or a pen will draw miniaturized copy fixed to the other. Using the same principle, different kinds of pantographs are used for other forms of duplication in areas such as sculpture, minting, engraving and milling.



Figure 2.1 : Aerial Work Platforms

A lift table is a device that employs a scissors mechanism to raise or lower goods or persons. Typically lift tables are used to raise large, heavy loads through relatively small distances. Common applications include pallet handling, vehicle loading and work positioning. Lift tables are a recommended way to help reduce incidents of musculoskeletal disorders by correctly repositioning work at a suitable height for operators. Lift tables lend themselves to being easily adapted to a specific use. They can work in hostile environments, be manufactured in stainless steel and have equipment like conveyors, turn-tables, barriers and gates easily added to their deck plates.

These scissor lift tables can be found in many different types operations, all equally adaptable, stable and ergonomic in design. The scissor lift table is often used as a means for material handling directly on the production floor or as a lorry loader outdoors at a loading dock. With a variety of performances and models, not to mention a load capacity from 500 to 10.000 kilos, there is a scissor lift table for every need. It is not just different industrial companies that are major users of our scissor lift tables it also deliver to distribution warehouses, stores and other service establishments. All models in the single scissor lift table group that start with T (T models) can be customized to the endusers specific requirements. A single scissor lift table can be supplied in a with an array of different accessories or control alternatives. The functionality of the single scissor lift tables can be increased with the help of a number of accessories. Examples of such accessories within the product group are mobile base, load flaps, guard rails, roller conveyors and turntables.



Figure 2.2 : Table lifting use in World War 2

2.3 HISTORY

Scissor lifts are a type of aerial work platform (AWP) or mobile elevated work platform (MEWP), used to provide temporary access at height. They are commonly used for temporary maintenance purposes and to undertake construction work. Charles Larson, of the USA, first patented the scissor lift in 1963, but he did not invent it. It was invented by John W Parker of California.

The first patent request for a scissor lift was filed by Charles Larson of the USA in 1963. It said that he based the design off the pantograph. JLG was the first U.S. company to make the scissor lift commercially available. In 1976 JLB company take the Larsons mechanism of an extendable lift and turn it into an operational machine

The X shape of the pantograph style makes the scissor lift a stable tool for working at heights. It also makes the extension and collapse of the equipment a lot smoother than with a single arm. The improved design patented by Charles Larson has been improved over the years with additional tech advancements. The modern hydraulic system now makes raising and lowering the platform easier.

April 19, 1966

C. L. LARSON
SCISSOR-LIFT MECHANISM
Filed Dec. 28, 1963

3,246,876

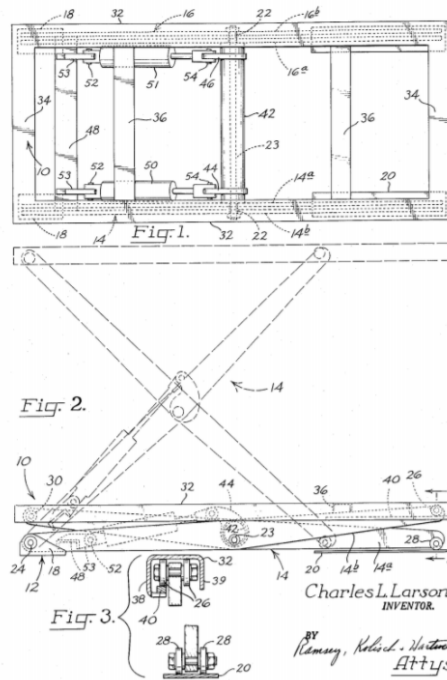


Figure 2.3 : Invention of C. L Larson

2.4 CONCEPT OF LIFTING TABLE

It has been the motivation of many concepts and models in theory and industry practice alike to create and implement successful solutions to the challenging situation described that most manufacturing companies find themselves in. To present a selection of existing concepts that have been established in literature and have found application in an industry setting. They are all, in a general sense, concerned with managing product complexity, and most of them consider product architecture in one way or another. Although the set of concepts chosen here reflects the current state of knowledge in the field, it does not mean to be complete as this would be beyond the scope of this work. The same concept has been used but modification is made. The existing product before only used a foot pump as a medium to lifting the items. It took time and foot energy to raise the item from bottom to the top.

2.4.1 Concept 1

A scissor lift, or commonly called a table lift, is mainly used to lift people upwards with its criss-crossing foundation supporting beneath the platform. As the platform pulls itself together, it moves upright in the vertical direction and pushes the platform in accordance with the height and weight. These lifts are controlled through a spindle system. The spindle system is a safer option as there is no risk of oil leakage, which could cause a tripping hazard. Originally delivered in numerous sizes and shapes, it is designed and manufactured as an industrial lift, and has been customized for commercial and comprehensive purposes. However, To fully lift this table it will take 225 Cycles of the handle which take a lot of time and energy to do the lifting.



