



**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH**

**JOYSTICK LADDER**

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**CIVIL ENGINEERING DEPARTMENT**

**JUNE 2019**



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**This report is submitted to the Civil Engineering Department as part of the  
award of the Diploma in Building Services Engineering**

**CIVIL ENGINEERING DEPARTMENT**

**JUNE 2019**

# DECLARATION OF AUTHENTICITY

**TITLE : JOYSTICK LADDER**

**SESSION : JUNE 2019**

1. We,           **1. SELFIANA BINTI LAJUDDIN (08DPB17F1179)**  
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**Selangor.**

2. We acknowledge that the above-mentioned 'project' and its intellectual property are the originals of our original works / creations without taking or imitating any intellectual property from others.

3. We agree to transfer the intellectual property of 'the project' to 'the Polytechnic' to meet the requirements for award **Diploma in Building Services Engineering** to us.

**Made and actually acknowledged by it;**

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at ....., on.....

)

**In front of us, ROZIMAH BINTI TAHIR**

).....

.....

(670610-01-5246) as a project supervisor.

) ROZIMAH BINTI TAHIR

## **ACKNOWLEDGEMENT**

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## **ABSTRACT**

Today's society is very much concerned about the convenience of doing something in their daily lives which is are convenient and safe. Using ladder to reach higher places is common for example, to do work such as cleaning activities. Unfortunately, the users have to descending from a ladder to move it from one place to another place. The purpose of this Joystick Ladder is to ease the user to move the ladder from one place to another and to reduce the user's time as it will help the users to move the ladder from one place to another place without having to climb down the ladder. There is Joystick Ladder is built with the help of wheels and joystick where the wheels can move ladder and joystick can control the movement of ladder and wheels. Joystick Ladder helps users to move the ladder from one place to another place without having to descend from the ladder. Thus, this product can help the work done easily, quickly and safely.

## **ABSTRAK**

Masyarakat hari ini sangat prihatin terhadap kemudahan untuk melakukan sesuatu dalam kehidupan seharian mereka iaitu yang lebih memudahkan dan selamat digunakan. Menggunakan tangga untuk mencapai tempat yang lebih tinggi adalah contoh yang sentiasa dilakukan untuk kerja-kerja seperti aktiviti pembersihan. Malangnya, pengguna perlu turun dari tangga untuk memindahkannya dari satu tempat ke tempat lain. Tujuan tangga ini adalah untuk memudahkan pengguna untuk memindahkan tangga dari satu tempat ke tempat yang lain dan untuk mengurangkan masa pengguna kerana ia akan membantu para pengguna untuk memindahkan tangga dari satu tempat ke tempat lain tanpa perlu menaiki tangga tersebut. Joystick Ladder yang dibina dengan bantuan roda dan joystick di mana roda dapat bergerak tangga dan joystick dapat mengawal pergerakan tangga dan roda. Joystick Ladder membantu pengguna untuk bergerak tangga dari satu tempat ke tempat lain tanpa perlu turun dari tangga. Oleh itu, produk ini dapat membantu kerja dengan mudah, cepat dan selamat.

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## LIST OF SYMBOL

### SYMBOL

<i>cm</i>	Centimeter
<i>kg</i>	Kilogram
<i>m</i>	Meter
<i>V</i>	Volt
%	Percent

## **LIST OF SHORT FORM**

### **SHORT FORM**

IEEE	Institute of Electrical and Electronic Engineer
SPSS	Statistical Package of The Social Science
UPS	Uninterruptible Power Supply

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

A folding ladder is a vertical or inclined set of rungs or steps. There two types rigid ladders that are self-supporting or that maybe leaned against a vertical surface such as a wall and rollable ladders. As an example, those made of rope or aluminium that may be hung from the top. The vertical equipment of a folding ladder are called stringers or rails. Folding ladders are usually portable but some types are permanently fixed to a structure, building or equipment. They are commonly made of metal or aluminium.

Many advantages of folding ladder such as to help the user in doing the work. As an example, painting, wiring and so on. Besides, help the user to take the things in high place. Folding ladder is very widespread in use for many types of work. But, the folding ladder also has many disadvantages after we are doing the observation. The disadvantages of this folding ladder is will be stated in this report as the problem statements.

Generally, our group will create an innovation that is Joystick Ladder. We will upgrade the ordinary folding ladder to help and facilitate users for doing the work.

## **1.2 BACKGROUND RESEARCH**

Folding ladder is very important and widely used at home, shop, industry and many more. Generally, folding ladder used by human to perform a various type of job. For instance, cleaning work, to store high storage items, construction work such as wiring and painting. However, there are a different types of folding ladder that available in the market according to the size, shape, material and price.

Nowadays, there are no folding ladders that allow the users to move folding ladder while doing work. In our current industry, the users need to get off from the folding ladder and move it by their self if they want to move from one place to another place. This is the main problem and difficulty faced by the users especially for those who work involving a ladder.

So, in this case there a various difficulties faced by the users. This chapter will discuss about problem statement, objective of the project, scope of the project, conclusion and so on

Thus, this study must be carried out so that the improvement can be introduced to provide a maximum comfort and convenience to the users. Thus, the idea of this study is to create a project innovation as I mentioned before at introduction that can ease and facilitate the users of the folding ladder which is Joystick Ladder.

## **1.3 PROBLEM STATEMENT**

After conducting a observation, there are some problems statement detected towards the folding ladders that available in the market today. The main problem is, the difficulty of the users in term of moving the folding ladder to another place. As mentioned before, the users need to get off from the staircase and lift if if they want to move the folding ladder.



The next problem is waste of time. This is related to the first problem which to get off the folding ladder and to move from one place to another place, it has taken a lot of time. So, this will slow down the work of the users.

In addition, the current folding ladder in the market also waste the energy of the users. This is because, get off from the stair and lifting it repeatedly will got them tired and slow down their work.

#### **1.4 OBJECTIVES OF THE PROJECT**

This is two objectives of the project :

1. To produce a folding ladder that can be moved from one place to another place so that the users no need to get off from the ladder first before moved it.
2. Times taken for finishing work of wiring construction is faster than using other folding ladder. Time can be reduced to 10%.

#### **1.5 SCOPE OF THE PROJECT**

The scope or the limitation is the most important part to ensure the implementation of this project is in line with the objective. Therefore, this project must not be exceeding it goals and it functions. Scope of the project is :

1. This project is restricted to users with 80kg weight and below. Overweight users cannot be accommodate and the folding ladder cannot be moved.
2. The folding ladder only suitable to construction work such as wiring and painting for maximum height of 3m. Ceiling or any height place exceeding 3 meters are inconsistent.
3. Suitable for construction work such as cleaning ceiling, painting and wiring.

#### **1.6 THE IMPORTANT OF RESEARCH**

The importance of research is very helpful in implementing and completing a project. Therefore, our group members have made an observation on the project that we will produce a project which is Joystick Ladder.

After observing, there are various problems faced when using ordinary folding ladder and it has also been stated in the problem statements. Among them, many workers who use the ordinary folding ladder experience anxiety while doing the work such as construction work, information related to this ladder is stated on the internet and through our observations.

Other than that, this research is very important to help people who always use the folding ladder. We will upgrade the existing folding ladder to the Joystick Ladder. This can facilitate the work that will be done in construction.

### **1.7 TERM DEFINITION / OPERATION**

Term definition / operation is a sentence or word indicating the meaning of the project. The definition and term are based on the project name :

**JOYSTICK** : Joystick is a vertical handle that can be moved forwards, backwards and sideways to control the direction of height of an aircraft or to control a machine or usually use in computer game. The joystick got its name from the control stick used by a pilot to control the ailerons and elevators of airplane, is a hand held lever that pivots on one end and transmits its coordinates to a computer. It often has one or more push buttons, called switches. Other than that, a Joystick is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling. A Joystick also known as the control column, is the principle control device in the cockpit of many civilian and military aircraft, either as a center stick or side stick.

**LADDER** : Ladder is a piece of equipment consisting of a series of bars or steps between two upright lengths of wood, metal or rope. Used for climbing up or down something.

