



MESIN “KUIH LAPIS” VIA ARDUINO

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SUBMISSION OF FINAL REPORT DECLARATION

DECLARATION BY STUDENT (GROUP LEADER)

Please tick (/)

We have made all the necessary amendments based on comments and suggestions given by Supervisor and Presentation Panel.

All the writing format of Report is in accordance with the Coordinator format and style.

We have obtained approval of our Report from Supervisor.

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Acknowledgment

By the Name of Allah, Most Gracious, Most Merciful

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Abstract

MUHAMMAD ASLAM BIN ABDUL RAZAK, MUHAMMAD SYAZWAN BIN ZUALKPLI, MOHD ZAHIR BIN ZAHARIM, MOHD AIMAN BIN AZMI, NUR SYAZLEEN SYARINA BINTI MOHD NIZAM

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The Machine "*Kuih Lapis*" Via Arduino is a project that is intended for renovation, besides enhancing the functionality of the project that can help reduce the energy of the individual to create the perfect "*Kuih Lapis*". In addition, there are many more ways to make this traditional "*Kuih Lapis*" steamer become more modern to make sure work can be done quickly and easily. The Machine "*Kuih Lapis*" Via Arduino can be used anywhere suitable in rural and urban areas. With this Machine "*Kuih Lapis*" Via Arduino project, an individual does not need to spend time observing or controlling during the Steam Processing process, so we create and produce this Machine "*Kuih Lapis*" Via Arduino with the appropriate material and achieve objective. Therefore, the Machine "*Kuih Lapis*" Via Arduino is expected to further expose the public to the advantages of reducing energy and to ensure the perfection of the steam results.

Abstrak

Mesin Kuih Lapis Via Arduino merupakan satu projek yang dilaksanakan bertujuan untuk pengubahsuaian disamping dapat menambahkan fungsi projek tersebut yang dapat membantu mengurangkan banyak tenaga individu untuk membuat kuih lapis yang sempurna. Selain itu, banyak cara lagi untuk membuat penambahbaikan pengukus kuih lapis tradisional ini menjadi lebih moden bagi memastikan kerja dapat dilakukan dengan cepat dan mudah. Mesin Kuih Lapis Via Arduino ini dapat digunakan di mana-mana tempat yang sesuai sama ada di kawasan pendalaman dan perbandaran. Dengan adanya projek Mesin Kuih Lapis Via Arduino ini, seseorang individu tidak perlu membuang masa untuk memerhati atau mengawal semasa proses mengukus kuih lapis sedang dijalankan, kerana itu kami mencipta dan menghasilkan Mesin Kuih Lapis Via Arduino ini dengan material yang sesuai dan mencapai objektif. Oleh itu, Mesin Kuih Lapis Via Arduino ini diharapkan dapat mendedahkan lagi kepada orang ramai tentang kelebihan mesin kuih lapis yang dapat mengurangkan tenaga dan dapat menjamin kesempurnaan hasil kukusan kuih lapis tersebut.

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CHAPTER 1

INTRODUCTION

1.1 Background Project

Figure 1.1 shows the picture of tradisional "*Kuih Lapis*" which in white and red colour.^[1] "*Kuih Lapis*" or called as a "*Kuih Pelangi*" is the most popular which is available for daily meals especially for tea-time. The most popular "*Kuih Lapis*" is the flavour colour of white and red colour that have be identify as Bendera Malaysia and also can buy this "*kuih*" at any of cafeteria, night market, farmer's market, hotels and even a stall on the roadside. The white and red "*Kuih Lapis*" also famous for citizen Malaysian. Eventhough they have changes to different colours as yellow-white, yellow-green and others combination but red-white colour is the most being love for people. The taste creamy and sweet also the soft texture make this "*kuih*" not only being love for children also for adult even a man or women from any race. We also need to know the making process took a time and need more focus to make sure it taste creamy and look nice. Layer by layer need to pour which is take time 9 minutes for one layer. If not give any attention ,probably the progress for making "*kuih*" will not being satisfied. However the innovation will be need for make over the progress of "*Kuih Lapis*".

Nowadays a traders small and medium industries still using manual methods. They do not use sophisticated technology to expand the business and increase productivity. Now, a traders small and medium industries still using the workers to do the production process such as the layer cakes steaming process. In addition, when using manual ways it also will waste their workers energy in steaming the layer cakes process , our initiative is to create the machine that can conduct the steaming process automatically. Its make the process became faster other than old method^[1] .



