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DEVELOPMENT OF HALAL AUDITOR INFORMATION SYSTEM FOR HALAL CERTIFICATION IN CHICKEN SLAUGHTERHOUSE

FAIZ RAHMAN ARIFIN
NRP. 02411440000114

Supervisor
Prof. Iwan Vanany, ST., MT.Ph.D.
NIP. 197109271999031002

Co-Supervisor
Diesta Iva Maftuhah, ST, MT.
NIP. 197005231996011001

DEPARTMENT OF INDUSTRIAL ENGINEERING
Faculty of Industrial Technology
Institut Teknologi Sepuluh Nopember
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APPROVAL SHEETS

DEVELOPMENT OF HALAL AUDITOR INFORMATION SYSTEM FOR HALAL CERTIFICATION IN CHICKEN SLAUGHTERHOUSE

FINAL PROJECT

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Surabaya, Indonesia

Author:

FAIZ RAHMAN ARIFIN

NRP. 0241144000114

Acknowledge and approved by:

Supervisor	Co-Supervisor
Prof. Iwan Vanany, ST., MT.Ph.D.	**Diesta Iva Maftuhah, ST, MT.**
NIP 197109271999031002	**NIP 197005231996011001**

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DEPARTEMEN TEKNIK INDUSTRI

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Name : Faiz Rahman Arifin

NRP : 02411440000114

Supervisor : Prof. Iwan Vanany, ST., M.T. Ph.D

Co-supervisor : Diesta Iva Maftuhah, ST, MT.

ABSTRACT

As the most Muslim populated country in the world, the availability of Halal product in Indonesia become critical. On 2014 there are only 11.63% of marketed products in Indonesia are halal certified. The high needs of Halal certified product require a strong effort from stakeholders. Meat requires extra consideration in the process of halal certification, and chicken is the most consumed meat in Indonesia. Halal certification should be applied across the supply chain, the start point of the chicken product is the slaughterhouse. Currently halal audit process in slaughterhouse done manually using paper there is lack of information system usage, and there is no integrated database which connect auditor (LPPOM-MUI) and MUI. Audit data collected by LPPOM-MUI need to documented manually so MUI able to review the product. Therefore, the auditor information system will be developed. The system will be modelled by using UML (Unified Modeling Language). Integer Linear Programming was used to determine best option method to implement Halal Auditor Information System.

Key Word: Information System, Halal, Unified Modeling Language, Net Present Value

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PREFACE

Alhamdulillah, all praises belong to Allah SWT, by whose grace, guidance, and blessings, the author can finish this research entitled "Development of Halal Auditor Information System in Chicken Slaughterhouse".

This research is conducted as a requisite to finish Industrial Engineering major and to achieve Bachelor Degree from Institut Teknologi Sepuluh Nopember (ITS), Surabaya. The author would like to express the biggest appreciation and gratitude to those who had supported, motivated, and helped the author during the completion of this research, namely:

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Last, the author realizes that this research is far from perfect. Therefore, constructive criticism and positive suggestions will be very useful in improving the quality of subsequent writing. Apart from all that, the author hope that this report can benefit the readers in general, contribute the academic world, and provide improvement for the company.

Surabaya, July 2018

Author

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CHAPTER 1
INTRODUCTION

This chapter will discuss research background. problem formulation will be answered, the objective of research, the benefit of research and scope of this research.

1.1 Background

Every people need food, not only to meet daily energy required but nowadays food can be seen in many different ways, like physical fitness, nutrition and lifestyle. Muslim cannot eat all food, food which allows being eaten by Muslim called Halal food. The halal concept is not limited to food safety and its quality but also include process control, packaging, storage and delivery (Yusaini et al., 2016).

According to LPPOM-MUI (2010), the world's Muslim population currently stands at 1.8 billion or 23% of the population worldwide. In Indonesia, the Muslim community every mile reaches 204.6 people, or 88% of the Indonesian population are Muslims. In 2010, the halal food market accounted for 16% of the world's food trade and was estimated to be worth more than USD 500 billion per year (Omar & Jaafar, 2011). The global Halal food market value for trade in Halal foods is estimated reach USD 2.55 trillion by 2024 (Felton et al., 2017). The growing of halal food not only because of the growing number of Muslim it is because halal food provides hygienic and healthy food, but it also attracts both Muslim and non-muslim customer. For Muslim buyer is not the matters of religion of the business owner its about efficacy and quality of the product.

Halal food not only about the ingredients of food, and the way of an animal slaughtered, it is also about the sources of food, food cleanliness, reliability and its quality assurance. It makes the customer not only concern on food ingredient but want to make sure about all the activities involved in the food

supply chain are according shari'a, from the source of material until the food arrived on the plate of the customer

Meat requires extra attention in the process of halal certification. Because in the process of halal certification, instead of raw materials, storage process, delivery process, and the animal slaughter process are also critical things to consider. Chicken meat is one of the livestock commodities which mostly consumed in Indonesia. Therefore, supervision to produce high-quality chicken meat, free from chemical residues, and safe for consumption needs to be done. Following table provide information about meat consumption per capita per week from 2012 -2016, data obtained from the Director General of Animal Husbandry and Animal Health of the Ministry of Agriculture.

Table 1. 1 Fresh meat consumption data per week from 2012-2016

No	Commodity	Unit	Year				
			2012	2013	2014	2015	2016
A	**Fresh Meat**						
1	Beef	kg	0,007	0,005	0,005	0,008	0,008
2	Bufalo meat	kg	0,000	0,000	0,000	0,000	0,000
3	Lamb	kg	0,000	0,001	0,000	0,000	0,000
4	Pork	kg	0,004	0,004	0,003	0,004	0,005
5	Broiler meat	kg	0,067	0,070	0,076	0,092	0,098
6	Local chicken meat	kg	0,010	0,009	0,010	0,012	0,012
7	Other poultry meat	kg	0,001	0,001	0,001	-	-
8	Other meat	kg	0.001	0.001	0.001	-	-

Lembaga Pengkajian Pangan, Obat-obtain dan Kosmetik Majelis Ulama Indonesia (LPPOM-MUI) review all halal product in Indonesia. This institution issued a halal certification to all product in Indonesia which meet Halal Requirement. Consideration of halal certification not only about ingredients of the food. LPPOM-MUI also consider the company's policy on halal products, production facilities, supplying procedure, and others. Determining halal not only in the consumption of food and beverages but health products and cosmetics as

well. Analyzing halal has its complexity, because every product has different production process, for example in a slaughterhouse, lamb and chicken has different slaughter process because it has a different structure. After LPPOM-MUI audit the company, then MUI can determine either the product is halal or not. According to LPPOM-MUI in 2013, there is 120 slaughterhouses accredited Halal by MUI. While there are 700 of a total slaughterhouse in Indonesia, it means there are only 17,14 % of a whole slaughterhouse in Indonesia certified by Halal MUI. Halal certification procedure in a slaughterhouse is regulated in Halal Assurance System (HAS) 23103.

MUI has implemented a website-based information system called CEROL-SS23000 to conduct halal certification online, so the companies do not need to come directly to propose halal certification. By developing CEROL-SS23000, it is expected that the halal certification process becomes more comfortable and faster. The scope of CEROL includes a registration process, upload document, payment until the issue halal certificate, but LPPOM-MUI still has to audit directly to the company. The audit process done manually using paper. There is lack of information system usage, audit data collected by LPPOM-MUI need to documented manually so that MUI can review the product. The scope of auditing process is an animal condition, slaughter status, slaughter equipment, slaughtering procedure, processing and storage. In manual audit form, there is no instruction about auditing procedure, although the audit of halal certification in some case become complicated, especially in slaughtering house. Sometimes some beginner auditor experiencing difficulty in the auditing process.

Therefore, this research will focus to develop an information system to help LPPOM-MUI in auditing process at chicken slaughtering house and its financial investment analysis. This information system expected to help LPPOM-MUI, MUI, and chicken slaughtering companies in the process of halal auditing certification, there will be integrated database and information between MUI, LPPOM-MUI and companies. Before developing an information system, author will model business process and procedure of auditing chicken slaughtering house by using Unified Modeling Language (UML). Unified Modeling Language

(UML) is a standardized modeling language enabling developers to specify, visualize, construct and document artefacts of a software system. This modeling tool as a foundation for the author to develop information system in the process of halal auditing certification at chicken slaughtering house.

1.2 Problem Formulation

Based on background and observation result conducted in LPPOM MUI, so problem formulation for this research is to develop information system on the audit process of Halal Certification at a chicken slaughterhouse and its investment evaluation

1.3 Research Objectives

This research aims at the following objective:

1. To develop new Halal Auditor Information System (HAIS) at a chicken slaughterhouse
2. To analyse the feasibility investment of Halal Auditor Information System (HAIS) at the chicken slaughterhouse.

1.4 Research Benefits

By research objective, the following benefit will be obtained by LPPOM MUI:

1. LPPOM MUI Obtain information system to help LPPOM MUI on halal certification audit process at chicken slaughtering house.
2. LPPOM MUI obtains information about investment analysis of developing an information system to help LPPOM MUI on halal certification audit process at chicken slaughtering house.

1.5 Research Scope

The scope of this research consist of limitation and assumpation.

Limitation

Limitation for this research are:

1. An information system that will be developed is an information system that helps LPPOM MUI on halal certification audit process at chicken slaughtering house.
2. Auditing process scope is an animal condition, slaughter status, slaughter equipment, slaughtering procedure, processing and storage, delivery, and availability of traceability and Halal Assurance System (HAS) system.
3. A feasibility study is calculated using the Net Present Value method

Assumption

The assumption for this research are:

1. There are no changes regarding halal criteria for Slaughtering House in Halal Assurance System 23103 LPPOM MUI.
2. The interest rate used is 9,75% (BCA Corporate Interest Rate)

1.6 Report Outline

This research consists of 7 chapters which are:

CHAPTER I INTRODUCTION

This chapter explains research background, problem formulation, research objectives, research benefits, limitations and assumptions used in this research. There are two objectives of this research which are to develop information system on halal certification audit process at chicken slaughtering house and to understand the feasibility of developing information system on halal certification audit process at chicken slaughtering house. Furthermore, report Outline also will be discussed in this chapter to give a big picture of this research.

CHAPTER II LITERATURE REVIEW

This chapter explains the theoretical description of the problems and research methods derived from the reference as a foundation in conducting this research. Theories discussion aims to provide an overview of the concepts used in conducting this research to the reader. Theories used derive from various articles,

journals, previous research, and other literature. The literature review applied in this research are, unified modeling language, definition of halal and halal food, halal slaughtering standard, halal assurance system LPPOM MUI, IT investment analysis, payback period, net present value, return on investment, internal rate of return and halal certification MUI website based information system (CEROL – SS23000)

CHAPTER III RESEARCH METHODOLOGY

Research methodology chapter presented as systematic guidance of conducting the research. The research methodology is presented in a flowchart follow with the description of activities that are involved in this research. This chapter explains the process of developing user information system to help LPPOM MUI in auditing halal certification at chicken slaughtering house and its financial investment analysis. Start from start from determining background, problem formulation, research objectives and research scop, then conducting literature review and field study to get new insight and become the foundation of conducting this research, collecting necessary data by interviewing expert and from other resources, before developing information system author will design information system modeling using unified modeling language (UML) methodology, Information system will be developed after the model valid. Then LPPOM-MUI will try to use this software, to make sure the software is worked. After that evaluating financial investment of developing information system using Benefit-Cost Analysis, and the last step is to conclude the research and give a recommendation for further research

CHAPTER IV DATA COLLECTION

Data collection chapter explain collected data to develop an information system to help LPPOM MUI in auditing halal certification at a chicken slaughterhouse and its financial investment evaluation along with its processing which is processed based on Chapter III. There are 2 type of data will be collected, data primer will

be collected by interviewing expert auditor from LPPOM-MUI, while data seconder will be collected from other sources such as article, journal and book.