### **1.8 CHAPTER SUMMARY**

In summary, after conducting a observation the folding ladder have some

problems statement detected. As mentioned before, difficulty to move the folding ladder from one place to another place. Also, waste a lot of time because get off from the folding ladder has taken time and it will affected slow down the work of the users. Other than that, the current folding ladder waste the energy of the users. This is because get off from the folding ladder and lifting it repeatedly will cause them to be tired quickly.

So, we will produce a folding Joystick Ladder that will enable the users to move from one place to another place without to go down and lift the folding ladder.

The folding Joystick Ladder that we will produced can be moved to the left, right, front and back by using the concept of the lever. Therefore, the users doesn't need to go down and lift the folding ladder if they want to move it.

Lastly, the folding ladder that we will make are especially important to the users as it can solve the problem of users who use these folding Joystick Ladder when doing work construction such as panting and wiring.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This research is to identify and learn more about the project that we will produce which is Joystick Ladder. This study will explain how to create a Joystick Ladder where it can move forward, back, left and right by using the joystick that we will produce without need go down from the folding ladder.

That will facilitate the folding ladder users to be moved from one place to another place with more easily. So in this project, we will create an innovation will facilitate users without get off from the folding ladder and move it by their self. The users only need to control the joystick if they want to move the folding ladder.

For this research, all statements of problems will be solved based on the information obtained through the study of previous literature review and secondary information's in the form of data, questionnaires, lecturer's views and observations and on the ideas of our own team members.

Next, this references is based on literature review from books written by domestic and international writers. Other than that, this literature review also derived from internet web site and from Google Scholar.

#### **2.2 CONCEPT / THEORY**

The **concept** can be interpreted as an abstract description that provides an explanation to something in some dimensions. These dimensions or views are formed or determined according to the requirements. Usually in a literature review, the concept should be clarified based on different views that have to do with things described.

This is very important in a literature review because the explanation put forth in a research will give a special understanding of the researcher to control his analysis carefully. This concept will be formed in symbols or words and it is said to be the understanding formed from experience. Actually humans are exposed to various concepts which existed in social life, but they faced difficulties for explain it regularly.

This systematic explanation is referred to as concept in academic writing. In this case, daily life experience and educational science play an important role in to design an academic concept. In a study, concept formation should be based on research. Otherwise it may load unrelated things and not relevant with the objective of a literature review. The concept is also important in the study because it gives an understanding and plays its role as a guide to the material studied.

The Ladder **Theory** was developed in 1994 in Exeter, California, by Dallas Lynn, who acknowledges Jared Whitson for helping to formalize the theory. Ladder Theory has since become a social ideology, or way of thinking about behavior.

## **2.3 LITERATURE REVIEW**

**2.3.1** According to Richard A. Stephans (2004) to produce a ladder, the safety system should be emphasized in all aspect to be safer and better quality to use it.

**What is safety system?** Simply put, safety system is the name given to the effort to make things as safe as practical by systematically using engineering and management tools to identify, analyze and control hazard. The safety system effort is sometimes called an approach, a discipline, a concept, a doctrine and a philosophy.

Things to be made safe can be systems, programs, projects, products, operations

or facilities. As safe as is practical may be expressed as the best degree of safety, optimum safety or optimum risk management within constraints (operational effectiveness, cost and time). Most formal definitions of safety system also emphasize that the effort is for all phase of the life cycle even though most efforts are concentrated (and rightfully so) in the early phases of new programs.

**Why we do safety system?** The reason is for using a safety system approach is to achieve better safety ladder. Most traditional safety programs are compliance oriented that is safety is achieved by complying with appropriate codes, standards and regulations. First, codes, standards and regulations are by and large, political documents. Such as, they are frequently the result of compromise and represent minimum acceptable levels of performance. A second shortcoming of a safety program based only on compliance is that tends by nature to be reactive. One of the oldest clichés in the safety world is that safety codes, standard and regulations are “written in blood” that is of accidents. So, safety system is so important to create some project innovation.

**Safety systems relies on :**

1. Systematic hazards analyses
2. Team effort
3. Optimum safety

The safety system effort strives to be proactive by very early identification, analysis and control of hazards to produce first-time safe system.

**Who does safety system?** Management has the overall responsibility for ensuring that safety system programs are established that they are adequately staffed at all levels, that the training is conducted for all personnel associated with the safety system effort, that safety concerns are identified and communicated and that adequate resources are allocated.

At the working level safety system tasks are normally performed by a safety system working group. Therefore, all persons who do or are producing a project should prioritize the security so that no injury occurs. For example, injuries when making the ladder or injuries while using the ladder.

**2.3.2** According to J.P Den Hartog (1949) to produce a project must use strength of materials so that the project will be produce in good quality and durable.

**Theories of strength :** After the loads on an engineering structure have been determined or properly estimated and when from these loads and the chosen dimensions of the structure the stress have been calculated, the sixty-four-dollar questions presents it self of whether the construction is safe or not. Since a structure will always start to fail at one spot (the weakest). First, the questions reduces to that of the safety of an element of material DX DY and DZ subjected to a given stress pattern. During the last two centuries a number of assumptions have been made concerning the criterion of failure of such an element and these assumptions have been honored with the designed “THEORY OF STRENGTH”. The most important of them in historical order.

**To know the theory of strength must be proficient with :**

1. The maximum stress theory
2. The maximum strain theory
3. The maximum shear stress theory
4. The theory of MOHR
5. The theory of maximum distortion energy

After knowing the concept of theory, the choice of material to produce the project must be based on the strength of the material that has the theoretical strength. Strong and suitable materials will produce a good project and not easily damaged.

[Strength Of Materials]

**2.3.3** According to Buick Davision & Graham W.Owens (2012) the use of steel and design also needs appropriate selection to provide good project folding ladder.

Consideration of the whole structure is essential for the analysis of the stability portals of the folding ladder. It may also be more convenient to use a steel model of

the entire structure to assist with the organization of the load cases of governing actions.

**Design philosophy :** Simple connections are defined as those connections that transmit end shear only and have negligible resistance rotation and therefore do not transfer significant moments at the ultimate limit state. This definition underlies the design of the overall ladder in which the steel are designed as simply-supported and the shear are designed for axial load and the small moments induced by the end reactions from the ladder. In practice, however the connections do have a degree of fixity, which although not taken into account in the design is often sufficient to allow erection to take place without temporary bracing.

**Structural integrity :** The partial collapse of Ronan Point 1968 alerted the construction industry to the problem of progressive collapse arising from a lack of positive attachments between principle elements in a structure. This resulted in amendments to both the Building Regulations Approved Documents A - Structure and the UK's steel design code.

[Steel Designed Manual]

**2.3.4** According to Warren R.Merrill (1994) ladder stability is also very important to produce project Joystick Ladder.

**Theory :** A ladder stabilizer comprising a telescopically adjustable leg having an upper end and a lower end a coupling mechanism for coupling the upper end of the leg to a ladder and allowing the leg to be pivoted and rotated with respect the ladder. Limiting means for limiting the extent to which the leg can be pivoted and rotated and a foot pivotally coupled to the lower end of the leg and having a gripping mechanism extended downwards therefrom for preventing the foot from slipping when placed on a recipient surface.