Figure 1.1 : *Kuih Lapis*

1.2 Problem statement

- Lot of works :

The main problem is that a lot of work. This can be proved by steaming traditional "*Kuih Lapis*", this process requires close monitoring from the beginning to the end of the process the "*Kuih Lapis*". This is because, if less rigorous monitoring, the likely outcome will be less satisfactory "*Kuih Lapis*" for example be hard and over cooked at the same time will change the texture of the cookie. To make the production in large quantities it will require many workers as each process is done manually.

- Use a lot of time :

Second problem is need to much time to process, for example the flour mixture abundant and thick, it will take some time for steaming each layer of "*Kuih Lapis*" and also it will take a long time for the large scale production.

- Prevent common error :

Next, the problem is to prevent common error. With using the old method, we will faced the common error related to the time for steaming and will get unsatisfactory result of "*Kuih Lapis*"

1.3 Objective

We have set the objectives of this project are :

- i. To make "*Kuih Lapis*" machine.
- ii. To reduce time taking and work load to the labour.
- iii. To improve quality during process of "*Kuih Lapis*".

1.4 Scope of Project

- Limited to only the type of "*Kuih Lapis*":

This machine can only to be used for making "*Kuih Lapis*" because this machine has been specially designed to make the process of creating a layer of "*Kuih Lapis*" and do the steaming process in the same machine. This machine is also equipped with a heating rod to produce water vapor from the steaming process and is suitable to producing quality "*Kuih Lapis*" texture.

- One person only needed to operate :

Machine "*Kuih Lapis*" Via Arduino has been designed with a mixture together with steamer and it easy to use for industrial worker. It only needs to control and monitor the process of making a "*Kuih Lapis*" on a small scale industry. For the producer of "*Kuih Lapis*" for large industry, workers must monitor every "*Kuih Lapis*" machine because large-sized machines need precise control. For small-scale industries, workers can produce "*Kuih Lapis*" with a large quantity by controlling all "*Kuih Lapis*" machine of the same system.

- Use Arduino :

This Machine "*Kuih Lapis*" Via Arduino that using automatic control. This type of new machine is using Arduino Uno R3 to control all the process.

1.5 The important of the Project

- Making large-scale production to meet demand.
- To make the cake-making process easier indirectly reduce human labor plus save the cost.
- Use to save more time on making "*Kuih Lapis*".
- To maintain the quality of the cake by using the new method compared to the old method that consist many common error.

CHAPTER 2

LITERATURE RIVIEW

2.1 Concept/ Theories related project

This Machine "*Kuih Lapis*" Via Arduino is a new invention designed to simplify the process of "*Kuih Lapis*". With the present invention, the production of "*Kuih Lapis*" can be produced with more productive.

This Machine "*Kuih Lapis*" Via Arduino created by using Arduino UNO R3 which can be programmed to set the time for water pump is turned on to discharge the flour mixture into the mold containers provided. The water pump is placed in a container deposit flour mixture before mixing it at the pump and then supplied to the container mold.

This "*Kuih Lapis*" machine created with rod water heater placed in the bottom of the container mold which is used to heat / boil water for steaming the "*Kuih Lapis*". Before the heating rod heated water, tap water will be put into boiling water container through the inlet duct is placed at the side of the machine. Perforated aluminum sheet placed under the mold container and also serve as a reference to assist padding former water vapor resulting from heating water heater rod directly into the walls of the oven and then it will flow back into the container boiling water. With the inlet also, it simplifies the process of adding water during the steaming process is carried out. Drain the water out is also provided for removing excess water boil after the steaming process is finished.

"*Kuih Lapis*" machine is also designed in the form at the top of the steamer with a slightly curved / domed to prevent water vapor resulting from drip directly onto the cake and make the cake cooked perfectly and not humid. In addition, the machine is also designed with an aluminum frame.

2.2 Previous research projects

Steaming is a cooking process that uses steam from evaporating water in a particular room or heat for cooking. Heated water or heat flow of electrical current allows food to be cooked. The high pressure causes the water to evaporate and warm the surrounding air.