CHAPTER V DEVELOPING INFORMATION SYSTEM

This chapter will explain how to develop the information system; Firstly flowchart will be conducted to represent the business process of halal auditing certification in a chicken slaughterhouse. After that unified modeling language will be performed as a foundation to develop an information system. UML will consist of several diagrams including use case diagrams, activity diagrams and sequence diagram. Information System will be developed based on valid UML. The last step is designing Halal Auditor Information System implementation activities.

CHAPTER VI INFORMATION SYSTEM INVESTMENT ANALYSIS

This chapter will explain about investment analysis of developing an information system to help LPPOM MUI in auditing halal certification process at chicken slaughtering by using time cost trade-off analysis and net present value.

CHAPTER VII CONCLUSION AND SUGGESTION

The last chapter explains the conclusions of the research as well as suggestions or recommendation for improvement for the LPPOM MUI and further research development.

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CHAPTER 2
LITERATURE REVIEW

This chapter will discuss about a theory which supports this research, theories obtained from many resources such as previous book, journal, article, previous research and other supporting data.

2.1 Unified Modeling Language

UML (Unified Modeling Language) is the modeling language for systems software that is object-oriented. Modeling is used for simplifying complex issues in such a way that it is easier to learn and understand (Nugroho,2009).UML can make an object scalable and robust in execution. UML become common language to use as a foundation for the programmer to develop software. Compare to the other modeling language, in developing software UML is more applicable because it is object-oriented and there is a lot of type of UML diagram so that UML could explain the system more detail. Below is the comparison between UML with flowchart, and data flow diagram.

Table 2. 1 Modeling language comparison

Modeling Language	Explanation	Advantages	Disadvantages
Unified Modeling Language	Modeling language for a system that is object-oriented	Because it is an object-oriented system, it will be easier to understand for people who don't have a basis in programming. There are a lot of type of diagram so that the model will be more detail	Complex to use, because there are a lot of diagrams

Modeling Language	Explanation	Advantages	Disadvantages
Flowchart	Is a diagram with graphic symbols which show a logarithmic flow or a process symbolized with a box shape and connected with an arrow	Simple and easy to understand, able to provide solution step by step.	Only provide a basic algorithm of the process
Data Flow Diagram	Modeling language use graphical as a representation of the flow of data through an information system	Easily communicated by professionals users and program makers, more applicable for complex system	More focus on system function

There are three models in UML, which are use case model, static model, and dynamic model (Kim, 2003). Below is an explanation of each model:

1. Use Case Model

Use case model explains the needs of the system from the user's point of view (users involved in the software), it represents the processes in the system that must be handled. This model consists of use cases and actor, use case represents with oval and the explanation of activities inside of it. The actor is an exteral entity which interacted each other in the systemcases and model of the system itself. Below is the example of use case model in

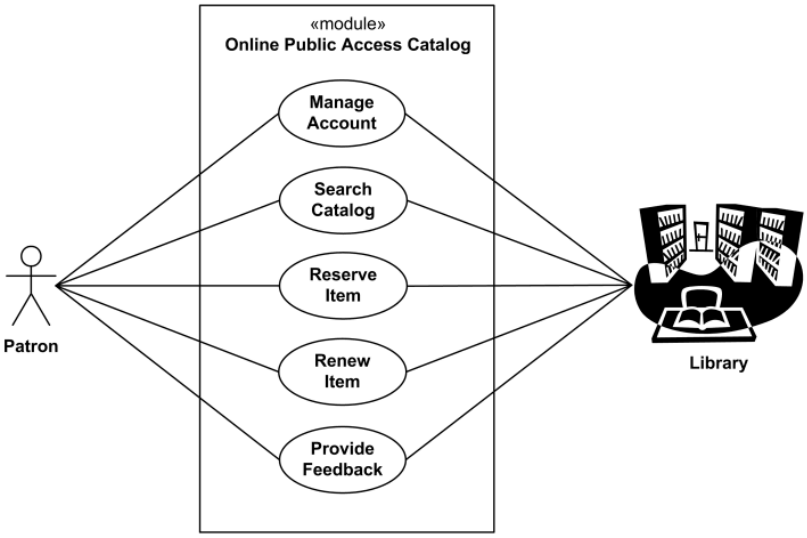


Figure 2. 1 Example of the usecase diagram (UML-diagram.org)

2. Dynamic Model

In every system there is communication between object, dynamic model able explains the behaviour that occurs within the system. There are two types of the dynamic model will be conducted explain on the table below:

Table 2. 2 Dynamic Model Type

Diagram Type	**Explanation**
Activity Diagram	Shown activity in a system, which activities can be done parallel, and shown the alternative activities
Sequence Diagram	Shown the time between each activity

2.2 Integer Linear Programming

Linear programming is a tool for solving optimization problems (Michael,2017) Linear Programming is a method to determines an optimal decision with the most value advantageous for objective function among the possibilities that meet the constraints. A linear system is a system that has a provision where different inputs will have different results.

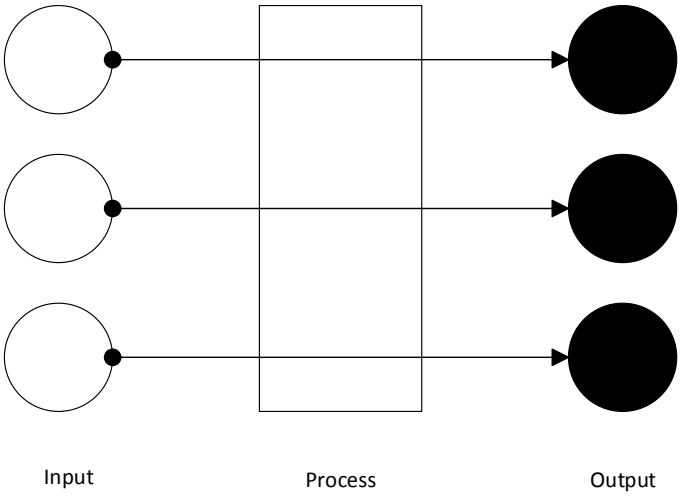


Figure 2. 2 Linear Programming Scheme

While the non-linear system, is a system that is not fixed, and has high sensitivity. In non linear system different inputs can produce the same output. One input can have more than one output.

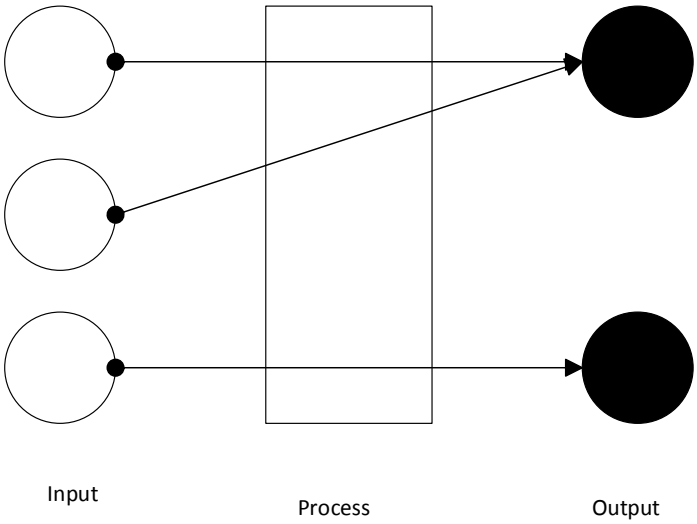


Figure 2. 3 Non Linear Programming scheme

Linear Programming determine the value of each variable so the value of the objective function becomes optimum (maximum or minimum) by considering the constraint for every input. There are 4 possible solutions of Linear Programming: Only has one solution, more than one solution, no solution, unbounded solution.

Integer linear programming is a mathematical optimization or feasibility program in which some or all of the variables are restricted to be integers.

The criteria of Integer linear programming are:

a. The objectives to be achieved must be expressed in form linear function. This function is called the objective function.
b. There should be alternative solutions. Solutions which create function values optimum goals (maximum profit, minimum cost, and other function) are must be selected.
c. Resources are available in limited quantities (limited materials, etc.). The restrictions must be expressed in the linear inequalities.
d. All variables restricted to be integer.

Integer Linear Programming will be used to determine best option of Halal Auditor Information system implementation project. Below is the comparison between integer linear programming and other method.

NO	Aspect	Integer Linear Programming	Critical Path Method
1	Expected Benefit Consideration	Consider expected benefit after information system implementation.	Do not calculate expected benefit after information system implementation.
2	Purpose	Calculate the most profitable option.	Determine shortest possible time for which an activity can be scheduled
3	Deadline project	Not necessary	Important to determine the best option.

2.3 Halal

The word halal comes from the word hall which means "loose" or "unbound". Etymologically the word halal means things that can be done because it is free and not bound by the provisions that prohibit it. While the phrase thayyibat (the good) that is all things normally considered good and worthy to be used in society that does not arise because of the influence of tradition, then things that are seen thayyib (Qardhawi,1993)

The first basic set by Islam is the origin of something created by God is lawful and mubah (Permitted). Nothing is forbidden, except for there the legitimate passage of the Shari '(which is authorized to make the law itself, Allah and the Messenger) vetoed it. If there is no legitimate passage, because there are some weak Hadiths or no firm passages (shariah) that determined haram, then it remains as it originated, namely mubah (Qardhawi,1993.)

Halal and Haram become important for all Muslim, one of the shaheed hadist which commanded Muslims to pay attention to the lawful and forbidden a matter is as follows:

"The lawful is clear, as the haram is clear. Between the two there is a *sunhat* still vague case that most people do not know. Whoever avoids the case of *sunhat*, then he has saved his religion and honour. Whoever is falling into the case of *syubhat* (vague), then he can fall on the case of haram. Just as there are shepherds, who pasture their livestock around the prohibitive land that almost plunges it. Know, every king has a prohibition of land and the prohibition of God on earth are the things that are forbidden by Him." (HR. Bukhari Muslim)

Based on hadits above provision about Halal and Haram applicable to both behaviour and things. Between Halal and Haram, there is *Syubhat* (Vague) which requires Muslim to pay attention when performing all activities.

Consuming Halal and thayyib (good) is a manifestation of devotion to Allah SWT. According to Qardhawi (1993), there are 11 things that made Islam the principle of halal and haram, namely:

1. Everything is law mubah (allowed);
2. Determining halal and haram is merely the authority of Allah SWT;
3. To forbid Halal and justify the haram is equal to the behaviour of Shirk to Allah SWT;
4. Something is prohibited because it is terrible and dangerous;
5. On something Halal does not require the haram;
6. Something that carries it to the Haram is also Haram;
7. To deal with the haram is haram;
8. Good intentions do not abolish unlawful laws (Haram);
9. Be careful of those who are not to be involved in haram;
10. Something forbidden applies to everything;
11. The state of emergency allows prohibited to be recognized.

2.3.1 Halal Food

Halal food is food which adheres to Islamic law, as defined in the Koran. Food which consumed by Muslim must be halal and good as commanded by Qur'an Surah Al-Baqarah verse 168 :

وَقَطَّعۡنَٰهُمۡ فِي ٱلۡأَرۡضِ أُمَمٗاۖ مِّنۡهُمُ ٱلصَّٰلِحُونَ وَمِنۡهُمۡ دُونَ ذَٰلِكَۖ وَبَلَوۡنَٰهُم بِٱلۡحَسَنَٰتِ وَٱلسَّيِّـَٔاتِ لَعَلَّهُمۡ يَرۡجِعُونَ ١٦٨

Translation: O mankind, eat from whatever is on earth [that is] lawful and good and do not follow the footsteps of Satan. Indeed, he is to you a clear enemy. (QS Al-Baqarah (2):168).