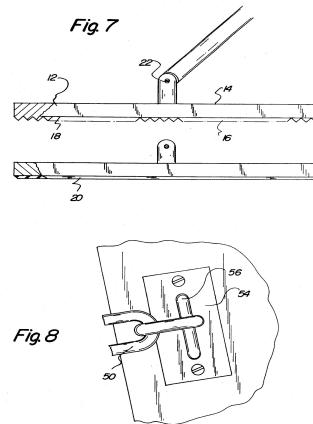
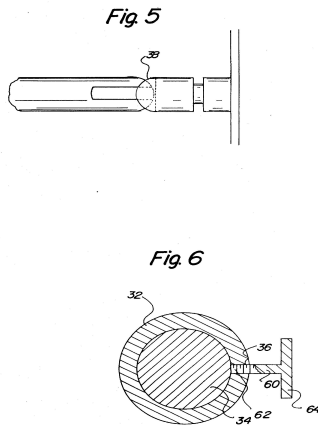
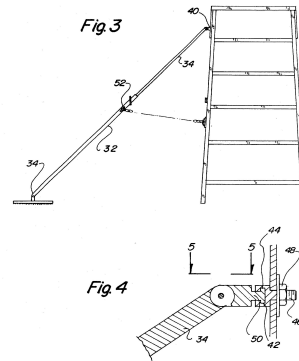
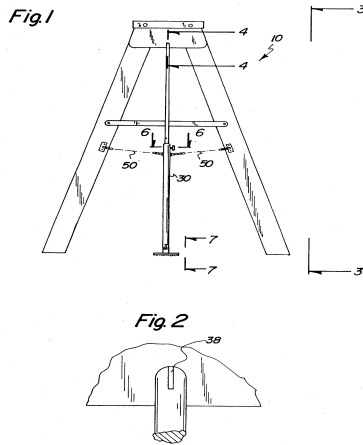


Figure 2.3.4.1 : Component of Ladder

**Description of the Prior Art :** The use of stabilizer devices is known in the prior art. More specifically, stabilizer devices heretofore devised and utilized for the purpose of stabilizing ladders are known to consist basically of familiar, expected and obvious structural configurations, not with standing the myriad of designs encompassed by the crowded prior art which have been developed for the fulfillment of countless objectives and requirements.

While these devices fulfill their respective, particular objective and requirements, the aforementioned patents do not describe a step ladder stabilizer that

allows a step ladder to be stabilized for use and inherently limits its extension and rotation with respect to the step ladder.

In this respect, the step ladder stabilizer according to the present invention substantially departs from the conventional concepts and designs of the prior art, and in doing so provides an apparatus primarily developed for the purpose of maintaining a step ladder in an upright configuration when in use.

Therefore, it can be appreciated that there exists a continuing need for new and improved step ladder stabilizer which can be used for maintaining a step ladder in an upright configuration when in use. In this regard, the present invention substantially fulfills this need.

[Step Ladder Stability]

**2.3.5** According to Hugo Hoiije (1978) painting of steel for ladder requires the right way so that the paint steel is not easily rusted and fragile.

A method of preparing a steel surface for painting or enamelling in which the surface is coated with a tin-zinc alloy by electrodeposition from an aqueous electrolyte containing zinc sulphamate, tin sulphate and sulphamic acid the proportion of tin sulphate to zinc sulphate being such as to provide a weight ratio of not less than 20:80 and not more than 60:40 between the tin and the zinc present in the solution

It is an object of the present invention to provide an improved method of treating a steel surface which imparts to said surface the property of providing a strong adhesive bond with a coating of paint or enamel subsequently applied on said surface. Another object is to provide an electrolyte for the pre-treatment of a steel surface which is not poisonous and not, or only slightly, corrosive and can be used safely by unqualified persons.

The method according to the invention is distinguished substantially thereby that it comprises the step of coating the steel surface with a tin-zinc-alloy by electrodeposition from an aqueous electrolyte containing zinc sulphamate, tin sulphate and sulphamic acid. Accordingly, the new electrolyte according to the invention is distinguished substantially thereby that it consists of an aqueous solution containing

zinc sulphamate, tin sulphate and sulphamic acid. The ratio of the contents (by weight) of tin and zinc present in the solution should preferably amount to not less than 20:80 and not more than 60:40. At Sn:Zn ratios below 20:80, the adhesion of the coating of paint or enamel to the treated area will not be satisfactory. Ratios above 60:40 render the electrolyte chemically unstable, the divalent tin tending to be oxidized into quadrivalent tin which is precipitated.

[Preparing A Steel Surface For Painting Or Enamelling]

**2.3.6** According to IEEE Industrial Electronic (2009) learn how to install a joystick on an automobile toy car and learn how the joystick works so it can move the toy car. Want to apply the method of installation on the Joystick Ladder that will be produced. Joystick car driver for toy car. The joystick driver system allows remote control toys from remote. Operation of the joystick at the rear and the direction of power controls the acceleration or decrease of the vehicle while the left and right direction switch steering wheel. In addition, toy car drivers do not have to change the seat from the wheelchair to the car seat. Since the built-in van is equipped with a rear lift, the toy car driver can access the driver's position by moving the toy seat inside the van. To maintain the safety of a van in the case of a system error, the gas pedal and brake are physically displaced by mechanical connections connected with joystick lever.

Therefore the van can be stopped by manual operation under any circumstances. The steering wheel is powered by an electric motor controlled by a microcomputer system. The steering angle is PID controlled to track the reference angle provided by the joystick. To realize the joystick driver system with a toy car seat, design a steering driver mechanism that includes DC motors, magnetic clutches, and potentiometers for steering angle detection, and transmission gear. Most of the cars manufactured today are equipped with a power steering system that reduces the power of human steering operations.

Next, the system can use a power steering system to realize the joystick car drive system with minimum motor capacity. The prototype mechanism is installed in the real van cockpit and tested the realizability of the moving toy car system operated by the joystick.

A joystick includes accelerator, brake pedal and steering wheel in one lever. The analysed joystick systems have a joystick with spring-feedback and do not have the mechanical connection with the steering wheels and brake system. The result is that much information fed back to the driver in a conventional car by means of steering wheel and pedals is lost. Since the joystick is designed as a lever, fastened at one point and with two control directions, lateral and longitudinal controls may interfere.

Further shortcomings can be identified for joystick-operated cars but their influence on traffic safety is difficult to decide. Information and knowledge have been gathered to the knowledge survey through literature studies in the field and contacts with joystick ladder that we will provide.

[Toy Car Joystick Controller]

**2.3.7** According to David Schweninger (1998) to learn how to lock the rollers so they cannot move if the joystick is not pressed.

A turn rollers locking device for use with ladder having at least one turn rollers. The locking device functions to automatically disable the ladder when it is removed from a prescribed area by locking the turn rollers in a turned configuration so that the ladder can travel only along a generally when pushing the button of joystick ladder.

The present invention relates generally to wheel locking devices. More specifically, the invention concerns a locking device for locking turn rollers of the type used on vehicles such as ladder in a manner such that the turn rollers is releasably locked in a vehicle turning configuration.

It is an object of the present invention to provide a simple, inexpensive and easy to install turn wheel locking device which disables the cart from normal use when the ladder is removed from a prescribed area. More particularly, it is an object of the invention to provide a device of the aforementioned character which operates in

conjunction with one of the forward turn or swivel wheels of the in a manner to cause ladder to travel only when pushing the joystick

Another object of the invention is to provide a locking device of the character described in which the locking mechanism is triggered when the ladder passes over a signal generator that circumscribes the not in construction area or spans an exit thereto. In this case, the signal generators are connected to a low voltage power loop that circumscribes the construction area. Next, object of the invention is to provide a turn wheel locking device, which when triggered, will not abruptly stop the cart in a manner to risk possibly serious injury to the user, but rather will merely disable the cart by locking one of the turn wheels in a turning configuration so that the ladder can no longer travel in a straight line.

Another object of the invention is to provide a wheel locking device of the character described in the preceding paragraphs which can quickly and easily be installed on various types of push carts of conventional construction.

Other than that, object of the invention is to provide a locking device as described in the preceding paragraph which is inexpensive to manufacture, is easy to install on a conventional ladder, is highly reliable in use and can be quickly and easily reset to enable normal operation of the cart. Another object of the invention is to provide a wheel lock system of the class described which disables the ladder from normal operation in a manner such that a continued pushing force imposed on the ladder by the user will not cause structural damage to the ladder or to the locking system.

Therefore, the object of the invention is to provide a wheel turning lock for push ladder which can be used in inclement weather conditions without damage to the locking mechanism. The advantages of the apparatus of the present invention will become apparent from the discussion which follows.

[Rollers Locking Device]

**2.3.8** According to Harry L. Martin, Raymond E. Goodson (1980) learn how to install the battery to connect to the joystick. So that, be able to move the ladder by

using the joystick which has a battery. To determine the suitable battery capacity used to fit the joystick so that the ladder can be moved.