Figure 2.4 : Spindle Scissor Lift Table

2.4.2 Concept 2


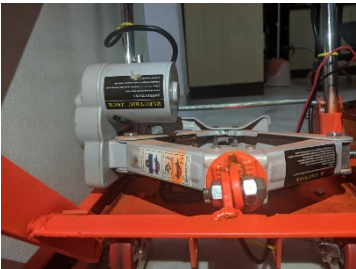
Foot Pump Lifting Table helps workers raise or lower heavy items to convenient working levels, helping reduce the risk of strained backs, injured shoulders and pulled neck muscles. These lifts use air pressure to lift objects. This lift is the most environmentally friendly in comparison to other lifts because it has no fumes. This works by taking in the surrounding air. They require little maintenance because of fewer moving parts and no engine. The pneumatic scissor lift works anywhere since its only requirement is air. When replacing the Foot Pump Assembly on your

Lange Lift Hydraulic Lift Table, it took less energy than using the spindle system. However this lift cannot go lower to beneath the platform.



Figure 2.5 : Foot Pump Lifting Table

2.5 COMPONENT IN SMART TROLLEY

<p>i) Up and down switch button</p> 	<p>The switch button help to ease the movement of smart trolley platform upward and downward. It is connected from batteries</p>
<p>ii) Hydraulic jack</p> 	<p>A jack is a mechanical device used to lift heavy loads or apply great forces. A hydraulic jack is a jack that uses a liquid to push against a piston. This is based on Pascal's Principle.</p>


<p>iii) Batteries 12v</p> 	<p>A 12 volt battery is an irregular battery used in specific electronic applications. It is a rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals.</p>
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Table 1 : Product component

2.6 OPERATION DESIGN

A Smart Trolley Is a device that employs a hydraulic mechanism to raise or lower goods and/or persons. Typically lift tables are used to raise large, heavy loads through relatively small distances. Common applications include pallet handling and work positioning. Smart Trolley is a recommended way to help reduce incidents of musculoskeletal disorders by correctly repositioning work at a suitable height for workers. Lift tables lend themselves to being easily adapted to a specific use. Smart Trolley can come in a vast array of configurations and can be built to suit various highly specialized industrial processes. The design incorporates hydraulic cylinders and is electrically powered by batteries to actuate the Smart Trolley mechanism. Industries that commonly use lifting include woodworking, metalworking, paper, printing and publishing, warehousing and distribution, and transportation.

Once the scope of our project was determined we began to analyze the various components of the lift which needed to be improved. Combining this analysis with requirements we determined that we needed to focus initially on redesigning the following features as scissor arm, push button, platform, pin joint, hydraulic jack and batteries.

2.7 SUMMARY OF CHAPTER

Summary focus of this chapter is to design and build a lift for workers who does the lifting proses. The current lift is an improvement over the old one. However, there is still room for improvement. The final design has been utilized. The platform can be adjusted to several heights and can be extended horizontally forward to the to enhance ergonomics. We determined that a hydraulic lift would be the best choice for our application. Other design concepts generated include the wheel locking mechanism, button type, design, hydraulic jack, and power supply.

We began with an design and purchased the hydraulic lift. We had several meetings with our supervisor to make sure he was pleased with the design, during which she clarified several design requirements. These meetings led us through several design iterations and finally to our final design.

Overall obtained from this chapter is an experiment that will be made referring to the sources of previous studies to complete the work done. In addition, some information from lifting tools is identified for its function. This implementation can ease to the user of Smart Trolley.