The benefit of steaming food is categorized as a lifestyle and a good step in the care of the food. Compared with raw food, steaming can reduce folic acid by 15%, while the decoction can reduce by 35% of the nutrients. The other benefit of steaming food is to keep and maintain the nutrition of reduced, this technique is recommended as compared to boil or microwave and also can save time and energy, by placing a variety of foods in stages. In addition, steaming food can maintain the texture of food.

3 steaming is: -

- Directly
- Indirect
- High pressure

2.3 Old traditional making process for “Kuih Lapis”

2.3.1 Equipment

Steaming can retain most of the nutrients from food, as the food is not immersed in water. To select steaming equipment, choose those made of iron or bamboo. Large steamer was good because the hot air will fill the available space,

The process occurs, to fill water containers that can be determined is whether a pan or pot. Microwave also has a function for steaming. In the United States, U.S. Food and Drug Administration found that there were cases of the use of microwave burns.

In Morocco, the Berbers cooking tradition of Tajin, a former pottery is called a starch used. When cooking, the dome-shaped cap placed over the food, to allow the steaming process occurs

1.3.2 Ingredients:

- 2 cups rice flour
- 1/2 cup flour
- 1/2 cup cornmeal
- 1 cup granulated sugar
- 4 cups coconut milk (1 cup coconut milk mixed with 3 cup water)
- 1/4 teaspoon salt
- slightly red coloring and flavoring ros

1.3.3 How to cook :

- i. Preheat steamer and set up an 8-inch baking pan. Add coconut milk to the pot. Heat briefly let me be lukewarm. Close fire.
- ii. Add rice flour, wheat flour, corn flour, sugar and salt into a bowl. Add coconut milk. Mix well to not clump.
- iii. Divide the dough into 2 parts. (This mixture produces approximately 1200ml batter) divided into +/- 600 ml each. Paint one side with red roses and place the flavor.
- iv. Put the pan in a little rub oil into steam. Pour 200 ml of the batter into the pan without color. Steam for 5 minutes with strong fire. after the first layer of cooking, pour 200ml red blends. Steam again. Repeat the process until the expiry of 6 layers with a layer topped with red and lastly add a little more red dye to the final layer so that the colors are more vibrant.
- v. When ready, refrigerate the "*Kuih Lapis*" before being cut. Nice "*Kuih Lapis*", edible layer by layer.

1. Traditional Method

Figure 2.1 shows the picture of traditional “*Kuih Lapis*” which is in white and red layers.^[2] This snack usually consists of two alternating coloured layers, thus the name of layered cake. The cake is made of rice flour, sago, coconut milk, sugar, salt, and food colouring. Popular food colouring includes green-coloured pandan and red rozen food colouring. This cake is steamed gradually, and layers are subsequently added in alternating order to avoid different colours mixing together. This method will create a layered pudding-cake.

“*Kuih Lapis*” is similar to lapis legit or spekkoek, the difference being that lapis legit is a fluffy layered cake, made of flour and is baked, while kuih lapis is a moist layered pudding, made of rice flour and sago, and is steamed.^[2]



Figure 2.1 Traditional Method

5 Automatics machine

A machine is a tool containing one or more parts that uses energy to perform an intended action. Machines are usually powered by chemical, thermal, or electrical means, and are often motorized. Historically, a power tool also required moving parts to classify as a machine. However, the advent of electronics has led to the development of power tools without moving parts that are considered machines.

A simple machine is a device that simply transforms the direction or magnitude of force, but a large number of more complex machines exist. Examples include vehicles, electronic systems, molecular machines, computers, television, and radio.^[3]

2.6 Controller

Figure 2.2 shows the picture of controller.^[4] Controllers combine sensors, logic, and actuators to maintain the performance of components of a machine. Perhaps the best known is the flyball governor for a steam engine. Examples of these devices range from a thermostat that as temperature rises opens a valve to cooling water to speed controllers such as the cruise control system in an automobile. The programmable logic controller replaced relays and specialized control mechanisms with a programmable computer. Servo motors that accurately position a shaft in response to an electrical command are the actuators that make robotic systems possible.^[4]