**Theory :** A monitoring apparatus and method are disclosed for monitoring and/or indicating energy that a battery power source has then remaining and/or can deliver for utilization purposes as, for example, to an electric vehicle. A battery mathematical model forms the basis for monitoring with a capacity prediction determined from measurement of the discharge current rate and stored battery parameters. The predicted capacity is used to provide a state-of-charge indication. Self-calibration over the life of the battery power supply is enacted through use of a feedback voltage based upon the difference between predicted and measured voltages to correct the battery mathematical model. Through use of a microprocessor with central information storage of temperature, current and voltage, system behavior is monitored, and system flexibility is enhanced.

Battery 1 and the associated inverter 2 are normally disconnected from the output 3 of the UPS by means of a switch 4. The load is in this operational mode supplied directly from the mains supply 5. At a mains interruption, the mains supply is disconnected by switch 6, the inverter 2 is activated and connected to the load through switch 4. After mains voltage recovery, the initial state is resumed, and the charger 7 recharges the battery 1. The purpose of the transformer 8 is primarily to transform the output voltage of the inverter into a suitable load voltage during mains interruption. It can also provide energy from the load voltage to the charger 7 under normal conditions, if there is no switch 4. The switch 4 can be replaced by the switching functions of the semiconductor switches 10 of the main circuit of the inverter. A modern UPS usually also includes a logic unit performing various control functions of the different components of the UPS and also provides the necessary warning signals to users of the connected system.

[Monitoring Apparatus and Method for Battery Power Supply]

## 2.4 CHAPTER SUMMARY

In summary, after finish all the literature review, all of the information we get to

increase our knowledge in producing our project which is Joystick Ladder. All information is very important for our project. In short, the literature review has been made to explain how to produce the Joystick Ladder. Firstly, safety is very important during produce the projects. In addition, the stability of a project is also very important. Additionally, this literature review very helpful to our group as a reference to create a project.

However, this research is need to be done to increase our knowledge. Based on the results of the literature review, it can be concluded that there are very easy and have various ways need to follow to create a good project.

As mentioned before, difficulty to move the folding ladder from one place to another place. Also, waste a lot of time because get off from the folding ladder has taken time and it will affected slow down the work of the users. So, we will create a Joystick Ladder. The folding ladder that we will make are especially important to the users as it can solve the problem of users.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter is about the procedure and methodology undertaken by the researcher in collecting data to address the objectives of this study (Razlina, 2010). The aim of this research is to study the affect the use of Folding Ladder and factor to produce the new innovation which is Joystick Ladder. In this chapter, it is include the research design, data collection method, research instrument, sampling technique, data analysis method and the conclusion of chapter summary.

Based on this methodology chapter, it will explain in more detail about the method we use to find relevant data. In this chapter also, will explain how the production of the folding ladder and the flow chart of Joystick Ladder producing. Other than that, this chapter will explain in more details about chapter one until chapter three.

#### **3.2 RESEARCH DESIGN**

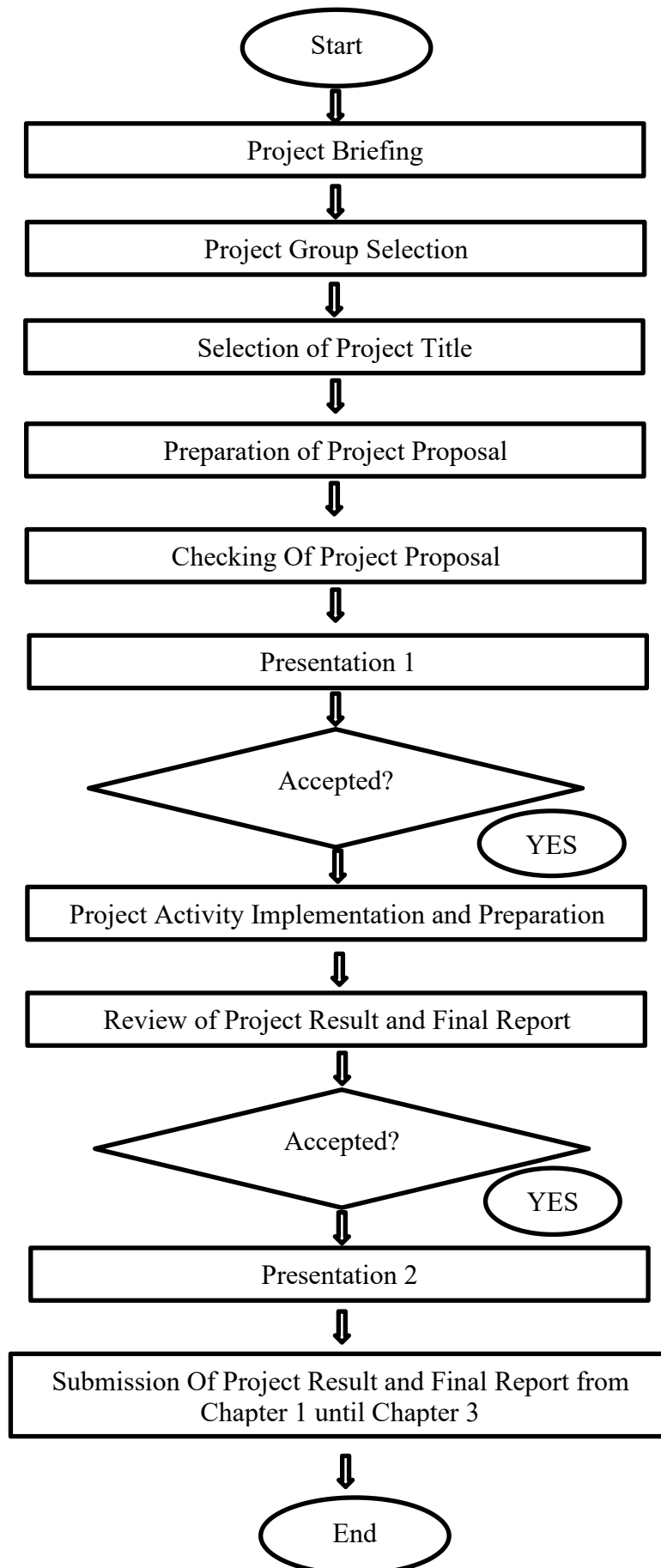
According to Bums and Grove (2003), research design define as a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings. A research design is the set of method and procedures used in collecting and analyzing measures of the variables specified in the research problem. As, for data collection and data analysis, a framework of this research is used as a guide.



In this study, the descriptive research is used to describe the factors that affecting of use our innovation which is Joystick Ladder. A descriptive research is a study in which information is collected without changing the existing folding ladder. It is used to obtain information concerning the users current status when use the existing folding ladder.

In this descriptive research, there's a method of research are used which is the first method is quantitative methods. This method is focus on derivation of conclusion from existing data using proven statistical or general quantitative methods (Marija, et, al, 2012). This methods involved range from the observation which describes the correlation study which investigates the relationship between Folding Ladder and Joystick Ladder. To developmental studies which seek to determine change over time and the of google form onto the sample of three types which is construction sector, students and other sector. This is through the usage of survey method.

## Flow chart of project



### **3.3 DATA COLLECTION METHOD**

Data collection method is the process of gathering and measuring information on targeted variables. Data collection in a research can be done in two ways which are primary data sources and secondary data sources,

Primary data refers to the data collected by the researcher on the first hand from the samples selected from the users of folding ladder. Information that was obtained personally by the researcher relating the research variables for the specific purpose of the study (Sekaran et, al, 2010). This type of data is generally a fresh and collected for the first time. The collection data tool that has been chosen in this study is from google form. The used of google form in this study does not meddle with daily routine at the respondent's since it took them only several minutes to answer the questionnaire (Intan, 2016).

The second way in data collection method is secondary data. Secondary data analysis is a flexible approach and can be utilized in several ways. It is also an empirical exercise with procedural and evaluative steps, just as there are in collecting and evaluating primary data (Doolan & Froelicher, 2009). Given the increasingly availability analysis as a systematic research method. Yet, few framework are available to guide researcher as they conduct secondary data is journals, articles, newspaper articles, reports, book and other.