Based on the verse above every Muslim commanded to eat *Halal* and *Thayyib.* Thayyib mean that the food is clean, useful and not harmful. That verse not only states that consuming a lawful law is mandatory because it is written in the Koran but also shows that it is one form of the embodiment of gratitude as one of God's creatures which given sense to distinguish which one is good and which one is bad for our soul and our body.

Definition of food according to government regulation RI number 28, 2004 food is everything comes from natural resources either processed or not processed

for human consumption including additives food, raw material food and other food which used in the process of making food.

Food has a broad understanding, from essential food to a healthy and productive human life (balance of calories, carbohydrates, proteins, fats, vitamins, fiber, and other necessary substances) and food consumed for social and cultural interests such as for fun, fitness, beauty, etc. Food not only about staple food such as rice but food related to other things.

Every people need food, not only to meet daily energy required but nowadays food can be seen in many different ways, like physical fitness, nutrition and lifestyle. Muslim cannot eat all food, food which allows being eaten by Muslim called Halal food. The halal concept is not limited to food safety and its quality but also include process control, packaging, storage and delivery (Yusaini, 2016).

Definition halal food according to the Ministry of Religious Affairs in the Decree of the Minister of Religious Affairs No. 518 of 2001 about Examination and Determination, halal food is food that does not contain elements or materials which forbidden to use in Islam, and its processing is not contrary to Islamic Shari'a.

Halal food is good food and drinks consumed for human, avoid the najis thing and obtained in a good way. Thayyib or good is something that is felt good by the senses or soul, or anything other than the painful and disgusting (Yaqub, 2009)

Food can be considered as Halal if it meets at least three terms, comes from halal raw materials, obtained lawfully, and processed lawfully.

a. Comes from Halal Substances

Food which comes from Halal Substances means the food is consumable because there is no prohibition that prohibits it. Such as chicken meat, cow meat, and fishes.

b. Obtained in a lawful manner

Obtained in Lawful Manner means that the food/drink consumed is obtained in a legal and justified way according to sharia as obtained through trade, farming, mutual giving of others, and other ways.

c. Processed in Lawful Manner

Food that was originally halal can be haram if the way of processing the food is not by shari'a. For instance, a cow that slaughtered with the name other than Allah, as stated in the Koran surah Al-Baqarah verse 173 :

بَاغٍ غَيْرَ اضْطُرَّ فَمَنِ ۖ اللَّهِ لِغَيْرِ بِهِ أُهِلَّ وَمَا الْخِنْزِيرِ وَلَحْمَ وَالدَّمَ الْمَيْتَةَ عَلَيْكُمُ حَرَّمَ إِنَّمَا
رَحِيمٌ غَفُورٌ إِنَّاللَّهَ ۚ عَلَيْهِ إِثْمَ فَلَا عَادٍ وَلَا

Translation: Allah only forbids you carcasses, blood, pork, and animals that (when slaughtered) is called (name) besides Allah. But whoever is obliged to eat and does not want it and does not exceed the limit, there is no sin for him. Allah is Forgiving, Merciful.

Haram in the Islamic Shari'a is very narrow, and halal is very wide. That's why there are a lot of passages that are valid and firm regarding haram. If there is no halal-haram information, then it back to the original law that is lawful and included in the category that is forgivable by Allah

2.3.2 Halal Slaughtering Standard

Fatwa MUI No. 4 of 2003 about Haram on Some Foodstuffs, one of them is meat. Meat which comes from halal animals can become Haram if slaughtered without following the rules of Islamic shari'a. Things that become a critical point of the process of slaughter are as follows:

A. Slaughtered Animal Standard

The slaughtered animal must meet the following condition:

1. The slaughtered animal is a lawfull animal.
2. The slaughtered animal must be alive.

3. Animal health condition must follow standard requirement set authorized institution.

B. Animal Slaughter Standard

Animal slaughter must meet the following condition:

1. Animal slaughter is Muslim and baligh.
2. Understand about slaughtering syar'I process.
3. Have expertise in the slaughter.

C. Slaughter Tools Standard

Slaughtering equipment must meet the following condition

1. Slaughtering tools are sharp
2. Nail, fangs and bones are forbid

D. Slaughter Process Standard

Slaughtering process must satisfy the following condition:

1. The process of slaughter is carried out with the intention of slaughtering and calling the name of god
2. Slaughtering process carried out by draining blood from oesophagus, trachea and arteries carotids
3. Slaughtering process is done once and fast
4 Ensure blood flow and movement of the animal as a sign if the animal is alive
5. Ensure the animal dead because of the slaughtering process.

E. The process, Storage and Delivery Standard:

The process, storage and delivery must meet the following standard:

1. Processing is done after the animal is dead
2. An animal which failed to die in the process of slaughter must be separated
3. Storage process must be differentiated between halal and non-halal product.
4. Storage process must be differentiated between halal and non-halal product.

F. Others Standard

There is other regulations standard set by MUI such as:

1. Slaughtered animal confronted to Qibla (Sunnah)
2. Slaughter is done as much as possible manually without stunning process
3. Stunning to make slaughter process easier is mubah (allowed) and must follow this requirement :

i. The stunning process doesn't kill the animal
ii. Stunning is done to make the slaughter process easier
iii. Stunning is done not to torture the animal
iv. Stunning equipment only used for Lawfull (Halal) Animal

4. Fattening the livestock is haram

2.4 Halal Assurance System (HAS) LPPOM MUI

Halal Assurance System is a management system which is arranged, implemented and maintained by halal certificate holder company to maintain halal production process by LPPOM MUI. Every manufacturer must meet the needs and rights of consumers, including Muslim consumers. Production of halal products is part of the company's responsibility to Muslim consumers. In Indonesia, to provide confidence to consumers that the consumed products are halal, the company needs to have a halal certificate MUI. If the company meet the requirement, MUI will provide company for two years certification. During this period, the company must be able to assure MUI and Muslim consumers that the company always maintains the halal consistency of its products. Therefore LPPOM MUI requires companies to set up a system called *Sistem Jaminan Halal* (Halal Assurance System) and documented as *Sistem Jaminan Halal* manual.

What the purpose of preparing and implementing HAS in the company is to maintain the continuity of halal production process, so that the resulting product can always be guaranteed halal according to the stipulation of LPPOM MUI. HAS can be applied to various industries such as food industry, medicine, cosmetics both in large and small scale and allows for service-based industries such as importers, distributors, transportation, and retailers. SJH is a framework

that is monitored continuously and reviewed periodically to provide adequate direction for the implementation of halal production process activities.

2.5 CEROL-SS23000

CEROL-SS23000 is an LPPOM MUI halal certification service system online; With this system, companies can apply for halal certification of products by online without the time and place restriction.

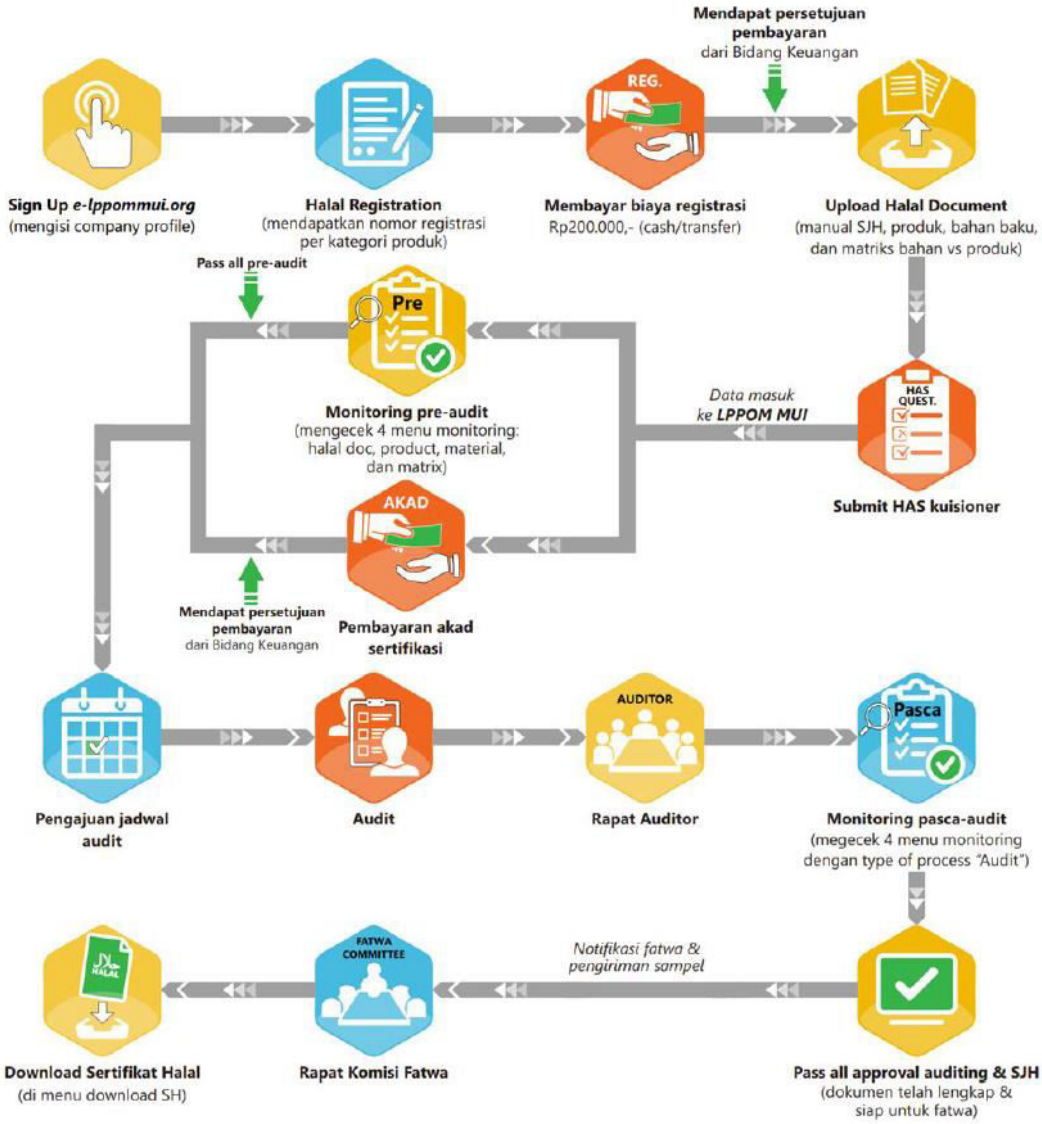


Figure 2. 4 Online certification procedure (CARROL-SS23000 manual)

The first step of online Halal Certification is to register account and input required data. There are five types of registration fields provided by LPPOM MUI

which are: manufacturing industry, restaurant, slaughterhouse, catering and kitchen.

After the company register the account, the company required to pay the registration fee through the bank, then the company must upload the required documents. Each type of business has different required documents. The following are documents required for food industry and slaughterhouse:

Documents required for the food industry are:

1. Administration Form Rp.100,000 (Domestic) Rp.200.000 (Overseas).
2. Photo size 3X4 2 Sheet, Owner.
3. Photo Copy of ID Card 1 Sheet, Owner.
4. Copy of ID Card 1 Sheet, Employee (Internal Auditor).
5. Appendix Menu List.
6. Raw Materials Attachment.
7. Copy of valid certificate of Halal Chicken & Meat.
8. List of Raw Materials for All Halal Certified Products.
9. Raw Material Matrix for Each Halal Certified Product.
10. The document is supporting material.
11. Copy of Halal Certificate The old product (for certification of development
    renewal).
12. HAS Manual for a new company or HAS Manual Revision for companies that already have Halal Certificate (if any).
13. Copy of HAS status or HAS Certificate (for companies that already have Halal Certificate).
14. Flowchart of the production process of the certified product.
15. Factory location map (for new company/factory).
16. Factory layout (for new company/factory). If the plant is part of a site/complex factory, then also attach the entire plant site layout.
17. Statement of production facilities free of pork elements.