CHAPTER 3 METHODOLOGY

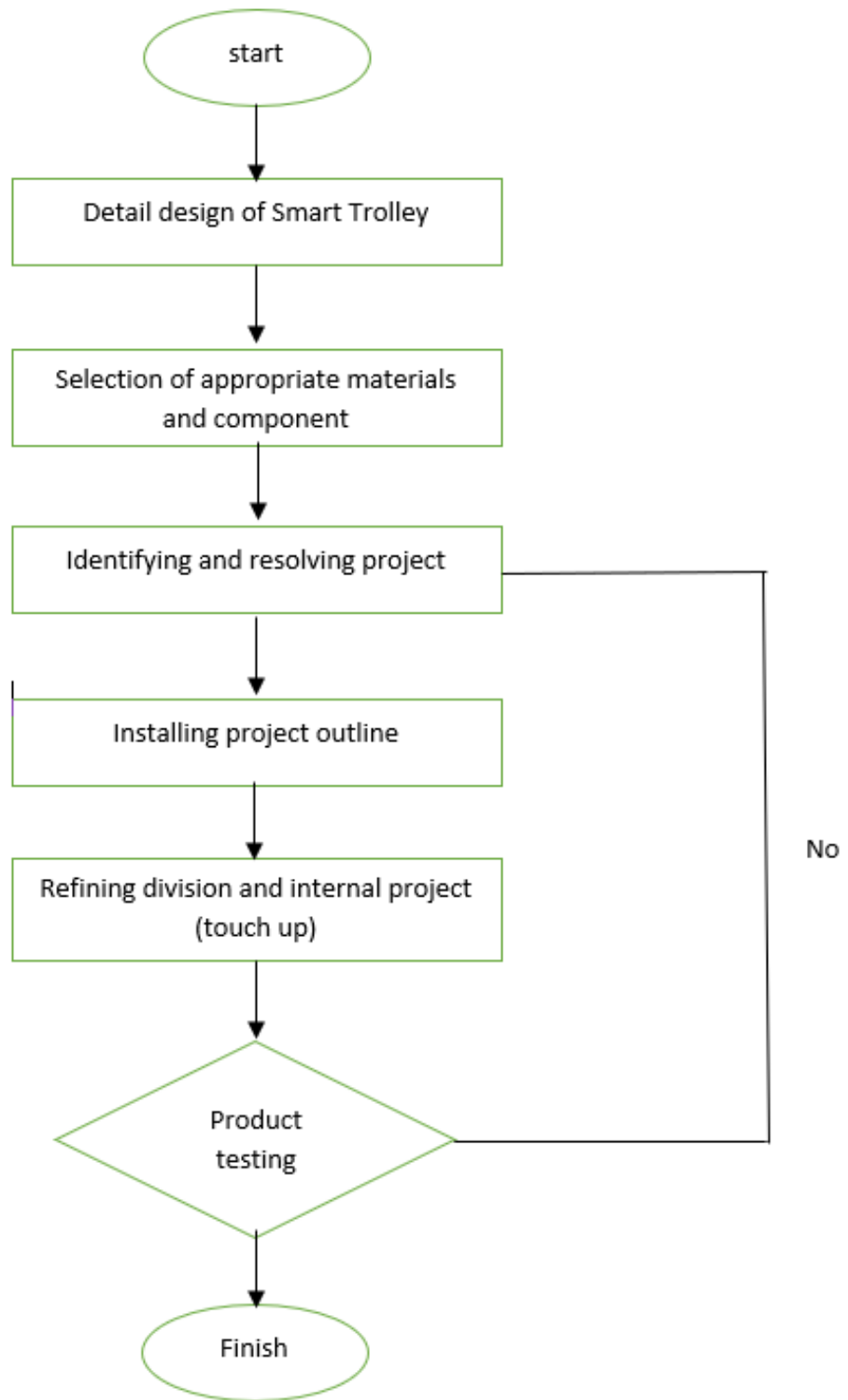
3.1 INTRODUCTION

There are a number of approaches used in this research method design. The purpose of this chapter is to design the methodology of the research approach through mixed types of research techniques. The research approach also supports the researcher on how to come across the research result findings. In this chapter, the general design of the research and the methods used for data collection are explained in detail. It includes three main parts. The first part gives a highlight about the dissertation design. The second part discusses data collection methods. The last part illustrates the general research framework. The purpose of this section is to indicate how the research was conducted throughout the study periods.

Research methodology is the path through which researchers need to conduct their research. It shows the path through which these researchers formulate their problem and objective and present their result from the data obtained during the study period. This research design and methodology chapter also shows how the research outcome at the end will be obtained in line with meeting the objective of the study. This chapter hence discusses the research methods that were used during the research process. It includes the research methodology of the study from the research strategy to the result dissemination. For emphasis, in this chapter, the author outlines the research strategy, research design, research methodology, data source and workplace site exposure. In order to satisfy the objectives of the study, a data research method is apprehended in general. The study used these mixed strategies because the data were obtained from all aspects of the data source during the study time. Therefore, the purpose of this methodology is to satisfy the research plan and target devised by the researcher.

A very significant decision in the research design process is the choice to be made regarding research approach since it determines how relevant information for a study will be obtained. The design used field observation at the selected industrial sites. Other than that, data analysis method follows the procedures listed under the following sections. The data analysis part answered the basic questions raised in the problem statement. The research methodology and design indicated the overall process of the flow of the research for the given study. The data sources and data collection methods were used.

3.2 FLOW CHARTS



3.3 METHODOLOGY PHASES

Our work project goes through few phases. The length and details may vary from project to project, but all will still follow the same basic framework. While some project methodologies such as agile approaches compress or repeat the following stages in faster, iterative cycles, the work of each phase is visible and distinct in every project. Phase, or stages, are very important for project managers. It is to ensure that the deliverables produced at the end of each phase meet their purpose. The phases are as follows initiation, planning, execution, design, monitor and control, and project close.

Firstly, Initiation is a project team formation, project chartering, and kick-off. A solid project initiation is to set the project up for success. During initiation, the project team members assigned, brief on the overall project goals, and observe as many workers as possible so we can plan the project solution based on problem statement efficiently.

Secondly, Planning works as finalizing the project scope, defining the detailed work breakdown, assessing risk, identifying resource requirements, finalizing the schedule, and preparing for the actual work. Once we initiated the project and gathered all relevant information, then begin planning our project. The planning stage depends on the size of our project, with information we have to organize and the result of planning is a clear project plan or schedule, from which everyone follow their assigned tasks. Using a project-planning program such as inventor is extremely helpful when planning a project. Using inventor to create our initial plan and design is equally as effective.

Then, Execution is performing the actual work required by the project definition and scope. As we have a solid project plan, our team can begin executing the project against our assigned tasks. This is the stage where we start doing the work. We want to officially kick off the execution stage with in person meetings to ensure everyone has what they need to begin executing their part of the project. Getting the team started on the right track is integral to a project success, so articulate the schedule and communications plan clearly.