On this chapter, our group use primary data for data collection methods. This is the table of the answer from our question from Google Form.

1	Timestamp	Gender	Occupation	Create a Joystick Ladder replacing Folding Ladder where the Joystick can be move forward, back, left and right	Joystick Ladder can ease the user by no need to get down from the ladder to divert it	This project can reduce the burden of the workers in light construction such as painting and wiring	Joystick Ladder able to facilitate work	Joystick Ladder is suitable to be market in construction sector	Nowadays, Joystick Ladder is very useful in construction sector
2	4/3/2019 9:13:52	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
3	4/3/2019 10:19:35	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
4	4/3/2019 10:58:48	Female	Others sector	Agree	Agree	Strongly agree	Agree	Strongly agree	Strongly agree
5	4/3/2019 10:58:53	Female	Student	Agree	Agree	Agree	Agree	Agree	Strongly agree
6	4/3/2019 11:01:00	Female	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
7	4/3/2019 11:02:17	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
8	4/3/2019 11:03:47	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
9	4/3/2019 11:04:32	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
10	4/3/2019 11:05:04	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
11	4/3/2019 11:05:36	Female	Student	Agree	Agree	Agree	Strongly agree	Agree	Agree
12	4/3/2019 11:06:26	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
13	4/3/2019 11:07:04	Male	Construction sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
14	4/3/2019 11:07:44	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
15	4/3/2019 11:08:21	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
16	4/3/2019 11:09:03	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
17	4/3/2019 11:09:29	Male	Student	Agree	Disagree	Agree	Disagree	Agree	Agree
18	4/3/2019 11:10:25	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
19	4/3/2019 11:12:09	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
20	4/3/2019 11:12:29	Male	Student	Strongly agree	Agree	Agree	Agree	Strongly agree	Agree
21	4/3/2019 11:12:42	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
22	4/3/2019 11:12:47	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
23	4/3/2019 11:12:48	Male	Student	Strongly agree	Strongly agree	Agree	Agree	Strongly agree	Agree
24	4/3/2019 11:13:04	Male	Student	Strongly agree	Agree	Agree	Strongly agree	Strongly agree	Strongly agree
25	4/3/2019 11:13:18	Male	Student	Agree	Strongly agree	Agree	Agree	Strongly agree	Agree
26	4/3/2019 11:13:31	Male	Student	Agree	Strongly agree	Agree	Agree	Strongly agree	Agree
27	4/3/2019 11:15:20	Male	Student	Agree	Agree	Agree	Strongly agree	Agree	Agree
28	4/3/2019 11:15:52	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
29	4/3/2019 11:17:23	Male	Student	Agree	Agree	Agree	Agree	Agree	Agree
30	4/3/2019 11:18:03	Female	Student	Disagree	Agree	Agree	Agree	Agree	Agree
31	4/3/2019 11:18:23	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Agree
32	4/3/2019 11:20:33	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
33	4/3/2019 11:21:38	Male	Others sector	Disagree	Disagree	Agree	Agree	Disagree	Disagree
34	4/3/2019 11:28:16	Male	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
35	4/3/2019 11:31:25	Male	Others sector	Agree	Agree	Agree	Agree	Agree	Agree
36	4/3/2019 11:42:49	Male	Student	Strongly agree	Agree	Agree	Strongly agree	Strongly agree	Strongly agree
37	4/3/2019 11:45:54	Female	Student	Disagree	Agree	Agree	Agree	Disagree	Agree
38	4/3/2019 11:46:47	Male	Construction sector	Agree	Agree	Agree	Agree	Agree	Agree
39	4/3/2019 11:47:44	Female	Student	Disagree	Agree	Agree	Agree	Agree	Agree
40	4/3/2019 11:48:35	Female	Student	Agree	Disagree	Agree	Agree	Agree	Strongly agree
41	4/3/2019 11:50:06	Male	Student	Agree	Agree	Agree	Strongly agree	Agree	Agree
42	4/3/2019 11:50:13	Male	Student	Agree	Agree	Agree	Strongly agree	Agree	Strongly agree
43	4/3/2019 11:50:34	Male	Student	Strongly agree	Strongly agree	Strongly agree	Agree	Strongly agree	Strongly agree
44	4/3/2019 11:53:12	Female	Student	Agree	Agree	Agree	Agree	Strongly agree	Agree
45	4/3/2019 11:56:06	Male	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
46	4/3/2019 11:57:54	Female	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
47	4/3/2019 12:04:44	Male	Construction sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
48	4/3/2019 12:12:35	Male	Construction sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
49	4/3/2019 12:13:07	Male	Construction sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
50	4/3/2019 12:22:50	Female	Others sector	Agree	Agree	Agree	Agree	Agree	Agree
51	4/3/2019 12:26:05	Female	Construction sector	Agree	Strongly agree	Agree	Strongly agree	Strongly agree	Strongly agree
52	4/3/2019 12:33:33	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
53	4/3/2019 12:37:13	Male	Others sector	Strongly agree	Disagree	Agree	Disagree	Disagree	Disagree
54	4/3/2019 14:13:43	Male	Others sector	Agree	Agree	Agree	Agree	Disagree	Disagree
55	4/3/2019 14:40:01	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
56	4/3/2019 17:52:56	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
57	4/3/2019 18:37:35	Male	Student	Agree	Agree	Agree	Agree	Agree	Agree
58	4/3/2019 18:39:15	Male	Others sector	Agree	Agree	Strongly agree	Agree	Strongly agree	Strongly agree
59	4/3/2019 18:44:17	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
60	4/3/2019 18:44:37	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
61	4/3/2019 20:01:47	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
62	4/3/2019 20:02:15	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
63	4/3/2019 20:06:34	Female	Others sector	Agree	Agree	Agree	Agree	Agree	Agree
64	4/3/2019 21:33:55	Male	Student	Agree	Agree	Agree	Agree	Agree	Agree
65	4/3/2019 21:51:00	Female	Construction sector	Agree	Strongly agree	Strongly agree	Agree	Agree	Agree
66	4/3/2019 22:30:59	Female	Student	Agree	Agree	Agree	Agree	Agree	Agree
67	4/3/2019 22:58:44	Female	Student	Agree	Agree	Agree	Agree	Agree	Strongly agree
68	4/4/2019 10:54:44	Female	Construction sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
69	4/4/2019 10:54:58	Male	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
70	4/4/2019 10:55:10	Male	Others sector	Agree	Agree	Agree	Agree	Agree	Agree
71	4/4/2019 10:55:24	Female	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
72	4/4/2019 10:55:35	Male	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
73	4/4/2019 10:55:49	Male	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
74	4/4/2019 10:56:00	Male	Student	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
75	4/4/2019 10:56:11	Female	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
76	4/4/2019 10:56:22	Female	Others sector	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree

Figure 3.3.1 : List of Questionnaire

### **3.4 RESEARCH INSTRUMENT**

Research Instrument is any equipment or methods used to obtain and collect research data. In some research, this instrument may be a questionnaire, list of interview questions or checklist. As an example, High Performance Liquid Chromatography (Agilent 1100 Series), Gas Chromatography (Shimadzu GC17A) and so on.

This section is divided in some section. The section one is contains about the personal details. For example, gender and sector. Our group make some questions based on folding ladder to Joystick Ladder. This question is to know the respondent answer and their opinions.

The respondent were required to answer the question provided. Which each question has to purpose of allowing the respondents to rate one of each questions. There are three point scale can be label as :

1. Agree
2. Strongly agree
3. Disagree

### **3.5 SAMPLING TECHNIQUE**

Sampling is the process of selecting sufficient number of elements from the construction sector, student and other sector, so that a study of the sample and understanding of its properties or characteristic would make it possible for us to generalize such as properties or characteristic to the construction sector, student and other sector elements. The sampling method that been chosen for this research is probability sampling method.

Under probability sampling, the method that has been is simple random sampling. Simple random sampling is defined subject in the sector are sampled by a random process, using either a random number generator or a random number table. So, the each person remaining in the construction sector, student and other sector has the same probability of being selected for the sample (Frerichs, 2008). In this study a

sample of 75 respondents selected from three types which is construction sector, student and other sector.