18. List of factory addresses, Marlon, warehouses (including central product warehouses), and pre-production preparation facilities (e.g. mixing facilities, weighing, drying).
19. Company profile (for a new company).
20. The design of the audit trip from departure to return (special external audit).
21. Letter of the ministry of health.
22. NPWP.
23. Domicile.

Documents required for slaughterhouse:

1. Administration Form Rp. 100,000 (Domestic) Rp.200.000 (Overseas).
2. Photo size 3X4 2 Sheet, Owner and Slaughter.
3. Photo Copy of ID Card 1 Sheet, Owner.
4. Copy of ID Card 1 Sheet, Employee (Internal Auditor).
5. List of Slaughter Officers, Slaughtering Methods and Stunning Methods.
6. Copy of Halal Certificate of old product (for certification of renewal).
7. HAS Manual for a new company or HAS Manual Revision for companies that already have Halal Certificate (if any).
8. Copy of HAS status or HAS Certificate (for companies that already have Halal Certificate).
9. Flowchart of the production process of the certified product.
10. Slaughterhouse location map.
11. Slaughterhouse building layout (for new slaughterhouse). If the slaughterhouse is part of a building site/complex, then also attach the whole building site layout.
12. A statement that the slaughterhouse facility only produces halal products.
13. List of slaughterhouse addresses, Independent Boning Room (if separate), and warehouse.
14. Company profile (for a new company).
15. Audit travel design from departure to return (overseas audit only).

16. Letter of the ministry of health.
17. NPWP.
18. Business Domicile License.

Based on document list above, table below show the differences between required documents for halal certification at the food industry and slaughter house.

Table 2. 3 Difference document needed between food industry and slaughterhouse

Food Industry	Slaughter House
Copy of valid certificate of Halal Chicken & Meat	List of Slaughter Officers, Slaughtering Methods and Stunning Methods
List of Raw Materials for All Halal Certified Products	List of Slaughter Officers, Slaughtering Methods and Stunning Methods
Appendix menu list	
Raw material attachment	

Furthermore, in the audit process there are some differences between the food processing industry and slaughterhouses, In the slaughterhouse industry, slaughtering techniques become very critical things to be considered, based on standard halal slaughtering there are some activities if that activity is miss procedure then the meat become not halal. For example, stunning process, if there is miss procedure in the stunning process and causing an animal to die before slaughter or to torture an animal, the chicken cannot be consumed (Haram).

After uploading certification data, the company must conduct post-audit monitoring. Post-audit monitoring is recommended every day to determine if there is any discrepancy in the audit results and if there is any discrepancy to make improvements. If the MUI agrees that the product of the company being audited is halal, then the Company may download the Halal Certificate in softcopy form in CERROL. The original halal certificate can be obtained at

LPPOM MUI Jakarta office and can also be sent to the company address. A halal certification is valid for 2 (two) years.

2.6 Information System Investment Analysis

Information system investment analysis is an approach to policy recommendation that permits the analyst to compare and advocate policies by quantifying their total monetary cost and benefits to evaluate the feasibility of the investment of information system. Information system investment analysis is a technique that done based on the calculation of "profit-loss" which valued by the unit of money. Not only tangible aspect, but information system investment analysis also calculates intangible aspect rationally in a unit of money. Project consider as profitable if "profit", or benefits higher than the cost.

The project/investment measured with benefit and cost, benefit are the sum of the maximum amounts that people would be a willingness to pay to gain outcomes that they view as desirable. While Cost is the sum of the maximum amounts that people would be willing to pay to avoid consequences that they consider as undesirable.

The challenge of Investment Analysis method is the evaluator must be able to identify and convert all benefits and costs generated by the project/investment into economic value, so the feasibility of the project can be analyzed by using financial tools analysis such as payback period, net present value, return on investment and internal rate of return.

According to Frederick H. Wu in his book Accounting Information Systems, Theory and Practice, the cost components associated with developing an information system can be classified into four categories:

1. Procurement Cost

Procurement costs are all costs incurred related to hardware procurement. Such as cost of hardware procurement consultation, hardware purchase cost, hardware installation cost, facility cost (space, air conditioner, etc.), the capital cost for hardware procurement, managerial cost and personnel for hardware

procurement. This procurement fee is usually issued in the first year (initial cost) before the system is operated unless the purchase of hardware is done by leasing.

2. Start-Up Cost

Start-Up Cost or operational preparation costs are all costs incurred related to eh effort to make the system ready to be operationalized. Operational preparation costs include purchasing software cost, information system software installations, communication devices installation cost.

3. Project Related Cost

Project Related Cost is an associated with developing the system including the cost of its application. Project costs include: cost analysis system; such as fees for collecting data, documentation costs (paper, photocopy, etc), meeting fees, staff analyst fees, managerial costs in the analysis phase of the system,cost of system design such as documentation costs, meeting fees, staff analyst fees, programming staff costs, purchase costs of application software, managerial costs in the system design stage, system implementation costs, such as the cost of making new forms, data conversion costs, human resources training costs, managerial costs in the application phase of the system.

4. Ongoing and Maintenance Cost

Ongoing and Maintenance Cost is a cost to make the system operate properly and maintain information system while it is running. On going and maintenance cost consists of : personnel costs (operator, administrative staff, data processing staff, data supervisory staff), overhead costs (telephone, electricity, insurance, security, supplies), hardware maintenance (reparation, service) software maintenance (program modification, addition of program module), equipment and facilities maintenance cost, managerial cost in system operation, contract cost for consultant during system operation, depreciation cost. Operational and maintenance costs typically occur routinely over the operational life of the system.

While the components of benefit or effectiveness because of information system can be identified as follows:

1. Costs reduction benefits

2. Error reduction benefits

3. The icreased speed of activity

4. The benefits of improving management planning and control.

There are some methodology in conducting Investment Analysis which are:

2.6.1 Payback Period

Payback period is one of benefit-cost analysis method which measures the time required to recover the initial cost of an investment. Payback period shows the comparison between initial investment and the annual cash flow. The longer payback periods are typically not desirable for investment positions. The payback period of investment can be calculated bu using following formula:

$$Payback\ Period = n + \frac{a - b}{c - b} + 1$$

With :

n = Years before full recovery

a = Initial investment

b = Cumulative cash flow on year n

c = Cumulative cash flow on year n+1

2.6.2 Net Present Value (NPV)

Net present value is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. Time value of money concept becomes important to calculate NPV. Because his method uses the discount rate to affect the value of or the cash flow. The formula to calculate NPV is:

$$NPV = -Initial\ Investment + \frac{C1}{(1+i)^1} + \frac{C2}{(1+i)^2} + \frac{Cn}{(1+i)^n}$$

With

Cn = Total cash flow at year n

I = Interest rate

2.6.3 Return on Investment

The method of return on investment is used to measure the percentage of benefits generated by a project compared to the costs incurred. The higher value of return on investment of a project, more profit will be generated by the project, if ROI is lower than 0, then the project is not profitable for the organization/company. The formula to calculate Return on Investment is :

$$\text{Return on Investment} = \frac{\text{Income} - \text{Investment}}{\text{Investment}} x\ 100\%$$

2.6.4 Internal Rate of Return

The internal rate of return method calculates desired interest rate that will make the sum of the present value of each cashflow at that interest rate is equal with the present amount of the initial cash outflow (project value). IRR is used to determine whether the investment feasible or not, the Internal Rate of Return must be higher than the Minimum Acceptable Rate of Return or Minimum Attractive Rate of Return. The minimum acceptable rate of return is the minimum rate of return on investment that investor willing to accept before starting a project, given its risk and the opportunity cost of forgoing other projects. The formula of Internal Rate of Return is :

$$\text{IRR} = \text{i1} + \frac{(\text{i2} - \text{i1})\ \text{x NPV1}}{\text{NPV1} - \text{NPV2}}$$

With

i1 = Interest rate for positive NPV

i2 = Interest rate for negative NPV

NPV1 = NPV positive with interest rate i1

NPV2 = NPV negative with interest rate i2

2.6.5 Selected information System Investment Evaluation Method

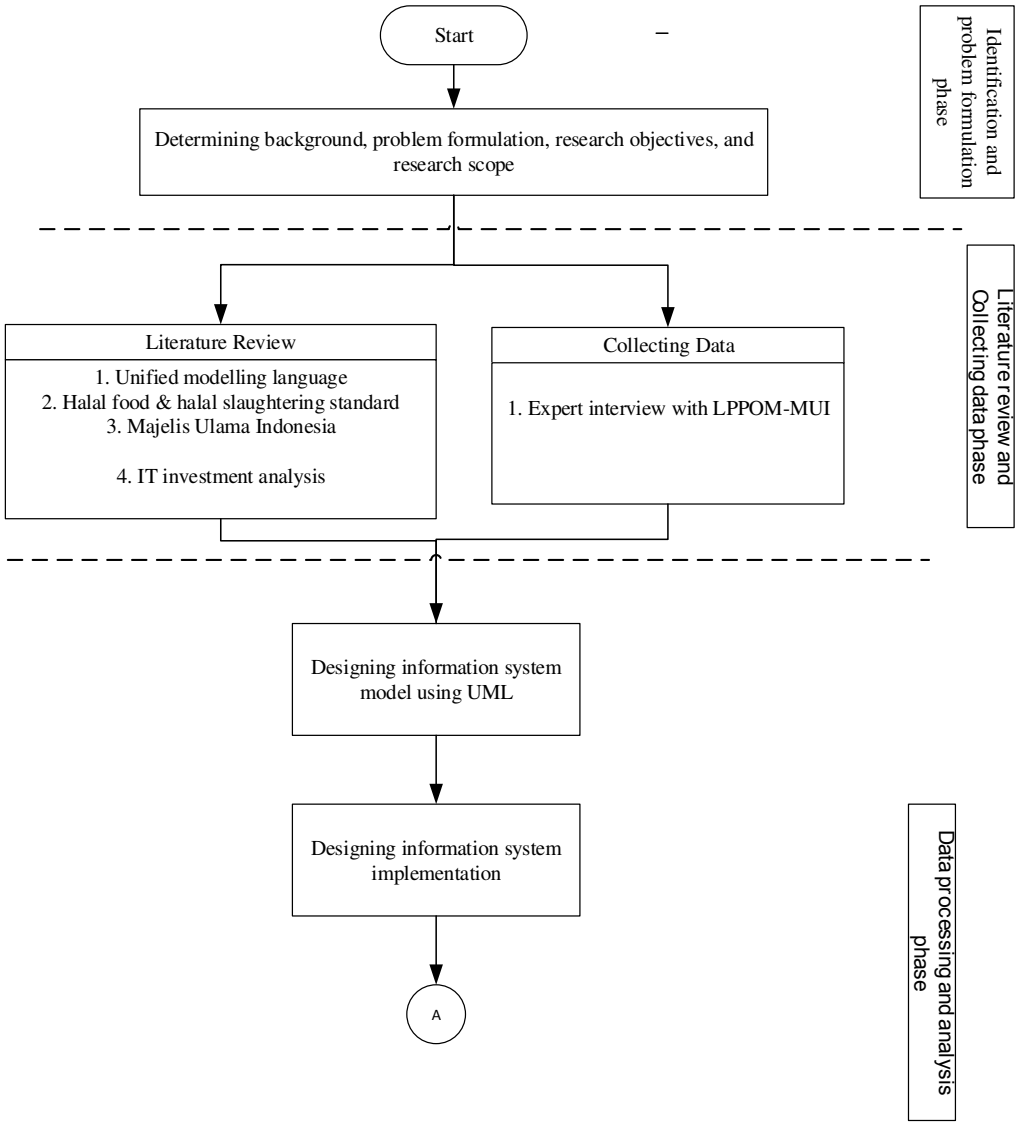
In this final assignment not all investment evaluation method can be used, Net Present Value is the only method will be used, the table below shows the reason for each method.