Next is design. In this phase we start the work involved with creating the project's deliverables, using the project strategy, and Project Initiation Document as starting point. We use a Flow Chart to create a detailed map of how things will work. At this stage, we must do everything to think through and deal with project issues before we start to build project deliverables.

After that, Monitor and Control is the actual management, reporting, and control of the resources and budgets during the execution phase. While the project is in the execution phase, we begin monitoring and controlling it to ensure it's moving along as planned. There are a variety of ways we monitor and control a project. Casual check-ins with team leaders, organized formal weekly status meetings are effective. The information that comes out of these meetings or communication channels will inform the feedback loop and ultimately any re-planning and adjustments that may be necessary to the project.

Lastly, Project Close is delivery of the project, assessment of lessons learned, adjournment of the project team. Once all the details and tasks of our project are completed and approved by the supervisor we can finally close our project. A project manager will document all the information from the project and organize it neatly so we can go back to it if necessary. This is also a good time to hold a post-mortem on the project so all team members can reflect on what went right or wrong during the project. All important project notes should also be documented so the outcome can be shared with other project members and filed in a project history folder. Finally, it is important us to formally adjourn the project team.

3.4 SAFETY MEASURE

Smart Trolley have a variety of uses, especially at small industries. Improper use of Smart Trolley can cause of quite a few fatalities and accidents over a period of time if the safety measure is not taken. When working with Smart Trolley it is important to follow proper safety procedures. Despite the knowledge that the equipment can cause injuries, safety precautions can often be lax. Below are some tips to ensure heavy equipment is being used safely.

Firstly, It is important to check the equipment regularly to ensure that it is well maintained. A thorough inspection should be done every year at the very least. Ensure that all the equipment is tested and certified by proper regulatory bodies. Apart from that we must perform a routine maintenance. It's one of the most important safety steps. Make sure routinely test your guardrails, inspect the workplace environment, and test your workers' knowledge of safety regulations.



Secondly, All heavy lifting machines have load limits. It is imperative that the load that the machine is lifting does not exceed these set limits. Our Smart Trolley has a load limit of 150 kg, loading it with above 150 kg of weight is only creating a recipe for potential disaster. Do not fill the lift platform beyond its capacity. This includes not carrying materials which are essentially not allowed to be carried into the work platform. Should there be any exceptions due to the nature of the work.

Furthermore, the workers should know how to position the Smart Trolley correctly. We should also eliminate any overhead wires. To be safe, nothing should be hanging over the trolley. Also, make sure to put down ground guides so that everyone is aware of where the lift is in their work environment. Familiarize with the manufacturer instructions, and always obey the limits on both weight and height set by the manufacturer.

Of course, the most important thing can do in order to prevent accidents is to properly train to use the Smart Trolley properly. This means ongoing training must be done to make sure everything is as it should be. Make sure you discuss as the basics of handling the scissor lift, How to spot hazards in the workplace, How to identify when the lift needs repairs, Weight limits. This will help you to avoid accidents.

3.5 PROTECTIVE CLOTHING AND SUPPLIES IN WORKSHOP

Personal protective equipment used to protect the user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure that are known to be more hazardous. This includes :

<p>i) Welding Helmet</p> 	<p>The welding helmet is generally constructed of a pressed fiber insulating material.</p> <p>To minimize reflection and glare produced by the intense light, the helmet is dull black in color. Lenses are designed to prevent flash burns and eye damage by absorption of the infrared and ultraviolet rays produced by the arc.</p>
<p>ii) Safety Goggles</p> 	<p>Safety goggles protect your eyes from weld spatter which occasionally gets inside the helmet. These clear goggles also protect the eyes from slag particles when chipping and hot sparks when using an angle grinder.</p>




<p>iii) Protective Clothing</p> 	<p>Welders should wear work or shop clothes without openings or gaps to prevent arc rays from contacting the skin. Woolen clothing should be worn instead of cotton since wool is not easily burned or damaged by weld spatter and helps to protect the welder from changes in temperature. welding jackets made of leather, fire-resistant material, or other suitable material should be worn for protection against spatter of molten metal, radiated heat, and sparks.</p>
<p>iv) Gloves</p> 	<p>Flameproof gauntlet gloves, preferably of leather, should be worn to protect the hands and arms from rays of the arc, molten metal spatter, sparks, and hot metal. Leather gloves should be of sufficient thickness so that they will not shrivel from the heat, burn through, or wear out quickly. Leather gloves should not be used to pick up hot items, since this causes the leather to become stiff and crack.</p>
<p>v) Safety Footwear</p> 	<p>It prevents from getting foot injuries due to slippery surface, heavy falling or rolling objects, sharp piercing edges, pinch points, rotary machinery, hot objects, loops of ropes under tension, splinters, electricity, chemicals</p>

Table 2 : Personal protective equipment

3.6 PROJECT OPERATIONAL

Smart Trolley are used in industrial lifting platforms for transportation of goods, up and down in workshops and warehouses. Since the goods to be loaded can be heavy in weight. The safe operation of the scissor lift table is of pretty importance. There are a few way on how to safely operate a Smart Trolley below :

i) Pre-use Inspection

Firstly, check whether the hydraulic oil is leaking or the oil level is appropriate, refuel if necessary. Also check whether the battery fluid is leaking and the liquid level is appropriate, add distilled water as needed. Meanwhile, ensure that all labels are clear, legible, and properly positioned.