### 3.6 DATA ANALYSIS METHOD

Data analysis method that use for this research are descriptive and reliability analysis. Descriptive statistic are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measured.

For reliability statistic, Statistical Package of The Social Science (SPSS) is being used for statistical analysis. Certain statistical measured were applied on the data to get the desired results. SPSS can take to generate tabulated reports, charts and plots of distributions and trends, descriptive statistics and conduct complex statistical analyses.

#### QUESTION 1

##### Occupation

75 responses

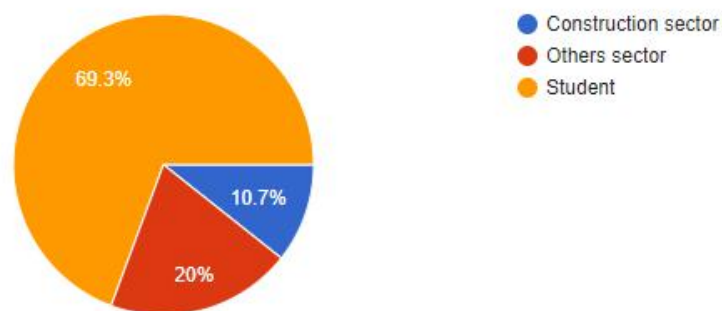


Figure 3.6.1 : Pie Chart in Questionnaire

## QUESTION 2

### Gender

75 responses

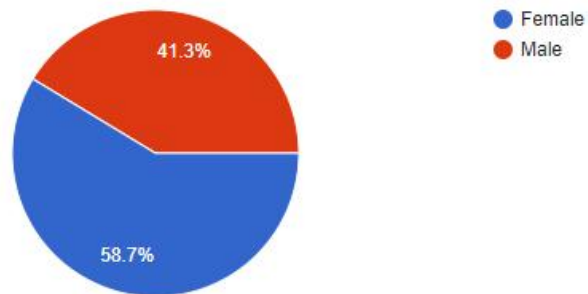


Figure 3.6.2 : Pie Chart in Questionnaire

## QUESTION 3

Create a Joystick Ladder replacing Folding Ladder where the Joystick can be move forward, back, left and right

75 responses

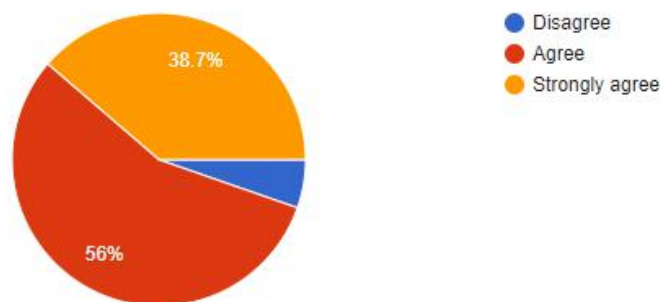


Figure 3.6.3 : Pie Chart in Questionnaire

#### QUESTION 4

Joystick Ladder can ease the user by no need to get down from the ladder to divert it

75 responses

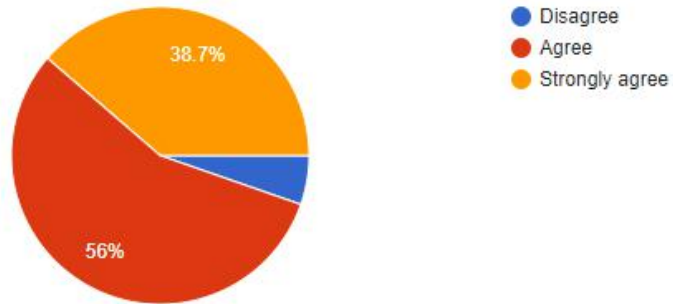


Figure 3.6.4 : Pie Chart in Questionnaire

#### QUESTION 5

This project can reduce the burden of the workers in light construction such as painting and wiring

75 responses

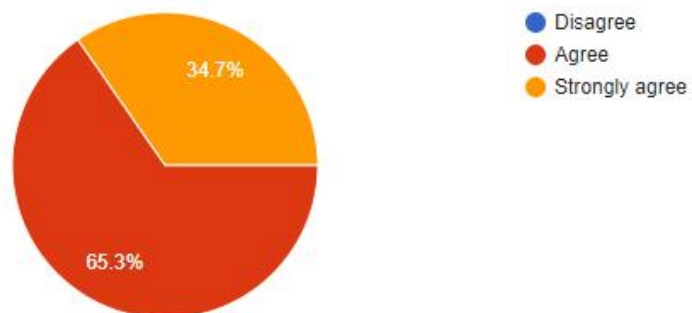


Figure 3.6.5 : Pie Chart in Questionnaire



## QUESTION 6

Joystick Ladder able to facilitate work

75 responses

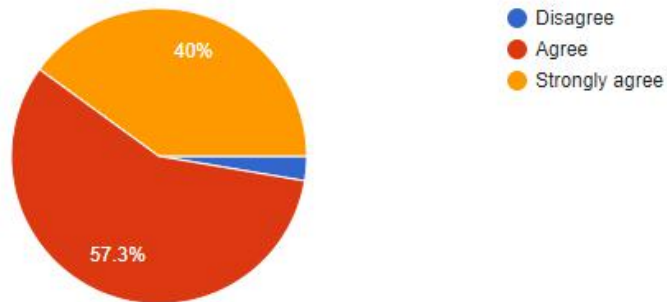


Figure 3.6.6 : Pie Chart in Questionnaire

## QUESTION 7

Joystick Ladder is suitable to be market in construction sector

75 responses

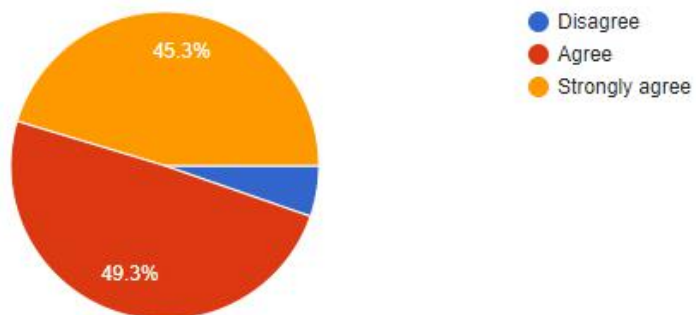


Figure 3.6.7 : Pie Chart in Questionnaire

## QUESTION 8

Nowadays, Joystick Ladder is very useful in construction sector

75 responses

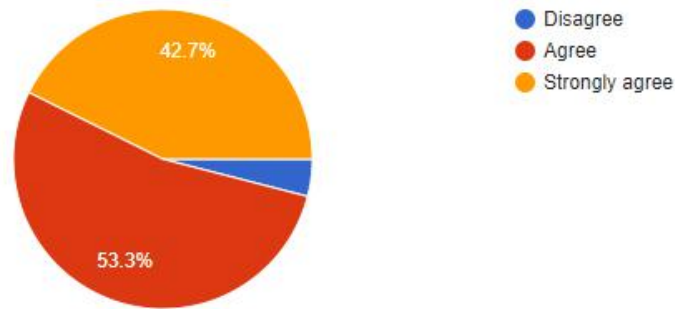


Figure 3.6.8 : Pie Chart in Questionnaire

### 3.7 CHAPTER SUMMARY

This chapter explains the various topics related to research design, data collection method which is primary and secondary data, instrument, the questionnaire design, sampling location, sampling sector, method used for sampling, data analysis and so on.

In addition, a design for Joystick Ladder has been presented during presentation one. Folding ladder becomes one of the important thing in construction. But, the folding ladder have problems when we use it. The problems is like I mentioned before in problem statement in chapter one.

During presentation one, the valuer giving a lot of comments and teaching to improve our knowledge about implementing of Joystick Ladder. Therefore, in this chapter, we are looking for information related to the production of folding ladder.