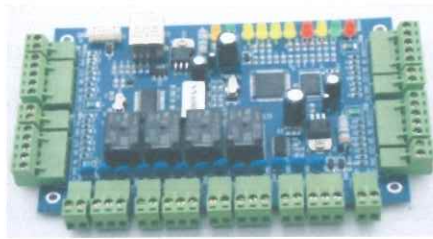


Figure 2.2 Controller

2.6.1 Via relay

Figure 2.3 shows the picture of relay. ^[5] USB Relay Controllers allow computer controlled switching using the USB port of your computer. An NCD USB Relay Board emulates a COM port, allowing you to speak to the relay board using any programming language that supports serial communications. COM drivers allow you to assign any COM port to the USB Relay Board. Many of our relay boards support 8-Channels of 8-Bit / 10-Bit Analog to Digital Conversion (A/D), and can be expanded to control more devices as your needs grow.^[5]



Figure 2.3 Via Relay

2.6.2 Via PLC

Figure 2.4 shows the picture of PLC. [6]Power-line communication (PLC) is a communication method that uses electrical wiring to simultaneously carry both data, and alternating current (AC) electric power transmission or electric power distribution. It is also known as power-line carrier, power-line digital subscriber line (PDSL), mains communication, power-line telecommunications, or power-line networking (PLN).

A wide range of power-line communication technologies are needed for different applications, ranging from home automation to Internet access which is often called broadband over power lines (BPL). Most PLC technologies limit themselves to one type of wire (such as premises wiring within a single building), but some can cross between two levels (for example, both the distribution network and premises wiring). Typically transformers prevent propagating the signal, which requires multiple technologies to form very large networks. Various data rates and frequencies are used in different situations.

A number of difficult technical problems are common between wireless and power-line communication, notably those of spread spectrum radio signals operating in a crowded environment. Radio interference, for example, has long been a concern of amateur radio groups[6].



Figure 2.4 Via PLC

2.6.3 Via Microcontroller

Figure 2.5 shows the picture of microcontroller.[7] A microcontroller (or MCU for microcontroller unit) is a small computer on a single integrated circuit. In modern terminology, it is a system on a chip or SoC. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a

button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.^[7]

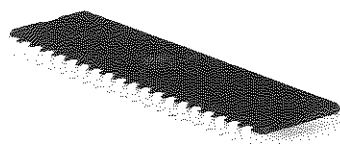


Figure 2.5 Via Microcontroller

2.6.4 Arduino uno

Figure 2.6 show the picture of arduino Uno R3.^[8] Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.^[8]

To complete all of these tasks, we used Arduino IDE Software to create the programming. For the first task, we were asked to turn on an led without using a switch. Then, for the second task, we were asked to turn on 2 units of 12V bulb with using a 5VDC relay and a toggle switch. For this task, we created the program in term of

'turn on relay delay (500)' to turn on the bulb for 0.5 second and the term of 'turn off relay delay (500)' to turn off the bulb for 0.5 second. For the third task, we were asked to control 2units of 12V bulb with 2units of 5VDC relay with using a switch. For this task, we created a same program with the second task that using the term of 'turn on relay delay(500)' and 'turn off relay delay (500)' to turn on and off the bulb for 0.5 second. All of the programming that we created for all of this task can be refered in appendix 1-4.



Figure 2.6 Arduino Uno R3

2.7 Water Pump

Figure 2.7 shows the picture of water pump.^[9] A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: *direct lift*, *displacement*, and *gravity pumps*.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

Mechanical pumps serve in a wide range of applications such as pumping water from wells, aquarium filtering, pond filtering and aeration, in the car industry for water-cooling and fuel injection, in the energy industry for pumping oil and natural gas or for generating cooling towers. In the medical industry, pumps are used for biochemical processes in developing and manufacturing medicine, and as artificial replacements for body parts, in particular the artificial heart and penile prosthesis.^[9]



Figure 2.7 Water Pump

2.8 Material

2.8.1 Stainless Steel

Figure 2.8 shows the picture of stainless steel.[10]In metallurgy, stainless steel, also known as inox steel or inox from French inoxydable(inoxidizable), is a steel alloy with a minimum of 10.5% chromium content by mass.

Stainless steel is notable for its corrosion resistance, and it is widely used for food handling and cutlery among many other applications.

Stainless steel does not readily corrode, rust or stain with water as ordinary steel does. However, it is not fully stain-proof in low-oxygen, high-salinity, or poor air-circulation environments. There are various grades and surface finishes of stainless steel to suit the environment the alloy must endure. Stainless steel is used where both the properties of steel and corrosion resistance are required.