Secondly, check and ensure the components of the Smart Trolley are not damaged, improperly installed or missing, including the electrical components, wiring, cables, joints, hydraulic jack, battery packs, drive motors, wheels, nut, bolt, platform overload component, safety arm, scissor arm pin, fastener, platform control handle, and brake parts.

Finally, find whether the entire Smart Trolley has cracks in welds or structural parts, dents or damage. Ensure that all structural parts and other key parts are complete, and all related fasteners and pins are in the correct position and tightened and make sure that the chassis battery tray and oil pump tray are closed and locked, and the battery is connected properly.

ii) Safe Operation

When operating a Smart Trolley platform equipped with a four-wheel chassis, be sure to run it on solid and flat ground. Because only four wheel are firmly fixed on a horizontal plane can avoid the rollover or tilting of the lift platform.

Then, the user must figure out the weight of the items to be loaded. For items that do not indicate an accurate weight, make an estimate of it. If the weight exceeds the maximum load of the lifting platform, stop using it because it may cause damage to the Smart Trolley platform.

When transporting goods with Smart Trolley, the heavy loads to be transported must be evenly placed on the center of the platform. Do not place the heavy objects on one side of the lifting table, to avoid falling.

3.6.1 METHOD OF USE

When operating a Smart Trolley, be sure to run it on solid and flat ground. Because only four tires are firmly fixed on a horizontal plane can avoid the rollover or tilting of the lift platform. Beside, figure out the weight of the items / goods to be loaded. For items that do not indicate an accurate weight, make an estimate of it. If the weight exceeds the maximum load of the lifting platform, stop using it, otherwise, it may cause damage to the Smart Trolley platform or impose risks to the user.

When transporting goods with Smart Trolley, the heavy loads to be transported must be evenly placed on the center of the platform. Do not place the heavy objects on one side of the lifting table, to avoid falling. The height of the trolley can be adjusted using the up and down push button. This push button are connected to the hydraulic jack. When the button is press either up or down the hydraulic jack will make a movement to the trolley platform.

3.7 PROJECT TESTING

The purpose of these tests is to ensure that all components and systems are in a satisfactory and safe condition before start up. Prior to the installation, certain tests and inspections has been carried out to ensure that proper materials and equipment complying with the specification are provided and that the site conditions are satisfactory and suitable for the execution of the installation. Preliminary adjustment and setting of equipment at this stage shall also carried out at the same time to pave way for the coming functional performance tests.

As a first step, after Smart Trolley was assemble we have done a lifting height testing to the Smart Trolley. We calculate the highest platform that Smart Trolley can lift. we set up the trolley to the lowest platform and record the maximum high that smart Trolley can lift. We use criss-crossing foundation to supporting beneath the platform to reduce the height of the lowest platform.

Then we move to second step, which is testing the maximum load. Our Smart Trolley support by hydraulic jack that can lift up to 150 kg of wight. This testing is the most important to make sure the load does not exceed these set limit or it may cause damage to the Trolley.

3.8 PROJECT REFINEMENT PROSESS

The project comprises of assembling a trolley with hydraulic jack that act as machinery device. The process started with material that we use which is stainless steel to form a platform for Smart Trolley. We welded a few parts of the trolley and also use bolts and nuts to joint the parts. Then, a hydraulic jack is attached to the criss-crossing foundation. To ease the movement of up and down platform, we use a push button to control the movement. This Smart Trolley is portable because we use a battery as a power supply. The whole process is depicted in Figure 3.1