Last but not least, in this chapter is very helpful to get information trough the

data collection method and data analysis method. In conclusion, our group has know and learned more about how to create a Joystick Ladder

## **CHAPTER 4**

### **FINDING RESULT**

#### **4.1 INTRODUCTION**

In this chapter, the researcher present the findings and analysis of the study in more details. The findings of this study are discussed according the objectives of the study which is :

- I. To produce a folding ladder that can be moved from one place to another place so that the users no need to get off from the ladder first before moved it.
- II. Times taken for finishing work of wiring construction is faster than using other folding ladder. Time can be reduced to 10%.

Each objectives is presented in the following steps, which is including analysis and data discovery, summary and discussion. This study used two types of statistics when analyzing data which are descriptive data (questionnaire) and empirical data (run test). The descriptive data analyzed from the questionnaire through Google form. The result of the the Google form will be analyzed in terms of field, gender of respondents and some of the opinions expressed by respondents through the questions provided.

Empirical data is the data from each test performed to get the results from the testing done. There are 4 testings place in the construction site, workshop, shop and house. It will explain in more details the data obtained during the test.

## 4.2 ANALYSIS AND FINDING OF DESCRIPTIVE DATA

This data will explain in detail the questionnaire that was created. This is to find out more about the response of the respondent to the project, Joystick Ladder.

### 4.2.1 Respondent's Background

The respondent's background is the occupation and gender of the respondent. There are 75 respondents from three sectors which is from construction sector 10.7%, student 69.3% and other fields 20%. The respondents are consist of male and female.

Field

Field	Construction Sector	Student	Others Sector
No (%)	10.7%	69.3%	20%

Table 4.2.1.1 : Field

Gender

Gender	Female	Male
No (%)	41.3%	58.7%

Table 4.2.1.2 : Gender

### 4.2.2 Question for Respondent

Based on this study, 6 questions were given to respondents consisting of 41.3% male and 58.7% were female. Each questions had a positive response from the respondents. The average response of these questions was 56.2% was agree, 40.1% was strongly agree and for disagree is 3.7% only. The average from 6 questions given to respondents clearly indicate that many of them were agree and strongly agree when the Joystick Ladder is produced. This is because there are many advantages of the ladder since it able to facilitate the users.

Question 1.

Create a Joystick Ladder replacing Folding Ladder where the Joystick Ladder can be move forward, backward, left and right.

Answer	Agree	Strongly Agree	Disagree
No (%)	56%	38.7%	5.3%

Table 4.2.2.1 : Question

Question 2.

Joystick Ladder can ease the user by no need to get down from the ladder to divert it.

Answer	Agree	Strongly Agree	Disagree
No (%)	56%	38.7%	5.3%

Table 4.2.2.2 : Question

Question 3.

This project can reduce the burden of the workers in light construction such as painting and wiring.

Answer	Agree	Strongly Agree	Disagree
No (%)	65.3%	34.7%	0%

Table 4.2.2.3 : Question

Question 4.

Joystick Ladder able to facilitate work

Answer	Agree	Strongly Agree	Disagree
No (%)	57.3%	40%	2.7%

Table 4.2.2.4 : Question

Question 5.

Joystick Ladder able is suitable to be market in construction sector

Answer	Agree	Strongly Agree	Disagree
No (%)	49.3%	45.3%	5.4%

Table 4.2.2.5 : Question

Question 6.

Nowadays, Joystick Ladder is very useful in construction sector

Answer	Agree	Strongly Agree	Disagree
No (%)	53.3%	42.7%	4%

Table 4.2.2.6 : Question

### **4.3 ANALYSIS AND FINDING OF EMPIRICAL DATA**

Analysis and finding of empirical data is a scientific investigation of methods, methods, regulated and empirical methods that aim to study observable relationships.

The three key words in this definition are systematic, controlled and empirical. Systematic and controlled scientific research may provide more convincing findings or findings. Empirical analysis and data acquisition means that planned research can be tested in the laboratory or outside the laboratory for others to study.

Empirical analysis and findings are also data collected through actual observation, experience or testing. Often, data is collected directly from respondents. Data can be collected through a variety of methods. For example, data may be collected from respondents through questionnaires or data may be collected when the researcher observes respondents in a particular setting (for example, a site).

In addition, empirical research begins with an observation of a situation. These observations will lead to an inference or initial conclusion. In order to conduct the study, hypotheses need to be developed and subsequently identify the variables involved. The hypotheses to be found should be studied through a planned method of investigation including data collection, interpretation of data and conclusions.

### **4.4 CONCLUSION**

In conclusion, this chapter discusses data collection and preliminary analysis of the study. The two data methods used are questionnaire and product testing method. In addition, the analysis of the questionnaire and project carried out are also presented as preliminary analysis.

Based on the empirical study conducted at the construction site, it was found that the use of stairs is essential to facilitate the work of workers to do the cleaning work. Through this testing, the goal of the project has been achieved so that the user does not have to come down the stairs to move them while doing the work and can

speed up the user's work.

Both methods are well suited to meet the research needs. In the self-review method, it is seen as more effective given that all the information is obtained accurately. In addition, testing methods and interviews with contractors in the construction site are very helpful in data collection. The conclusion is that the data collected for the study is satisfactory



## **CHAPTER 5**

### **DISCUSSION AND CONCLUSION**

#### **5.1 INTRODUCTION**

This chapter is the final chapter of this study and in general this chapter will discuss in more detail the results of the study analysis in chapter 4. This finding is supported by the opinions that can strengthen the results of the research analysis. In conclusion, it is based on discussion of the findings of the study and some suggestions are also available for use in future studies.

There are two objectives of the project :

- I. To produce a folding ladder that can be moved from one place to another place so that the users no need to get off from the ladder first before moved it.
- II. Times taken for finishing work of wiring construction is faster than using other folding ladder. Time can be reduced to 10%.

#### **5.2 DISCUSSION**

From the data analysis, the discussion of the results of the study will be based on 3 parts:

1. System safety
2. Use of joystick
3. Use of tire

**5.2.1** Based on our research and discussion , an author Harold E. Roland; Brian

Moriarty (1990) said the system safety concept calls for a risk management strategy based on identification, analysis of hazards and application of remedial controls using a systems-based approach. So, to produce ladder , the safety system must be in all aspect to be safer and better quality to use it.

System safety is the application of special technical and managerial skills to the systematic , forward-looking identification and control of hazards throughout the life cycle of a project, program, or activity. The concepts calls of safety analyses and hazard control actions, beginning with the conceptual phase of a system and continuing through the design, production , testing , use, and disposal phases, until the activity is retired.

System safety is not failure analysis. It is an existing or potential set of circumstances and actions that can transform an activity involving s hazardous condition into an accident or even a catastrophe. A failure, on the other hand , is when something functions in a manner in which it was not intended. A failure can occur without loss. Severe accidents have happened while something was operating exactly as intended.

A safety objective such that each person will live and work under conditions in which hazards are known and controlled to an acceptable level of potential harm. The goal of the system safety program is the elimination or control of hazards. This will reduce the potential loss of a system, reduce the potential injury or morbidity and reduce the potential damage of the system or related equipment to an acceptable level.

So, all persons that produce a project should emphasize the safety so that no injury occurs. For example, injuries when using a ladder.

**5.2.2** Based on our research and discussion, an author Gregory Y. S. Yeh, Kowloon, Hong Kong at (1985) said Joystick controllers are used in various applications, one of which is to control the movement of figures or object. Besides, joystick controllers must be highly reliable, resistant to damage through abuse, inexpensive, easy to operate and safe.

Second, an author Wah L. Chan, Flat L, 12/F, Phase 4, Kwun Tong Industrial Centre, 436-446 Kwun Tong Road, Kowloon, Hong Kong at (1997) said the joystick will usually have one or more function buttons which can be used.

Third, an author Carl M. Swinney at 13551 Ankerton St., Whittier, Calif at (1988) said the typical joystick provides for switches in four directions such as north, south, east and west. Also, the joystick typically has a firing switch which is often positioned at the top or the front of the joystick and which is operated by the user's thumb or finger. He also said a joystick is an object of the present invention to provide a particularly simple to make, low cost and durable joy stick switch assembly.

Next, an author Albert M. Leung, Burnaby, Canada at (1990) said the advantages of joystick are no significant directional effects, identify the signals transmitted by each joystick controller and joystick manually operable control apparatus may be utilized simultaneously.