Stainless steel differs from carbon steel by the amount of chromium present. Unprotected carbon steel rusts readily when exposed to air and moisture. This iron oxide film (the rust) is active and accelerates corrosion by making it easier for more iron oxide to form. Since iron oxide has lower density than steel, the film expands and tends to flake and fall away. In comparison, stainless steels contain sufficient chromium to undergo passivation, forming an inert film of chromium oxide on the surface. This layer prevents further corrosion by blocking oxygen diffusion to the steel surface and stops

corrosion from spreading into the bulk of the metal. Passivation occurs only if the proportion of chromium is high enough and oxygen is present.^[10]



Figure 2.8 Stainless Steel

2.8.2 Transparent Glass

Glass is a non-crystalline amorphous solid that is often transparent and has widespread practical, technological, and decorative usage in, for example, window panes, tableware, and optoelectronics. The most familiar, and historically the oldest, types of glass are "silicate glasses" based on the chemical compound silica (silicon dioxide, or quartz), the primary constituent of sand. The term *glass*, in popular usage, is often used to refer only to this type of material, which is familiar from use as window glass and in glass bottles. Of the many silica-based glasses that exist, ordinary glazing and container glass is formed from a specific type called soda-lime glass, composed of approximately 75% silicon dioxide (SiO_2), sodium oxide (Na_2O) from sodium carbonate (Na_2CO_3), calcium oxide, also called lime (CaO), and several minor additives. Many applications of silicate glasses derive from their optical transparency, giving rise to their primary use as window panes.



Figure 2.9 Transparent Glass

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques.