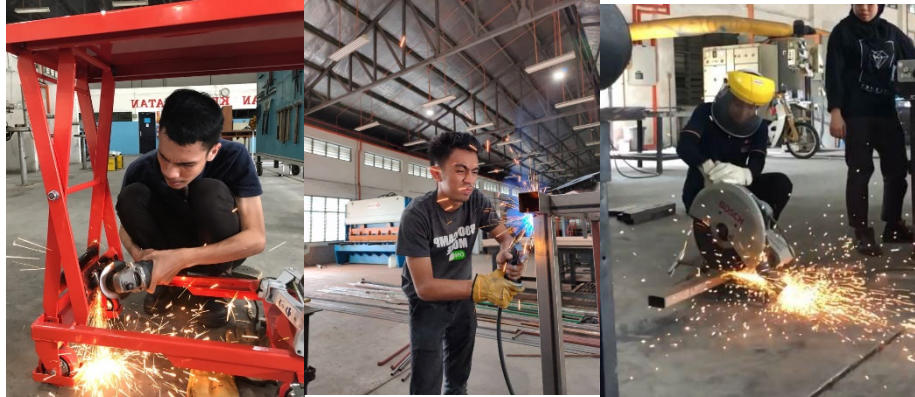


Figure 3.1 : Process of making Smart Trolley

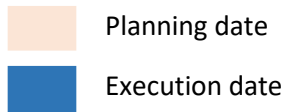
3.9 PROJECT BUDGET

Throughout the design process we had to be conscious of the budget. We had roughly RM 300 which is RM100 per person to work with. We must be able to create this new lifting project (Smart Trolley) while staying within the budget requirements. Therefore, when selecting the type of lift to be used we were wary of its cost because this was be the most expensive component of the table lift. We made sure to set aside enough money so that we could purchase a lift which will meet our requirements but still leave us with enough money to purchase the other necessary components such as hydraulic jack , batteries and cable jumper RM 210. With this in mind we purchased it for . We also purchased the switch button to go with this project at RM 10 and the wheel for RM6.25 per pairs. Together these five items accounted for roughly run our of our budget. We therefore had to continue to be conscious of the cost of many of our products. With the changes in project requirements, we changes the material selection. The most significant of these changes with regards to cost is the change from mild steel to stainless steel. This change has increased the cost of the total project budget. However our material to reduce the cost we buy it from the second hand / used item. The materials for the final design came to roughly RM 20. Therefore the estimated cost of the project is RM 293.50. For a complete breakdown of the materials budget please see Appendix B: page 50

3.10 PROJECT PLANNING

TIMEFRAME FOR FINAL YEAR PROJECT 1

Activity \ Week	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Division of team members and project supervisors	Planning	Execution													
Ideas and initial sketches brainstorming with supervisors	Execution	Execution	Execution												
Presenting Innovation			Planning	Planning	Execution	Execution									
Detailed hand sketches					Execution	Execution									
3D model with Autodesk Inventor						Planning	Planning	Planning	Planning	Execution					
Material Selection										Planning	Execution	Execution			
Flow Chart										Planning	Execution	Execution			
Project improvement											Planning	Execution	Execution		
Supervisor confirmation												Planning	Execution	Execution	Execution
Project presentation														Planning	Execution
Proposal report submission														Planning	Execution



TIMEFRAME FOR FINAL YEAR PROJECT 2

Activity \ Week	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Meeting with project supervisors															
Buying materials															
Assembly the parts															
Product testing															
Analysis data															
Report submission															
Project Presentation															

- Planning date
- Execution date

3.11 SUMMARY OF CHAPTER

The chapter provides descriptive and in-depth discussion of the methods involved in the research of the current study. The current study is looking towards a quantitative approach that takes into account positivism as it philosophical undertaking, using deductive reasoning for its interpretive approach. Project operational and project testing are made systematically in the methodology study to know the facts and information to support the research instrument and describe it more clearly in this study.

CHAPTER 4

RESULT AND ANALYSIS DATA

4.1 INTRODUCTION

To complete this study properly, it is necessary to analyze the data collected in order to test the hypothesis and answer the research questions. As already indicated in the preceding chapter, data is interpreted in a descriptive form. This chapter comprises the analysis, presentation and interpretation of the findings resulting from this study. Project findings and analysis is a project in terms of theory or writing related to the function and use of Smart Trolley and their operations related to the project field. In addition, it should explain the results or results obtained after implementing a project that is implemented works well or not.

4.2 TOOLS USED

Tool used is a step in the process of designing any physical object. In the context of product design, the main goal of tool used is to minimize cost while meeting product performance goals. Systematic selection of the best tool for a given application begins with properties and costs of our tools. It is essential that a we should have a thorough knowledge of the properties of the materials and their behavior under working conditions. Some of the important characteristics of tools are strength, durability, flexibility, weight, resistance to heat and corrosion, ability to cast, welded or hardened, machinability, electrical conductivity. Apart from that, our product chooses to use stainless steel as a main material.

Stainless steel is a one of a family of alloy steels usually containing 10 to 30 percent chromium. In conjunction with low carbon content, chromium imparts remarkable resistance to corrosion and heat. Other elements, such as nickel, molybdenum, titanium, aluminum, niobium, copper, nitrogen, sulfur, phosphorus, or selenium, may be added to increase corrosion resistance to specific environments, enhance oxidation resistance, and impart special characteristics. Resistance to corrosion and staining, low maintenance, and familiar luster make stainless steel an ideal material for many applications where both the strength of steel and corrosion resistance are

required. Moreover, stainless steel can be rolled into sheets, plates, bars, wire and tubing. We buy it for RM 20.00



Figure 4.1 : Stainless steel plate

We also use a spray paint as a finishing product. Spray paint is liquid paint that can be delivered onto a surface through a spray nozzle. The term is usually applied to paints of various colors that are available in inexpensive, easily portable aerosol cans. Pressurized gas forces the paint out of the can in an even stream, usually removing the need for brushes or rollers to distribute the paint across the surface. Most cans include a ball inside to mix the paint, resulting in the rattling sound when the can is shaken. It can be used as finishing touch. Beside it can works as prevention from corrosion. The price for spray paint is RM 5.00.