Table 2. 4 Investment evaluation method comparison

No	Method	Purpose	Used
1	Net Present Value	To calculate total present value for all cash flow in all period	Yes
2	Payback Periode	To measured time required to recover the initial cost of an investment	No
3	Return on Investment	measure the percentage of benefits generated by a project compared to the costs incurred	No
4	Internal Rate of Return	Calculates desired interest rate that will make the sum of the present value of each cash flow at that interest rate is equal with the present amount of the initial cash outflow	No

CHAPTER 3
RESEARCH METHODOLOGY

This chapter will discuss the methodology of this final assignment that became a foundation in conducting the research. This research defines into 4 phases which are: identification and problem formulation phase, collecting data phase, data processing and analysis phase, conclusion and suggestion phase as shown in the flowchart below :



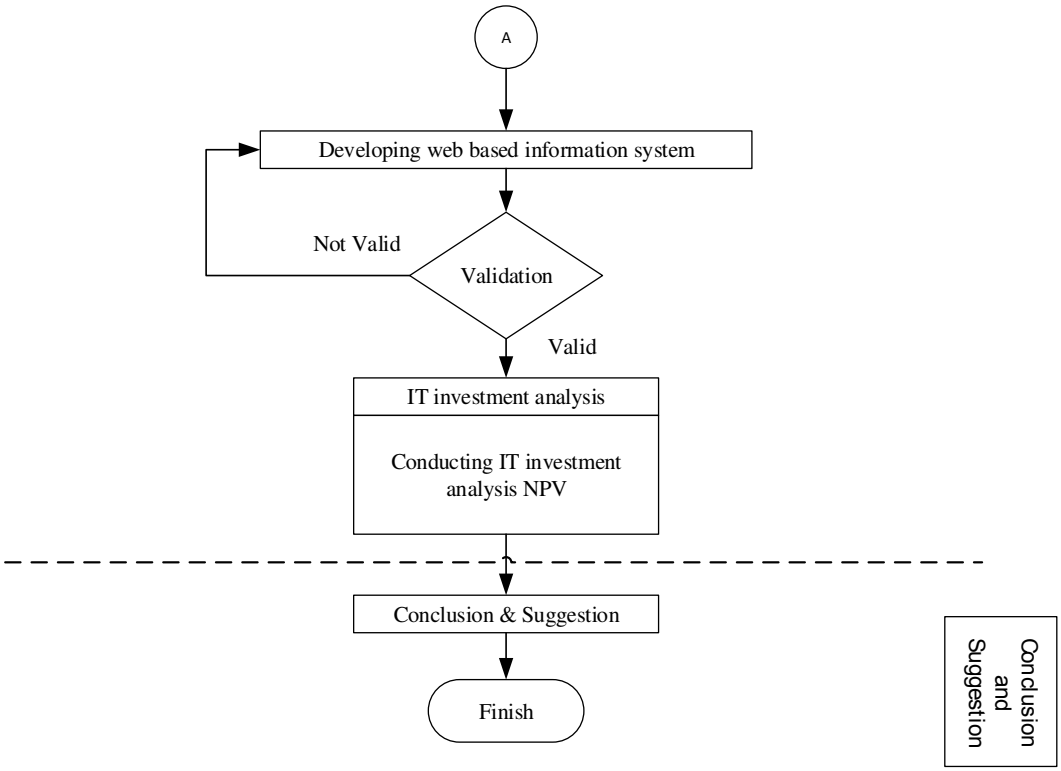


Figure 3. 1 Research Methodology Flowchart

3.1 Identification and Problem Formulation phase

This phase consists of determining the background of this research, problem formulation, research objectives that will be answered, the expected benefit of conducting this research, assumption and limitation used in this research

3.2 Literature Review and Collecting Data Phase

This phase conducted to provide necessary data will be processed, give explanations on theory used to the reader, enriching the author's insight and become a reference to determine the research methodology. There are 2 activities in this phase which are a literature review and field study

3.2.1 Literature review

Literature Review will be conducted to collect some basic theories that will be used as supporting theories in doing this research and to determine appropriate tools based on previous methods to finish this research. In this final project, the basic theories used are unified modeling language, the definition of Halal, halal food, halal slaughtering standard, halal assurance system *LPPOM-MUI, CEROL–SS2300* and Information System investment.

3.2.2 Field Study

A field study conducted by interviewing LPPOM- MUI. Information will be collected during an interview with LPPOM-MUI are a halal certification business process especially auditing process, regulation and essential things in conducting an audit, and other essential data for performing investment analysis.

3.3 Data Processing and Analysis Phase

In this phase, Author process the data has been collected required to develop an information system and the author able to conduct investment analysis of developing an information system. This phase consists of following activities:

3.3.1 Designing Information System Using UML

In this stage, the author will design model of the system by using Unified Modeling Language. This UML will consist of several diagrams including use case diagrams, class diagrams, state diagrams, activity diagrams and sequence diagram.

3.3.2 Developing information system (Software)

The information system will be developed based on UML valid model.

3.3.3 Information System validation (Software)

Validation of information system will be done by testing the software directly by LPPOM-MUI, to check whether the software can run correctly and

there is any interruption or complaint when LPPOM-MUI use the information system.

3.3.4 Information System Investment Analysis

Analysis of IT investment will be done in several methods including Time cost tradeoff to determine the best option of Halal Auditor Information System implementation. Net present value to measure the difference between the present value of cash inflows and the present value of cash outflows over a period of time.

3.4 Conclusion and Suggestion

The final phase of research is to conclude and provide advice on developing an information system to help LPPOM-MUI in auditing halal certification in a chicken slaughterhouse. Conclusion and suggestions are made objectively based on a result of this research. The author will also provide advice for the future research.

CHAPTER 4
DATA COLLECTION

This chapter will discuss data which has been collected, consist of determining audit form, online halal certification procedure, the relation between CERROL SS-2300 and Halal Auditor Information System.

4.1 Chicken Slaughterhouse Halal Audit Form

This chapter will discuss the process of determining Questionnaire list for halal chicken auditing process. According to *Fatwa* MUI No. 4 of 2003 about Haram on Some Foodstuffs, there is some critical point in halal slaughtering process, which are slaughterer animal standard, animal slaughter standard, slaughter tools standard, slaughter process standard, process & delivery standard and another standard. The table below is a critical point in slaughtering process.

Table 4. 1 Halal critical point

Slaughtered Animal Standard		
No	Halal Critical Point	Code
1	The slaughtered animal is a lawfull animal.	A1
2	The slaughtered animal must be alive.	A2
3	Animal health condition must follow standard requirement set authorised institution.	A3
Animal Slaughter Standard		
No	Halal Critical Point	Code
1	Animal slaughter is Muslim and baligh.	B1
2	Understand about slaughtering syar'I process.	B2
3	Have expertise in the slaughter.	B3
Slaughter Tools Standard		
No	Halal Critical Point	Code
1	Slaughtering tools are sharp	C1
2	Nail, fangs and bones are forbid	C2

Slaughter Process Standard			
No	Halal Critical Point		Code
1	The process of slaughter is carried out with the intention of slaughtering and calling the name of god		D1
2	Slaughtering process carried out by draining blood from oesophagus, trachea and arteries carotids		D2
3	Slaughtering process is done once and fast		D3
4	Ensure blood flow and movement of the animal as a sign if the animal is alive		D4
5	Ensure the animal died because of the slaughtering process.		D5
Process Storage and Delivery Standard			
No	Halal Critical Point		Code
1	Processing is done after the animal is dead		E1
2	An animal which failed to die in the process of slaughter must be separated		E2
3	Storage process must be differentiated between halal and non halal product.		E3
4	Storage process must be differentiated between halal and non halal product.		E4
Other Standard			
No	Halal Critical Point		Code
1	Slaughtered animal confronted to Qibla (Sunnah)		F1
2	Slaughter is done as much as possible manually without stunning process		F2
3	Stunning to make slaughter process easier is mubah (allowed) and must follow this requirement	The stunning process doesn't kill the animal	F3
		Stunning is done to make the slaughter process easier	
		Stunning is done not to torture the animal	
		Stunning equipment only used for Lawfull (Halal) Animal	
4	Flattening animal is haram		F4

According to a critical halal point above, the Questionnaire was developed. Based on the interview. There are 12 phase of auditing can be developed which are: Receiving phase (*phase penerimaan*), stunning phase (*phase pemingsanan*), slaughter phase (*fase penyembelih*), slaughtering process, (*fase penyembelihan*), meat processing phase (*fase pengolahan daging*), meat washing phase (*fase*

pencucian daging), packaging phase (*fase pengemasan*), storaging phase (*fase penyimpanan*), delivery phase (*fase pengiriman*), availability of traceability (*ketersediaan sistem telusur balik*), availability of Halal Assurance System document (*ketersediaan dokumen HAS*), and slaughterhouse condition (*kondisi rumah potong hewan*)

Table below shows the Questionnaire in the audit form for each phase

Table 4. 2 Questionnaire receiving phase

Receiving phase		
No	Question	Halal Assurance System
1	Chickens pass the ante mortem check? (*Ayam lolos pemeriksaan ante mortem*)	Chickens pass the ante mortem check ? (*Ayam lolos pemeriksaan ante mortem*)
2	Are all animals slaughtered alive? (*Apakah semua hewan yang disembelih dalam keadaan hidup?*)	Animals slaughtered alive (*Ayam yang akan disembelih dalam keadaan hidup*)
3	Is there an examination of stressful chickens before slaughter? (*Apakah ada pemeriksaan terhadap ayam yang stress sebelum disembelih?*)	Chickens in a state of no stress (*Ayam dalam keadaan tidak stress*)
4	Is there a SOP for a stressful chicken? (*Apakah ada SOP bagi ayam yang sedang stres?*)	Chickens in a state of no stress (*Ayam dalam keadaan tidak stress*)
5	Is there a minimum time SOP of animals to be slaughtered? How long? (*Apakah ada SOP waktu minimal hewan yang akan disembelih? Berapa lama?*)	Chickens in a state of no stress (*Ayam dalam keadaan tidak stress*)
6	Is not there a barking process in chickens to be slaughtered? (*Apakah tidak terjadi proses gelonggongan pada ayam yang akan disembelih*)	Not using a cock bark (*Tidak menggunakan ayam gelonggongan*)

Table 4. 3 Questionnaire stunning phase

Stunning phase		
No	Question	Halal Assurance System

Stunning phase		
No	Question	Halal Assurance System
1	Is there a validation SOP if there is a change in the streaking process? (*Apakah ada SOP validasi jika ada perubahan proses pemingsanan?*)	There is a validation process of stunning. (*Adanya proses validasi pemingsanan*)
2	Is the stun device used not causing the animal to die? (*Apakah alat pemingsanan yang digunakan tidak menyebabkan hewan mati?)*	Use appropriate stamping tools (*Mengguakan peralatan peminsanan yang pantas*)
3	Is there a SOP for the supervisor to periodically verify to ensure the process is in accordance with the validated method? (*Apakah ada SOP bagi supervisor untuk melakukan verifikasi secara berkala untuk memastika proses pemingsanan sesuai dengan metode yang telah di validasi?*)	The existence of the maintenance process at the stunning facilities (*Adanya proses maintenance pada fasilitas pemingsanan*)
4	What is the maintenance process for a stunning facility? (*Bagaimana proses maintenance untuk fasilitas pemingsanan?*)	There is maintenance process at the stunning facilities (*Adanya proses maintenance pada fasilitas pemingsanan*)
5	Is there a regular check to make sure the facilities are clean? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas suci dari najis?*)	Holy and clean from Najis (*Suci dan bersih dari najis*)
6	Is the stunning device used having a voltage of about 15-25 volts? (*Apakah alat pemingsanan yang digunakan memiliki tegangan sekitar 15-25 volt*)	The process of stunning does not cause the animal to suffer (*Proses pemingsanan tidak menyebabkan hewan tersiksa*)
7	Is the stamping tool used having 0.1-0.3 Ampere power? (*Apakah alat pemingsanan yang digunakan memiliki daya 0,1-0,3 Ampere?*)	The process of stunning does not cause the animal to suffer *Proses pemingsanan tidak menyebabkan hewan tersiksa*
8	Is the indicator of the voltage and voltage values in the sharper device already calibrated? (*Apakah penunjuk nilai tegangan dan voltase pada alat pemingsangan sudah terkalibrasi (sesuai)*)	Use appropriate stamping tools (*Menggunakan peralatan pemingsanan yang pantas*)