frame work of the study

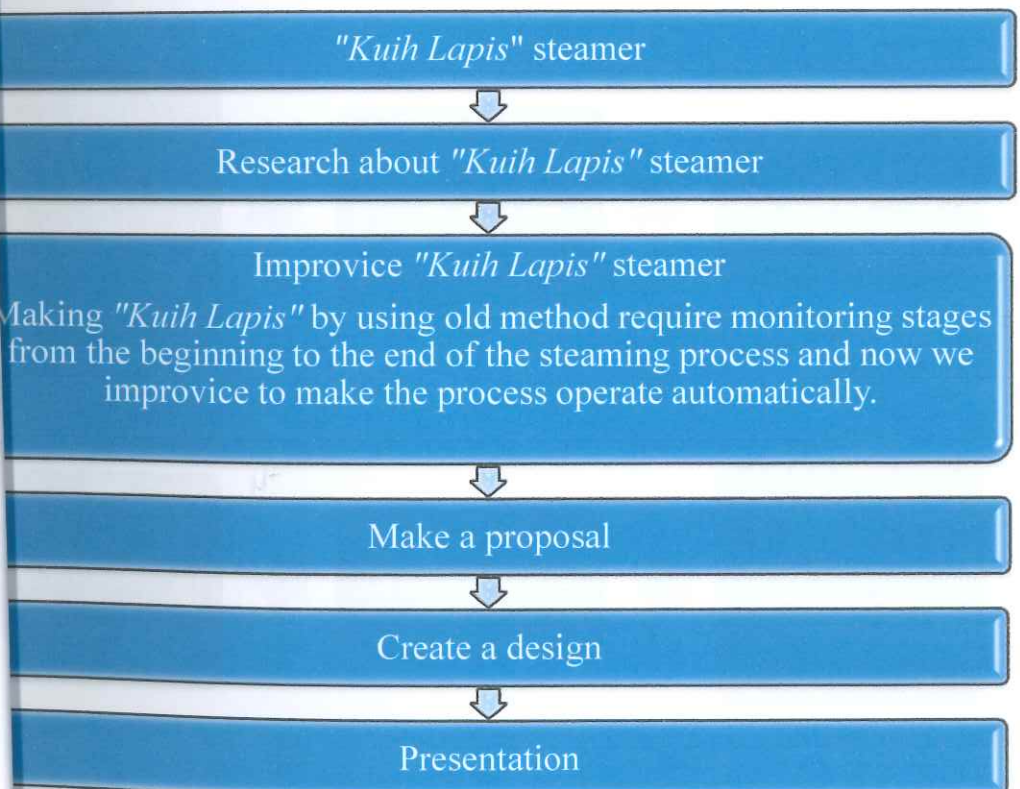
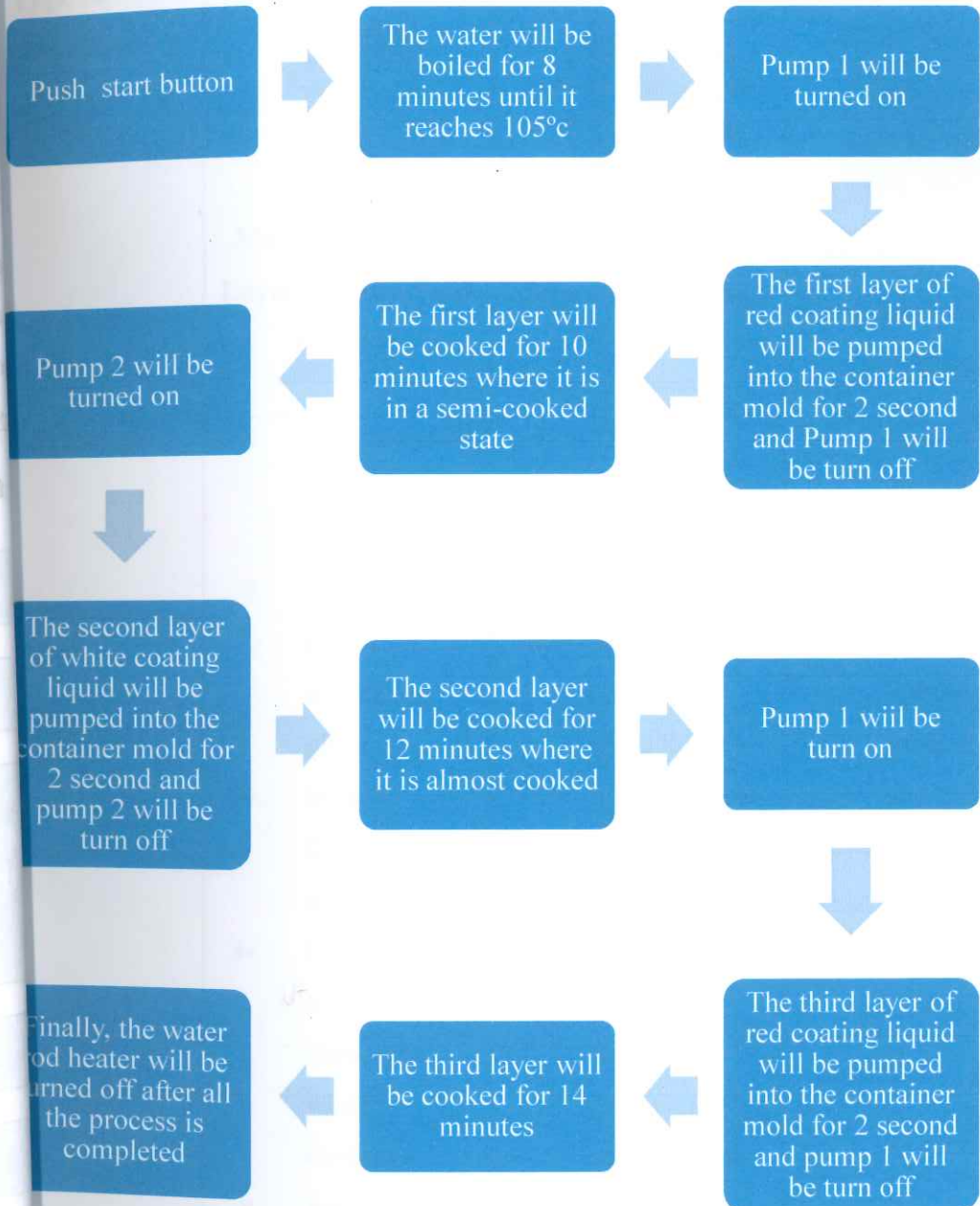