Figure 4.2 : Spray paint

Jumper cables, also known as booster cables or jump leads, are a pair of insulated wires of sufficient capacity with alligator clips at each end to interconnect the disabled equipment to another battery. The alligator clips may be covered in insulation to prevent inadvertent shorting. Clips may be made of copper or steel. Alligator clips are generally marked by black (-) and red/orange (+) to indicate the polarity. The cable came with batteries that we buy.



Figure 4.3 : Jumper cables

Beside we use caster type of wheel. The wheel that is designed to be attached to the bottom of a larger object to enable that object to be moved. They are available in various sizes, and are commonly made of rubber, plastic, nylon, aluminum, or stainless steel. The price that we buy is RM 6.25 per pair.

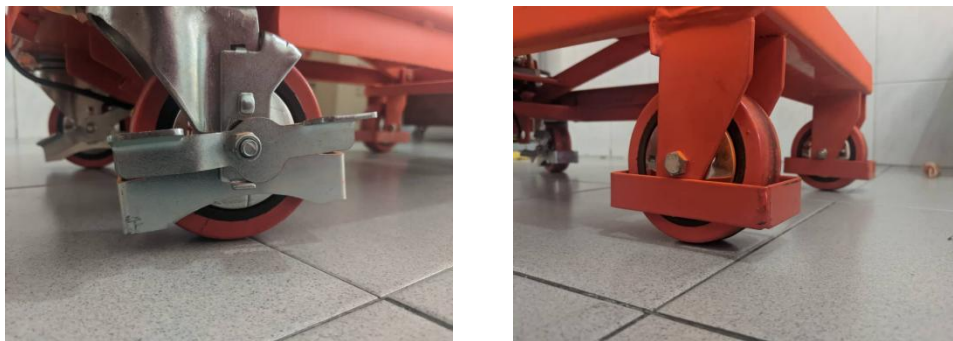


Figure 4.4 : Caster wheel

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can pass between them, while when the contacts are separated no current can flow. We use a switch button to move the platform upwards and downwards. It is cost RM10.00



Figure 4.5 : Switch button

We use a 12v batteries as a power supply. It is a rechargeable battery that is used make a movement to our project. Its main purpose is to provide electric current to the electricity-powered starting motor, which in turn starts the chemically-powered internal combustion engine that actually propels the project. The price is RM 41.00.



Figure 4.6 : 12v Batteries

Furthermore, we use hydraulic jack as medium to move the beneath criss-crossing foundation. Hydraulic jack are pieces of material handling equipment that uses force multiplication to lift or move heavy loads. The term jacks can refer to a variety of lifting devices that employ leverage and other methods of mechanical advantage to amplify an applied force to provide the ability to transport a load. Hydraulic jacks are distinguished by their use of an incompressible liquid, such as hydraulic fluid or jack oil, as the means by which force multiplication is achieved. Jacks may be categorized based on the type of mechanism used to generate the lifting force, typically mechanical power, hydraulic power, or pneumatic power. We buy it for RM200.00.

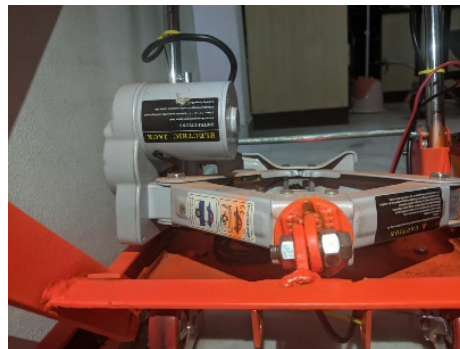


Figure 4.7 : Hydraulic jack

4.3 RESULT

The scissor lifting machine is tested by lifting three different weights 15, 20, and 30-40 kg in different heights. The first weight it has lifted is 15kg and it lifts the weight smoothly without any disturbance. Secondly, it is tested by lifting 20kg; this weight has also been lifted without any problem and thirdly it has tested lifting 30-40kg this weight also been lifted without any problem. Generally, the machine can lift the recommended weight 150 kg easily because the hydraulic piston makes lifting a high load easier and it does not have a disturbing sound



Figure 4.8 : Lifting test 1 (15 kg)



Figure 4.10 : Lifting test 2 (20kg)



Figure 4.9 : Lifting test 3 (30-40 kg)

4.4 SUMMARY OF CHAPTER

This chapter show the tool that we used and the result that we gain after we assemble all the parts. It was carried out effectively meeting the necessary criteria. The double scissors lift is operated by the hydraulic jack. The Smart Trolley can be design for average load, because the higher the load the higher the effort required. The Smart Trolley is easy in use and does not required tedious repairs. It can also lift heavier loads. For the given dimensions the trolley can high a load up to 150kg to the height of 720mm.

CHAPTER 5

DISCUSSION, CONCLUSION AND UPGRADE PLAN

5.1 INTRODUCTION

In this chapter, we will discuss and draw overall conclusion on Smart Trolley design and upgrade plan. This conclusion included design that more ergonomic and efficient in this research. With this innovation of Smart Trolley, some problems that been faced by visually impaired have been solved. The discussion about this project is how Smart Trolley related with literature review that has been made by researcher. There will be more explanation for discussion and conclusion about Smart Trolley.