Table 4. 4 Questionnaire slaughter phase

Slaughter phase		
No	Question	Halal Assurance System
1	Is the slaughter Muslim? (*Apakah penyembelih beragama islam ?*)	Muslim Slaughter (*Penyembelih beragama islam*)
2	Is the slaughter obeying compulsory worship? (*Apakah penyembelih taat menjalankan ibadah wajib?*)	Muslim Slaughter (*Penyembelih beragama islam*)
3	Is slavery understanding the syar'I slaughter procedure? (*Apakah penyemebelih memahami tata cara penyembelihan secara syar'I ?*)	The slaughterers understand syar'i slaughter rules (*Penyembelih memahami peraturan penyembelihan syar'i*)
4	Is the slaughtered healthy ? (*Apakah penyembelih berbadan dan berjiwa sehat ?*)	The slaughterer is healthy and healthy (*Penyembelih sehat jiwa dan raga*)
5	Does the slaughter have an identity card as a halal slaughterer from the MUI certified halal certification institute? (*Apakah penyembelih memiliki kartu identitas sebagai penyembelih halal dari Lembaga sertifikat halal yang diakui oleh MUI?*)	The slaughterhouse has a halal slaughter certification (*Penyembelih memiliki sertifikasi penyembelih halal*)
6	Do the slaughterers meet the slaughterhouses, at least 2 people at each slaughterhouse? (*Apakah jumlah penyembelih memenuhi kebutuhan penyembelihan, minimal 2 orang pada setiap lini penyembelihan?*)	It has a good ratio between slaughter and slaughterhouses (*Memiliki rasio yang baik antara penyembelih dan lini penyembelihan*)

Table 4. 5 Questionnaire slaughtering phase

Slaughtering phase		
No	Question	Halal Assurance System
1	Is the slaughterhouse used to break three main channels with one slaughter (*Apakah alat penyembelih yang digunakan dapat memutus tiga*	(Using sharp tools to slaughter) *Menggunakan peralatan yang tajam untuk menyembelih*

Slaughtering phase		
No	Question	Halal Assurance System
	saluran utama dengan satu kali penyembelihan)	
2	Are the slaughterers made of nails / fangs or bones? (*Apakah alat penyembelih tidak terbuat dari kuku/taring ataupun tulang?*)	Use slaughter equipment in accordance with the criteria of LPPOM MUI and agricultural ministries (*Menggunakan peralatan penyembelih sesuai dengan kriteria LPPOM MUI dan kementrian pertanian*)
3	Are the slaughter facilities used clean and free from stools? (*Apakah fasilitas penyembelih yang digunakan bersih dan terbebas dari najis?*)	Free from faeces and contamination of non-halal substances *(Terbebas dari najis dan kontaminasi zat non-halal)*
4	Are abattoirs used only for halal products? (*Apakah fasilitas penyembelihan yang digunakan hanya untuk halal produk?*)	Processing facilities are only for halal products (*Fasilitas pemotongan hanya untuk produk halal*)
5	Is the slaughtering process done without lifting the knife ? (*Apakah proses penyembelihan dilakukan tanpa mengangkat pisau*)	Use effective processing and stunning facilities .(*Menggunakan fasilitas pemingsanan dan pemotongan yang efektif*)
6	Is the slaughter process done quickly from the front of the neck and does not break the neck bone? (*Apakah proses penyembelihan dilakukan secara cepat dari leher bagian depan dan tidak memutus tulang leher?*)	Using effective processing and stunning facilities (*Menggunakan fasilitas pemingsanan dan pemotongan yang efektif*)
7	Does the slaughter read bismillah before the animal slaughter process? (*Apakah penyembelih membaca bismillah sebelum proses penyembelihan hewan?*)	Saying basmallah when slaughtering (*Mengucapkan basmallah ketika menyembelih*)
8	Is the process of slaughtering done quickly and not torturing animals? *Apakah proses pemotongan hewan dilakukan secara cepat dan tidak menyiksa hewan?*	*Proses penyembelihan berlangsung cepat dan efektif* (The slaughter process is fast and effective)

Slaughtering phase		
No	Question	Halal Assurance System
9	Does the slaughter process cut off 3 main channels? (*Apakah proses penyembelihan memotong 3 saluran utama?*)	Cut 3 channels (trachea, esophagus and blood vessels) (*Memotong 3 saluran (trachea, esophagus dan pembuluh darah)*)
10	Is there a regular check to make sure the facilities are clean (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas suci dari najis?*)	Holy and clean from Najis (*Suci dan bersih dari najis*)
11	Animals to be slaughtered are confronted to the Qibla ? (*Hewan yang akan disembelih dihadapkan ke kiblat*)	Animals to be slaughtered are confronted to the Qibla ? (*Hewan yang akan disembelih dihadapkan ke kiblat*)

Table 4. 6 Questionnaire meat processing phase

Meat processing phase		
No	Pertanyaan	Halal Assurance System
1	Is the meat processing facility used clean and free from najis? (*Apakah fasilitas pengolahan daging yang digunakan bersih dan terbebas dari najis*)	Clean from najis and non-halal (*Terbebas dari najis dan kontaminasi zat non-halal*)
2	Is a chicken meat processing facility used only for halal products? (*Apakah fasilitas pengolahan daging ayam yang digunakan hanya untuk halal produk*)	Processing facilities are only for halal products? (*Fasilitas pemotongan hanya untuk produk halal*)
3	Is the chicken fed into hot water only dead chickens? (*Apakah ayam yang dimasukan ke air panas hanya ayam yang sudah mati?*)	Animals to be processed in dead condition (*Hewan yang akan di proses dalam kondisi mati*)
4	Is the time between slaughtering and entering chicken into hot water for more than 3 minutes? (*Apakah waktu jeda antara penyembelihan dan memasukan ayam kedalam air panas lebih dari 3 menit?*)	Is the time between slaughtering and entering chicken into hot water for more than 3 minutes? (*Waktu minimal antara penyembelihan dan proses selanjutnya adalah 3 minutes*)

Meat processing phase		
No	Pertanyaan	Halal Assurance System
5	Is the meat processing facility used free from najis? (*Apakah fasilitas pengolahan daging yang digunakan terbebas dari najis?*)	Production facilities are only used for halal products (*Fasilitas produksi hanya digunakan untuk produk halal*)
7	Is there a regular check to make sure the sacred meat processing facility is from najis? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas pengolahan daging suci dari najis?*)	Production facilities are only used for halal products (*Fasilitas produksi hanya digunakan untuk produk halal*)

Table 4. 7 Questionnaire meat washing phase

Meat washing phase		
No	Pertanyaan	Halal Assurance System
1	Are the packaging facilities used clean and free from najis? (*Apakah fasilitas pengemasan yang digunakan bersih dan terbebas dari najis ?*)	Free from najis and contamination of non-halal substances (*Terbebas dari najis dan kontaminasi zat non-halal*)
2	Is the packaging facility used only for halal products? (*Apakah fasilitas yang pengemasan digunakan hanya untuk halal produk ?*)	Processing facilities are only for halal products (*Fasilitas pemotongan hanya untuk produk halal*)
3	Is meat washing facility protected from unlawful product residues? (*Apakah fasilitas pencucian daging terhindar dari residu produk yang tidak halal?*)	Free of non-halal waste (*Terbebas dari limbah non-halal*)
4	Has the cleaned meat been completely clean from najis? (*Apakah daging yang telah dibersihkan telah sepenuhnya suci dari najis?*)	Holy and clean from najis (*Suci dan bersih dari najis*)
5	Is there a regular check to make sure the purification facilities of the najis meat are najis? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas pencucian daging suci dari najis?*)	Inspect facilities to ensure no contamination with non-halal material (*Melakukan inspeksi terhadap fasilitas untuk menjamin tidak terjadi kontaminasi dengan non-halal material*)

Table 4. 8 Quetionair packaging phase

Packaging phase		
No	Pertanyaan	Halal Assurance System
1	Is the packaging facilities used clean and free from najis (*Apakah fasilitas pengemasan yang digunakan bersih dan terbebas dari najis ?*)	Free from najis and contamination of non-halal substances (*Terbebas dari najis dan kontaminasi zat non-halal*)
2	Is the packaging facility used only for halal products (*Apakah fasilitas pengemasan yang digunakan hanya untuk halal produk*)	Processing facilities are only for halal products (*Fasilitas pemotongan hanya untuk produk halal*)
3	Is there a separate room to process chicken and offal (the contents of the stomach)? (*Apakah ada ruangan terpisah untuk mengolah daging ayam dan jeroan (isi perut) ?*)	There is a separate facility to process chicken and offal (*Adanya fasilitas terpisah untuk mengolah daging ayam dan jeroan*)
4	Does the packaging contain halal logo? (*Apakah pada kemasan tercantum logo halal ?*)	It has a halal label attached to the packaging (*Memiliki label halal yang menempel pada kemasan*)
5	Whether on the halal logo listed information: halal logo, slaughter date, name or number of RPH, country of origin and net weight ? (*Apakah pada logo halal tercantum informasi : logo halal, tanggal penyembelihan, nama atau nomor RPH , negara asal dan berat bersih*)	It has a halal label attached to the packaging (*Memiliki label halal yang menempel pada kemasan*)
6	Is the halal label used strongly attached to the packaging? (*Apakah label halal yang digunakan menempel kuat pada kemasan?*)	It has a halal label attached to the packaging (*Memiliki label halal yang menempel pada kemasan*)
7	Is the packaging used clean and holy from najis? (*Apakah kemasan yang digunakan bersih dan suci dari najis?*)	Holy and clean from najis (*Suci dan bersih dari najis*)
8	Is there a regular check to make sure the sacred packaging facility is from najis? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas*	Inspect facilities to ensure no contamination with non-halal material (*Melakukan inspeksi terhadap fasilitas untuk menjamin tidak*

Packaging phase		
No	Pertanyaan	Halal Assurance System
	pengemasan suci dari najis?)	*terjadi kontaminasi dengan non-halal material*)
9	Is there any additional packaging to make sure the product is not contaminated najis? (*Apakah ada kemasan tambahan untuk memastikan produk tidak terkontaminasi najis?*)	Use additional packaging to avoid being najis? (*Menggunakan kemasan tambahan agar terhindar dari najis*)

Table 4. 9 Questionnaire storaging phase

Storaging phase		
No	Pertanyaan	Halal Assurance System
1	Is the storage facility used clean and free from najis? (*Apakah fasilitas penyimpanan yang digunakan bersih dan terbebas dari najis?*)	Transportation and storage facilities are free from najis? (*Fasilitas transportasi dan penyimpanan terbebas dari najis*)
2	Is the storage facility used only for halal products? (*Apakah fasilitas penyimpanan yang digunakan hanya untuk halal produk?*)	Transportation and storage facilities are free from najis? (*Fasilitas transportasi dan penyimpanan terbebas dari najis*)
3	Are storage areas for separate carcasses and offal? (*Apakah tempat penyimpangan untuk karkas dan jeroan terpisah?*)	There is a separate facility to process chicken and offal (*Adanya fasilitas terpisah untuk mengolah daging ayam dan jeroan*)
4	Is there a regular check to make sure the holy storage facility is from najis? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas penyimpanan suci dari najis?*)	Inspect facilities to ensure no contamination with non-halal material? (*Melakukan inspeksi terhadap fasilitas untuk menjamin tidak terjadi kontaminasi dengan non-halal material*)