The name "joystick" is thought to originate with early 20th century French pilot Robert Esnault-Pelterie.

So, the joystick work can move the folding joystick ladder want apply a method of installation on a joystick ladder that will be produced.

**5.2.3** Based on our research and discussion, Health and Safety Executive (2004) carried out a survey that feet ladders are generally supplied with caps to the top and base of the styles made of material which is durable and yet offers a high degree of friction. These can only be effective if this material remains the one in contact with the ground or vertical surface. The practical implication for ladder usage is that end contact pieces should be maintained free of contaminants such as oil and similar, and free of any compacted particulate material such as cement dust or sand. In normal use, the low total area contacts will have to endure arbitrarily high local pressures and this can easily drive loose debris into the top surface of the manufactured contact material. This will readily alter the designed frictional interface, without the user necessarily being aware.

Therefore, the rollers will be introduced in a project. The functions of rollers is to automatically disable a ladder when joystick controlling a ladder. A feet ladders that offers a high degree of safety will be replaced with rollers to avoid that problem from happening again. So, the rollers will lock the ladder if the joystick is not in controlling.

### **5.3 CONCLUSION**

In conclusion, the objectives of this study was to evaluate the effectiveness of ladder user's. Data collection on Joystick Ladder is through testing that has been done in several places such as construction sites, homes, workshops and shops. The data obtained from the test will be analyzed and evaluated. After testing, the project clearly achieved the stated objectives which is to produce a folding ladder that can be moved from one place to another place so that the users do not need to get off from the ladder first before moving it. Also, times taken for finishing work of wiring construction is faster than using other folding ladders. Time can be reduced to 10%.

In this study, Joystick Ladder's efficiency was more focused on ladder speed. From its overall assessment Joystick Ladder can help speed up the lightweight work done by users. This Joystick Ladder is able to speed up user work as it is more fast and safe.

Overall, with this Joystick Ladder, it has made it easier for users to do light work in some of places such as construction sites, homes, shops and workshops.

### **5.4 PROPOSAL**

Joystick Ladder is a project that used to help users speed up light tasks such as lifting, wiring, cleaning and painting.

Here are a few things that recommend to further for our project which is Joystick Ladder. This is to improve the effectiveness of our project. These are:

1. Increase the safety of the stairs so that no injuries occur while using the ladder.
2. The wiring needs to be refined to look better and not clutter.

3. The use of tires on the ladder should be improved in order to avoid any injury while using the ladder.

Some detailed information on the proposed Joystick Ladder improvements are:

1. Add a platform at the bottom of the stairs to enhance the security system on the ladder.
2. Rewiring should be done
3. Tires need to be converted to rubber tires.

## **5.5 CHAPTER SUMMARY**

In summary, the result of testing was done on Joystick Ladder. It can be concluded that the Joystick Ladder has achieved all of the objectives of this project that previously stated. The Joystick Ladder can be moved by pressing the paddle on the ladder step. It also moves fast and it able to speed up user work. It is clear that the projects we have undertaken as a team of 4 peoples have achieved all of the objectives stated.

Finally, we are done with our project which is Joystick Ladder because the ladder is able to move forward, backward, left and right. Since the ladder can be moved when using it, so it fastens the users and the work can be done quicker. The Joystick Ladder is made from steel as like the ladder that already in the market today. The ladder used is five steps ladder with 146cm height and the width side of the ladder is 73cm. Originally, the ladder able to stand up 100kg weight. However, after the ladder has been modified to be a Joystick Ladder, it can only stand up to 80kg and below. The Joystick Ladder is used rechargeable battery by powered 12V and the ladder can move by push the paddle on the ladder steps. Hence, the joystick is a tool that functioning thing to controls the ladder to move forward or backward. To connect the ladder with tires, we used L racking iron with 5 inches and 10 inches to support the load while 12 pieces of bolt and nut also used. The tires used for the Joystick Ladder is from plastic coated with rubber. This is to make sure the Joystick Ladder is suitable for any kind floor surface. This Joystick Ladder used 4 tires with 18cm diameters to secure the stability of our Joystick Ladder.

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## **APPENDIX**

**APPENDIX A**

**Gantt Chart Final Year Project 1**

**APPENDIX B**

**Gantt Chart Final Year Project 2**

**APPENDIX C**

**Questionnaire**

**APPENDIX D**

**Project Cost**

**APPENDIX E**

**Component List of Project**

## APPENDIX A : GANTT CHART FINAL YEAR PROJECT 1

BIL	ACTIVITIES	DURATION (WEEK)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Introduction														
	i. Generating idea														
	ii. Project title section														
	iii. Identify problem statement														
	iv. Study project objectives														
	v. Discussion with supervisor														
	vi. Presentation 1														
2	Literature review														
	i. Define a suitable subtopics refer to project														
	ii. Make a previous research														
	iii. Discussion with supervisor														
3	Methodology														
	i. Writing methodology														
	ii. Presentation 2														



## APPENDIX B : GANTT CHART FINAL YEAR PROJECT 2

BIL	ACTIVITIES	DURATION (WEEKS)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>PRODUCTION PROCESS</b>																
1	Purchasing															
2	Measuring and cutting															
3	Assembling															
4	Finishing															
5	Making second survey															
6	Presentation 1															
	Presentation 2															
<b>WRITING REPORT</b>																
8	Chapter 4															
9	Chapter 5															

## APPENDIX C : QUESTIONNAIRE

1. Field

- a) Agree
- b) Strongly agree
- c) Disagree

2. Gender

- a) Male
- b) Female

3. Create a Joystick Ladder replacing Folding Ladder where the Joystick Ladder can be move forward, backward, left and right?

- a) Agree
- b) Strongly agree
- c) Disagree

4. Joystick Ladder can ease the user by no need to get down from the ladder to divert it.

- a) Agree
- b) Strongly agree
- c) Disagree

5. This project can reduce the burden of the workers in light construction such as painting and wiring.

- a) Agree
- b) Strongly agree
- c) Disagree

6. Joystick Ladder able to facilitate work

- a) Agree
- b) Strongly agree
- c) Disagree

7. Joystick Ladder able is suitable to be market in construction sector

- a) Agree
- b) Strongly agree
- c) Disagree

8. Nowadays, Joystick Ladder is very useful in construction sector

- a) Agree
- b) Strongly agree
- c) Disagree

## APPENDIX D : PROJECT COST

NO	ITEMS	QUANTITY	PRICE PER UNIT (RM)	OVERALL PRICE (RM)
1.	LADDER	1	80.00	80.00
2.	JOYSTICK	1	20.00	20.00
3.	SWITCH ON/OFF	1	8.00	8.00
4.	GEAR FSR	1	8.00	8.00
5.	CABLE	4	5.00	20.00
6.	CONNECTOR	1	10.00	10.00
7.	TIRES	4	10.50	42.00
8.	SHAFT IRON	1	10.90	10.90
9.	MOTOR	1	40.90	40.90
10.	MOTOR REGULATOR	1	35.00	35.00
11.	RACKING IRON	4	16.00	64.00
12.	BOLT & NAT	12	0.40	4.80
13.	SCREW& WASHER	20	0.50	10.00
14.	RECTANGULAR PAN	2	9.95	19.91
15.	BOX	1	3.30	3.30
16.	BRACKET	8	0.22	1.76
17.	PVC ANTI SLIP TAPE	1	9.90	9.90
18.	BATTERY 12V	1	49.00	49.00
17.	PADDLE	1	16.90	16.90
		<b>TOTAL</b>		<b>454.37</b>

## **APPENDIX E : COMPONENT LIST OF PROJECT**

<b>NO</b>	<b>COMPONENT</b>
1.	Ladder
2.	Joystick
3.	Switch ON/OFF
4.	Gear FSR
5.	Cable
6.	Connector
7.	Tires
8.	Shaft Iron
9.	Motor
10.	Motor Regulator
11.	Racking Iron
12.	Bolt & Nut
13.	Screw & Washer
14.	Rectangular Pan
15.	Box
16.	Bracket
17.	PVC Anti Slip Tape
18.	Battery 12V
19.	Paddle