5.2 DISCUSSION

Based on literature review, there are various types of hydraulic trolleys sold in the market. The selection of trolleys on the project should focus on the cost, type, durability and materials used. we choose a trolley that uses hydraulics. The hydraulics are controlled by electric power to facilitate the user. We also use stainless steel because an ideal material for many application where both the strength of steel and corrosion resistance are required. Moreover, stainless steel can be rolled into sheet, pates, bars, wire and tubing.

Then, we apply a hydraulic at the trolley to facilitate the movement of the trolley. We use electronic hydraulic jack that controlled by the switch button. Why we choose this hydraulic because this jack can lift heavy loads (150 kg). This hydraulic jack also use mechanical method. After that, a 12 volt battery used in this hydraulic for draining power to hydraulic jack movement. It is a rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminal. This hydraulic is made our project is different between the trolley at the market.

After that, our trolley is design for user feel comfortable with the trolley. We design this trolley is more ergonomic and efficient for reduce user from pain. The most important is safety. After we try our the trolley, we limit the load that can lift for the trolley is 150 kg only. We can't take a risk for the user safety.

Lastly, the wheel is one of the important parts because it involves movement. As everyone knows wheels are used to facilitate movement for our project. Wheel selection is also very important because it should follow the spec that fits the requirements of the project. We use 4 wheels where the 2 wheels at the back can be locked so that it does not move during the transfer process.

5.3 CONCLUSION

As conclusion, Smart Trolley makes a significant in terms of safety and productivity. Smart Trolley are versatile and height-adjustable because of the design. It have myriad benefits, including the prevention of repetitive stress injuries. The most important we innovation this trolley is because of safety and less use the human power to carry heavy things that can cause pain.

Beside that, in loading and palletizing jobs, the positioning of the Smart Trolley table at the required height for a particular job reduces the cycle times by improving the loading efficiency. To conclude it multiply the reduce cycles multiple times, and across different workstation, it find that the amount of time saved translates to more productivity.

Laid on the line, our product can give positives impact to user which save time and energy. Apart from that, lifting the items will be easy. We hope that with the advent of product will help users to lifting the items easily and can avoid injuries cause by ergonomic systems. Lastly, the presence of this smart trolley will facilitate the process of moving goods by taking a short time. In addition, it also does not use full manpower because the innovative design has reduced humans to produce energy.

5.4 UPGRADE PLAN

Smart Trolley a project innovation that simplifies the process of shifting goods due to its ergonomic and efficient design. The following are some of the things that are suggested to further enhance this project;-

1. Use the Solar Systems at battery so that the battery can be recharged naturally after use.
This proposal can save battery and reduce the cost of buying a new battery.
2. Place a barrier such as a cage so that's thing on the base do not fall while the trolley is moving.
3. Upgrade the base trolley size more bigger so that it can fit more stuff.
4. Use the hydraulic that can be lift more loads.

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APPENDIX

APPENDIX A	Final product
APPENDIX B	Cost and expenses
APPENDIX C	Poster PITEK

APPENDIX A



(a)



(b)

Final Product (a) side view (b) back view

APPENDIX B

Budget Calculation

No.	Materials	Price /unit (RM)	Quantity	Total (RM)
1.	Hydraulic Jack	200	1	200
2.	Batteries 12v + Jumper cable	41	1	41
3.	Push Button	10	1	10
4.	Stainless steel	20	1	20
5.	Swivel wheel	6.25	2	12.50
6.	Spray paint	5	2	10.00
			Grand Total	293.50

Table 3: List of Materials and Approximate Expenses

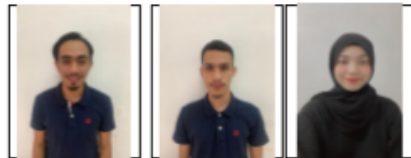
APPENDIX C

Poster Pitex



SMART TROLLEY

NAME GROUP LEADER : ABDUL RAHMAN BIN MAHLI
INSTITUSI : POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
NAME GROUP MEMBER 1 : KHAIRUL AMIR BIN AHMAD
INSTITUSI : POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
NAME GROUP MEMBER 2 : NUR NABILA BINTI ROSNIZAN
INSTITUSI : POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH



PENERANGAN INOVASI

THIS SMART TROLLEY IS INTALLED WITH HYDRAULIC JACK . A JACK IS A MECHANICAL DEVICE USE TO LIFT HEAVY LOAD OR APPLY GREAT FORCE .THE TROLLEY USES ERGONOMIC DESING TO INCREASE PRODUCTIVITY OF WORKERS.

IMPAK INOVASI

- EASY, QUICK AND SAVE TIME
- SAFETY AND COMFORT TO USER

OBJEKTIF

- TO LIFT UP TO A HEIGHT OF 1 METERS AND WITH A CARRYING CAPACITY OF 2000 KILOGRAMS
- TO SECURE THE SAFETY AND COMFORT TO THE USER BY APPLIED ERGONOMIC DESIGN
- TO REDUCE THE ENERGY AND THE TIME TAKEN FOR MANUAL LIFTING BY USING HYDRAULIC JACK AND PUSH BUTTON

BLOK DIAGRAM/CARTA ALIR OPERASI