Table 4. 10 Questionnaire delivery phase

Delivery phase		
No	Pertanyaaan	Halal Assurance System

Delivery phase		
No	Pertanyaaan	Halal Assurance System
1	Is the shipping facility used only for halal products? (*Apakah fasilitas pengiriman yang digunakan hanya untuk halal produk?*)	Transportation and storage facilities are free from najis (*Fasilitas transportasi dan penyimpanan terbebas dari najis*)
2	Is the chicken and offal delivery facilities separate? (*Apakah fasilitas pengiriman terpisah untuk pengiriman daging ayam dan jeroan (isi perut) ?*)	Transportation and storage facilities are free from najis? (*Fasilitas transportasi dan penyimpanan terbebas dari najis*)
3	Is the shipping facility used clean and holy from najis? (*Apakah fasilitas pengiriman yang digunakan bersih dan suci dari najis?*)	Holy and clean from najis (*Suci dan bersih dari najis*)
4	Are there regular checks to ensure holy delivery facilities from najis? (*Apakah ada pemeriksaan teratur untuk memastikan fasilitas pengiriman suci dari najis?*)	Inspect facilities to ensure no contamination with non-halal material (*Melakukan inspeksi terhadap fasilitas untuk menjamin tidak terjadi kontaminasi dengan non-halal material*)

Table 4. 11 Questionnaire availability traceability

Availability of traceability		
No	Pertanyaan	Halal Assurance System
1	Does the slaughterhouse have a traceability system in the product? (*Apakah rumah potong hewan memiliki sistem penelurusan (traceability) pada produk?*)	Has a traceability system (*Memiliki sistem telusur balik*)
2	Is there any follow up of traceability system? (*Bagaimana tindak lanjut dari sistem hasil penelusuran?*)	Has a traceability system (*Memiliki sistem telusur balik*)

Table 4. 12 Questionnaire HAS availability

HAS availability		
No	Pertanyaan	Halal Assurance System

HAS availability		
No	Pertanyaan	Halal Assurance System
1	Does the company have documents related to the halal assurance system that has been implemented by the company? (*Apakah perusahaan memiliki dokumen terkait sistem jaminan halal yang telah diterapkan oleh perusahaan*)	Have a halal assurance system document (*Memiliki dokumen surat jaminan halal*)
2	*Apakah dokumen sudah mencakup kriteria pada dokumen minimal Halal Assurance System?* (Does the document include criteria on minimum document Halal Assurance System)	Have a halal assurance system document. *Memiliki dokumen surat jaminan halal*

Table 4. 13 Questionnaire slaughterhouse condition

Slaughterhouse condition		
No	Pertanyaan	Halal Assurance System
1	Is the RPH location at a radius of at least 5 KM from a pig farm? (*Apakah lokasi RPH berada pada jarak radius minimal 5 KM dari peternakan babi?*)	Processing facilities are free from pig house contamination (*Fasilitas pemotongan terbebas dari kontaminasi rumah potong babi*)
2	Are there cross-contamination between workers in slaughterhouses and pig farms? (*Apakah ada kontaminasi silang antara pekerja di rumah potong hewan dan peternakan babi?*)	Processing facilities are free from pig house contamination (*Fasilitas pemotongan terbebas dari kontaminasi rumah potong babi*)
3	Are there tools / facilities used in conjunction with pig farms? (*Apakah ada peralatan/fasilitas yang digunakan bersamaan dengan peternakan babi?*)	Processing facilities are free from pig house contamination (*Fasilitas pemotongan terbebas dari kontaminasi rumah potong babi*)
4	Are there mosque facilities at slaughterhouses? (*Apakah terdapat fasilitas mushala/mesjid pada rumah potong hewan?*)	It has a mosque / mushala (*Memiliki masjid/mushala*)
5	How do waste disposal facilities in slaughterhouses? (*Bagaiaman fasilitas pembuangan limbah pada rumah potong*	Free of non-halal waste (*Terbebas dari limbah non-halal*)

Slaughterhouse condition		
No	Pertanyaan	Halal Assurance System
	hewan?)	

4.2 Online Halal Certification Procedure

For companies which want to obtain a halal certificate of LPPOM MUI, both processing industry (food, medicie, cosmetics), Animal slaughterhouse (RPH), and restaurant/catering / kitchen must register halal certification and fulfil halal certification requirements. The following shown step by the steps for the companies to obtain the halal certification process:

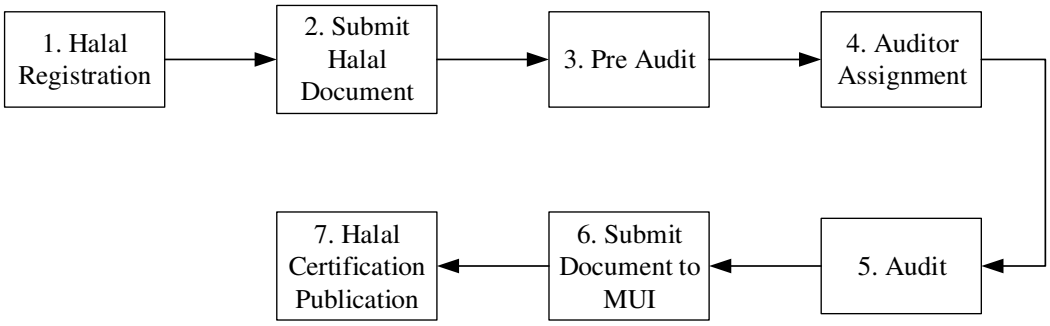


Figure 4. 1 Online halal certification procedure

There are seven steps of Online Halal Certification Majelis Ulama Indonesia (MUI):

1. Halal registration

Firstly, the company need to register its account in CEROL LPPOM MUI website; the company will ask to input company information such as a total of the employee, production capacity, NPWP and the other information. After the company finish fulfilling the form, the company need to pay the payment fee Rp 200.000

2. Submit halal document

When the system receives the payment fee, company ask to upload halal documents needed for pre-audit such as manual Halal Assurance system, evidence of a halal policy, evidence of HAS internal audit execution and other processes.

3. Pre Audit

After all necessary document already uploaded, LPPOM MUI will check all uploaded halal documents. If the document complete and pass the criteria, the company asked to pay the audit fee; the audit fee depends on the complexity of the business.

4. Auditor Assignment

If the company already paid the audit fee, and the system has received the payment, the company need to file the date of the audit process. LPPOM MUI will assign 2 auditors for each audit assignment, in the process auditor assignment LPPOM MUI will consider the location of the auditor and the experience of the auditor.

5. Audit

The auditor will observe and check directly to the company, every type of business has different audit procedure. The audit process still manually using paper. The auditor will write down the observation and audit result into the paper form.

6. Submit the document to MUI

Auditor must deliver all audit result to Majelis Ulama Indonesia. Auditor all only responsible for collecting all information about the company. While Majelis Ulama Indonesia responsible for determining either the company pass the halal certification or still need to improve its business process.

7. Halal Certification publication

If the company pass the halal certification, MUI will upload the halal certificate into CEROL, and company able to view and download halal.

4.3 Relation between Cerrol and Halal Auditor Information System

The halal auditor information system will be developed to support halal certification Majelis Ulama Indonesia. The figure below show the relation between CERROL LPPOM MUI and Halal Auditor Information System.

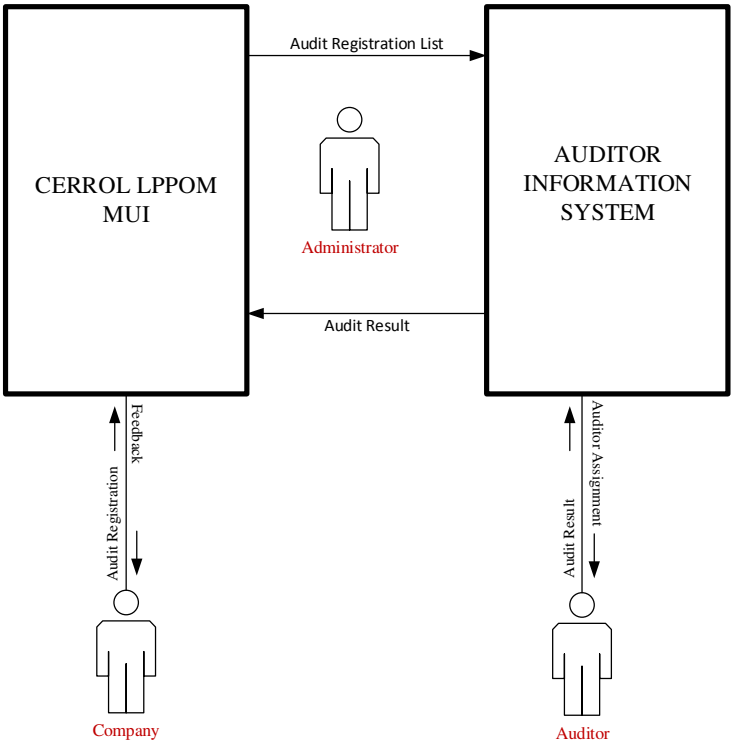


Figure 4. 2 Relation between cerrol and HAIS

Halal Auditor Information System (HAIS) will focus on auditing process. By the integration of Halal Auditor Information System with CEROL, the activity of audit assignment, audit result, and audit documents delivery will be operated online by using Halal Auditor Information System. The company will register the halal certification, upload pre-audit document, pay the registration fee and audit fee through CEROL LPPOM MUI. After the company determine the audit date, HAIS will facilitate administrator to do online auditor assignment, and provide auditors online form to audit company. The system will directly store results of the audit are in to the HAIS database. Both the auditors and

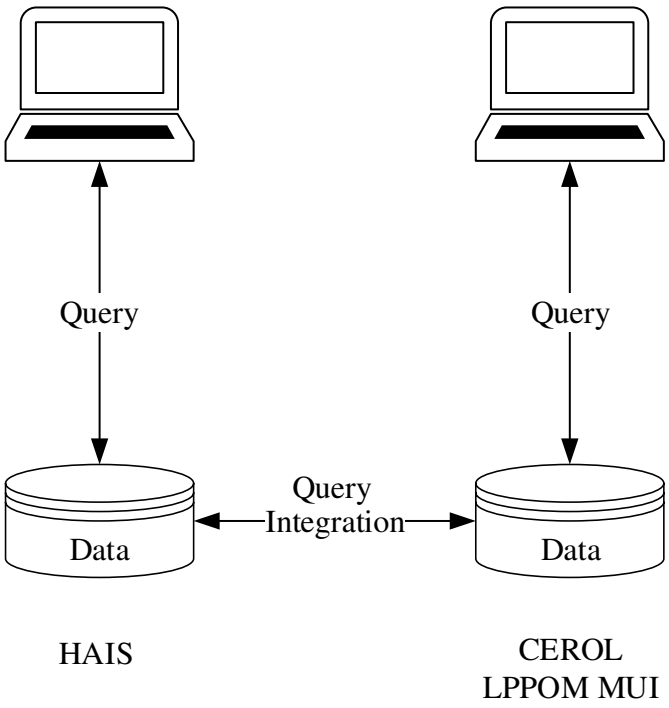
administrator able to see the audit result. The administrator is responsible for integrating audit result from HAIS database into CEROL LPPOM MUI database.

If the company pass the certification result, the halal certification result will be uploaded to CEROL LPPOM MUI. Table below shows th he comparison activity of CEROL LPPOM MUI and HAIS.

Table 4. 14 Comparison between CERROL and HAIS

No	Activity	Information System
1	Halal registration	CERROL LPPOM MUI
2	Submit halal document	
3	Pre-audit	
4	Auditor assignment	HAIS
5	Audit	
6	Submit the document to MUI	
7	Halal certification publication	CERROL LPPOM MUI

In the future, Halal Auditor Information System and CEROL LPPOM MUI will be integrated automatically.