Figure 3.1 : Frame work of the study

3.1.1 Flow Chart Of The Mechanisme Project



2.2 Selection of conceptual design

2.1 Generate Of Conceptual Design

Type of conceptual Design	 <p data-bbox="376 596 646 731">Multi-Function 2-Layer Electric Food Steamer</p>	 <p data-bbox="675 596 958 685">Faber Stainless Steel 3-Tier Food Steamer</p>	 <p data-bbox="1008 613 1215 752">Machine "Kuih Lapis" Via Arduino</p>
Advantages	<ul style="list-style-type: none"> i. ^[12]It can cook 1 to 14 eggs in minutes ii. Contain a useful measuring glass. iii. Multi-function usage. iv. Clear top allows you to view eggs while cooking. v. Auto-off the machine while the 	<ul style="list-style-type: none"> i. ^[13]Steamer with steamboat function. ii. Full-view tempered glass lid or stainless steel look through glass lid. iii. Various setting are perfect for making stews, souses, roast and more. iv. Unique fuse design to 	<ul style="list-style-type: none"> i. Spare part easy to find in the market. ii. Method of use are more easily and quickly. iii. Cost affordable to all.

	machine.	prevent damage from over heating.	
Disadvantages	<ul style="list-style-type: none"> i. The plastic used on the steamer body are quite thin and has some sharp edges that cut me on a couple of occasions. ii. Expensive compared to the other electric food steamer.^[12] 	<ul style="list-style-type: none"> i. The stainless steel used on the steamer body are quite thin and has some sharp edges that cut me on a couple of occasions. ii. The screw and the washer that fastens the handle the lid started rusting. 	<ul style="list-style-type: none"> i. Limited production quantity only for one tray per operation.

Table 3.1 : Generate Of Conceptual Design

ased on studies that have been made, we have chosen a design of “*Kuih Lapis*” machine because the spare part easy to find in the market, Method of use are more easily and cost affordable to all.

2 Concept Selection

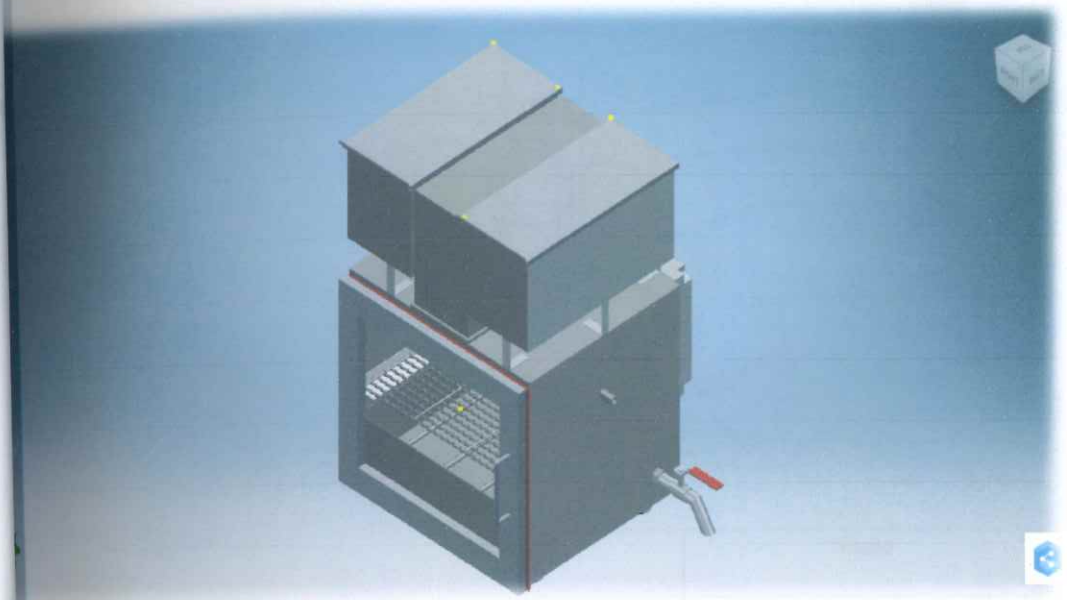


Figure 3.2 : Drawing of Machine “*Kuih Lapis*” Via Arduino

Figure 3.2 show the drawing of Machine “*Kuih Lapis*” Via Arduino. This machine has main part were flour mixture container, stainless steel tray, stainless steel L angle, heater, water pump and boiled water container. Flour mixture container is use for holding different colour of flour mold with is red flour mixture at the right side and white flour mixture at the left side. Next, stainless steel tray is use to support the container mold and stainless steel L angle use to hold the container mold. For the rod heater, it had been placed at the bottom of this machine. This rod heater is use to boil water to produce steam for this machine. Besides that, water pump are use to flow the flour mixture from flour mixture container to container mold through a pipe. Lastly, a water container is use for fill a water inside it before boiling process.