Every system has its data, database, query and user interface. The process of data transfer between database is done by using Structure Query Language (SQL). SQL is a query language used in programming and designed for managing data in a relational database management system. A query is a request for data or information from a database table or combination of tables, query is used to search, filter and process data. This data may be generated as results returned by Structured Query Language (SQL). Important data from CERROL Database will be selected and transferred into HAIS database, HAIS system will process the data and update it into HAIS database. Structure Query Language will select important data from HAIS database and update the CERROL database, so the CERROL system can process the updated data.

CHAPTER 5
INFORMATION SYSTEM DEVELOPMENT

This chapter will discuss the development of Halal auditor information system. Information system development consists of designing use case diagram, designing activity diagram, designing sequence diagram, halal auditor information system user interface and halal auditor information system implementation.

5.1 Designing Use Case Diagram

Use case diagram shown all actors and activities of each actor in Halal Auditor Information System. Use case diagram of Halal Auditor Information system shown on the figure below.

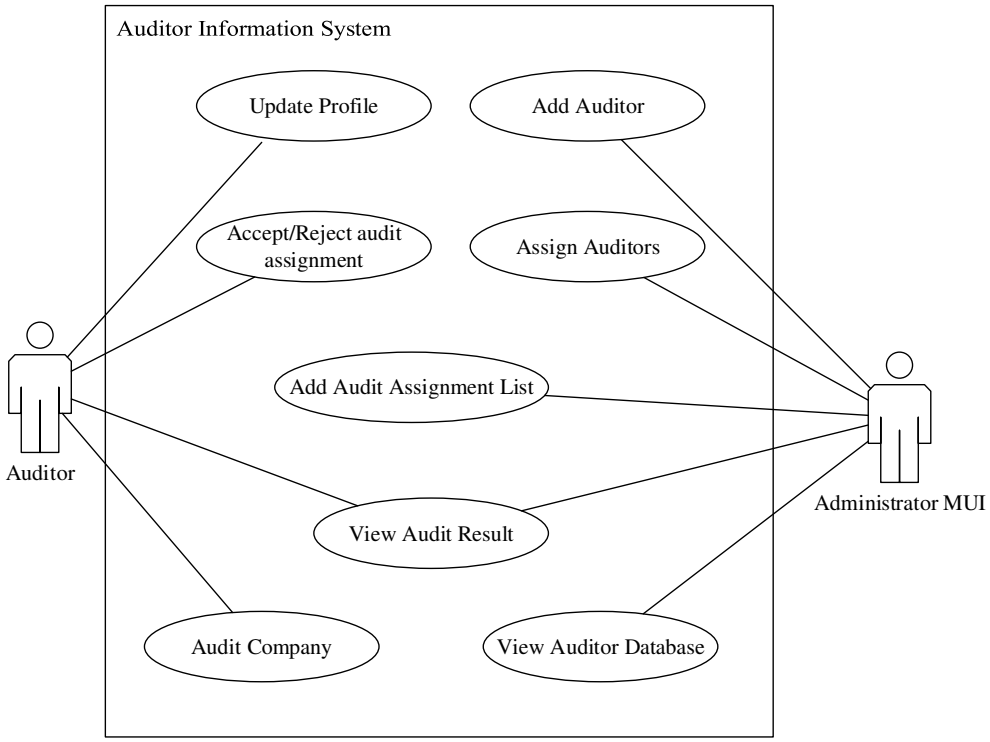


Figure 5. 1 Use case diagram

From the figure of above, there are 2 actors in the use case, which are Auditor and Administrator MUI. The table below will explain all actors in Halal Auditor Information System.

Table 5. 1 Actor in use case diagram

No	Actor	Explanation
1	Auditor	The person in charge to collect information about company business process.
2	Administrator	The person in charge to add new auditor, assign auditor and collect all audit result to be subsequently given to MUI

Every actor has a different use case, use cases for Auditor shown on the table below

Table 5. 2 Use case for auditor

No	Use Case	Explanation
1	Update profile	Auditors able to update their profile information, such as audit experience, auditor location, all auditor information will be stored in auditor database.
2	Accept/reject audit assignment	Auditor able to accept/reject all audit assigned by the administrator. Every audit assignment has its deadline; if there is no response from the auditor, the system will assume auditor reject that audit assignment.
3	Audit company	Auditor responsible for collecting information of the business process of all accepted audit assignment
4	View audit result:	Auditor able to view audit result.

Table below shows the use cases for the administrator:

Table 5. 3 Use case for administrator

No	Use Case	Explanation
1	Add auditor	The administrator responsible to input data of new

No	Use Case	Explanation
		auditor, and permit for the auditor to log in by using new auditor's account
2	Assign auditor	The administrator responsible for assigning all audit to the specific auditor, the administrator also responsible to put a deadline of every audit assignment.
3	Add audit assignment list	The administrator responsible to input all audit assignment from CEROL LPPOM MUI to Halal auditor information system
4	View audit result:	Administrator is able to view audit result.
5	View auditor database	Auditor allows viewing information about all auditor

5.2 Designing Activity Diagram

Activity diagram will show the flow activity in Halal Auditor Information System. There are 4 activity diagrams will be designed which are: activity diagram for add new auditor, activity diagram for add new audit assignment, activity diagram for assign auditor, and activity diagram for audit company.

5.2.1 Activity Diagram Add new auditor

Activity diagram for add new auditor will explain the flow activity of add new auditor done by Administrator MUI. Activity diagram adds new auditor is shown in the figure below.

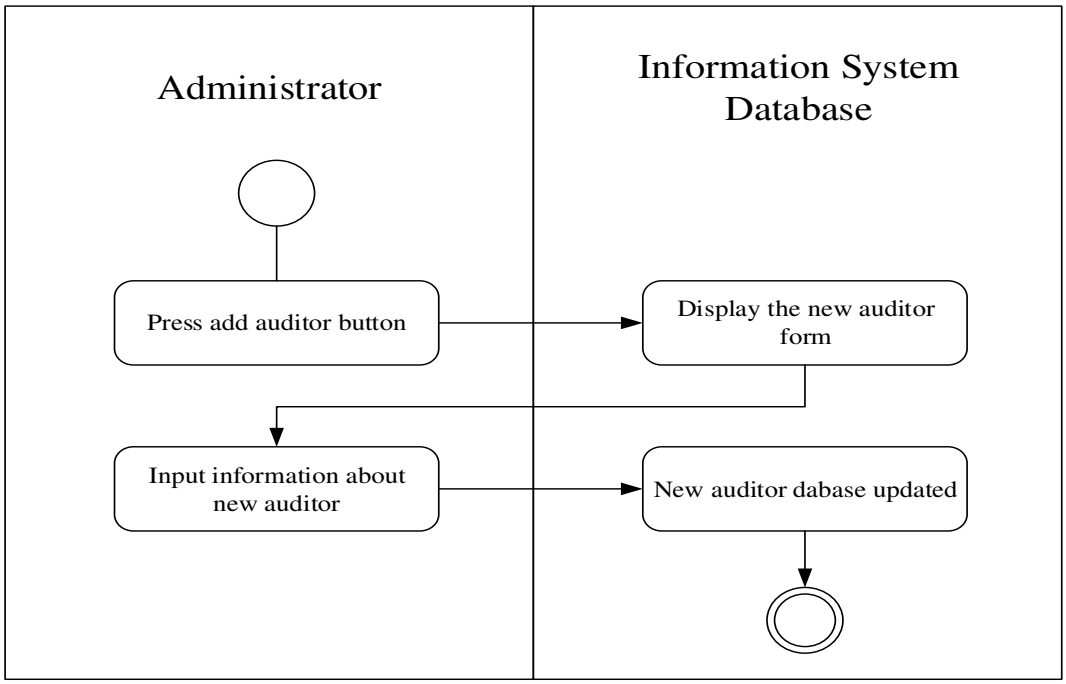


Figure 5. 2 Activity diagram add new auditor

The activity of add new auditor start by press add auditor button, then the information system will show new auditor form to filled by the administrator, then the new auditor database will be updated.

5.2.2 Activity Diagram Add New Audit Assignment

Activity diagram for add new audit assignment will explain the flow activity of add new audit assignment done by Administrator MUI. Activity diagram adds new audit assignment is shown in the figure below.

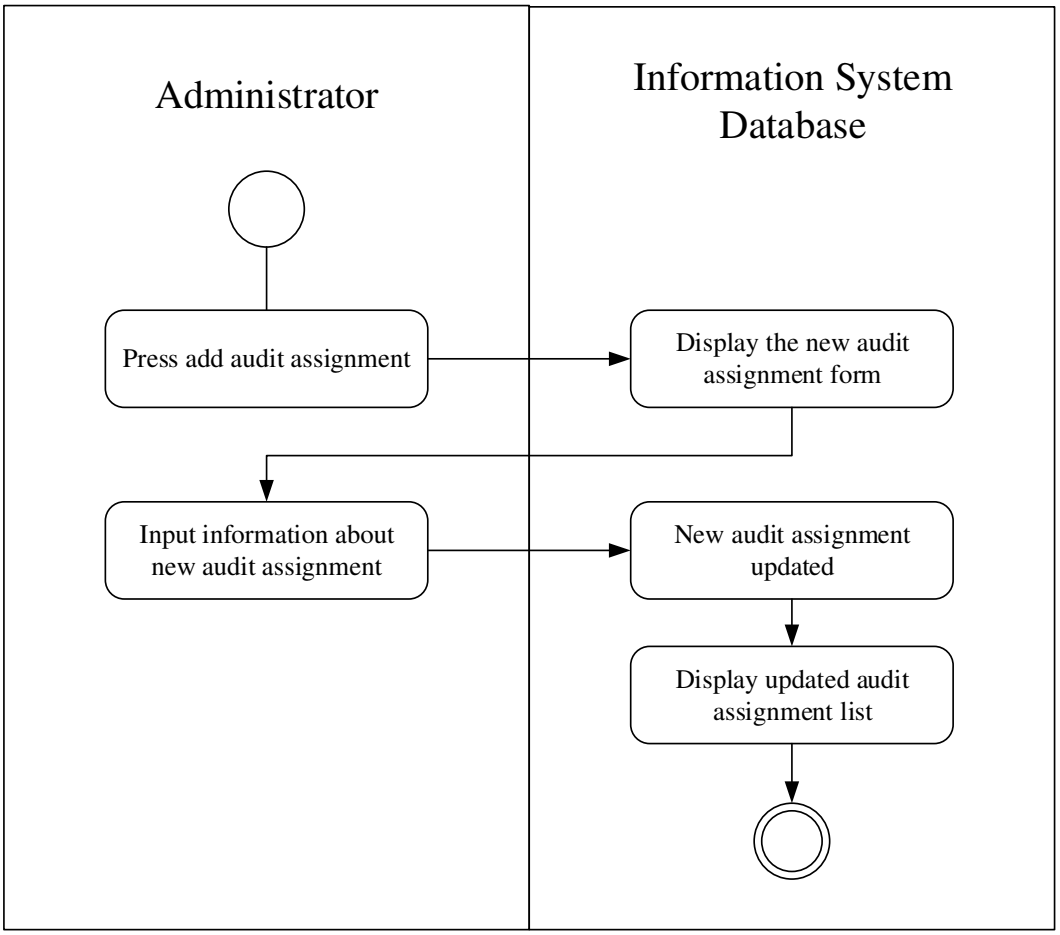


Figure 5. 3 Activity diagram add new audit assignment

The activity of adult add new audit assignment will start from add audit assignment, then the system will display audit assignment form to be filled by the administrator. New audit assignment will be stored into a data base and displayed into audit assignment list.

5.2.3 Activity Diagram Assign Auditor

Activity diagram for assign auditor will explain the flow activity of assign auditor. Activity diagram adds assign auditor is shown on the figure below.

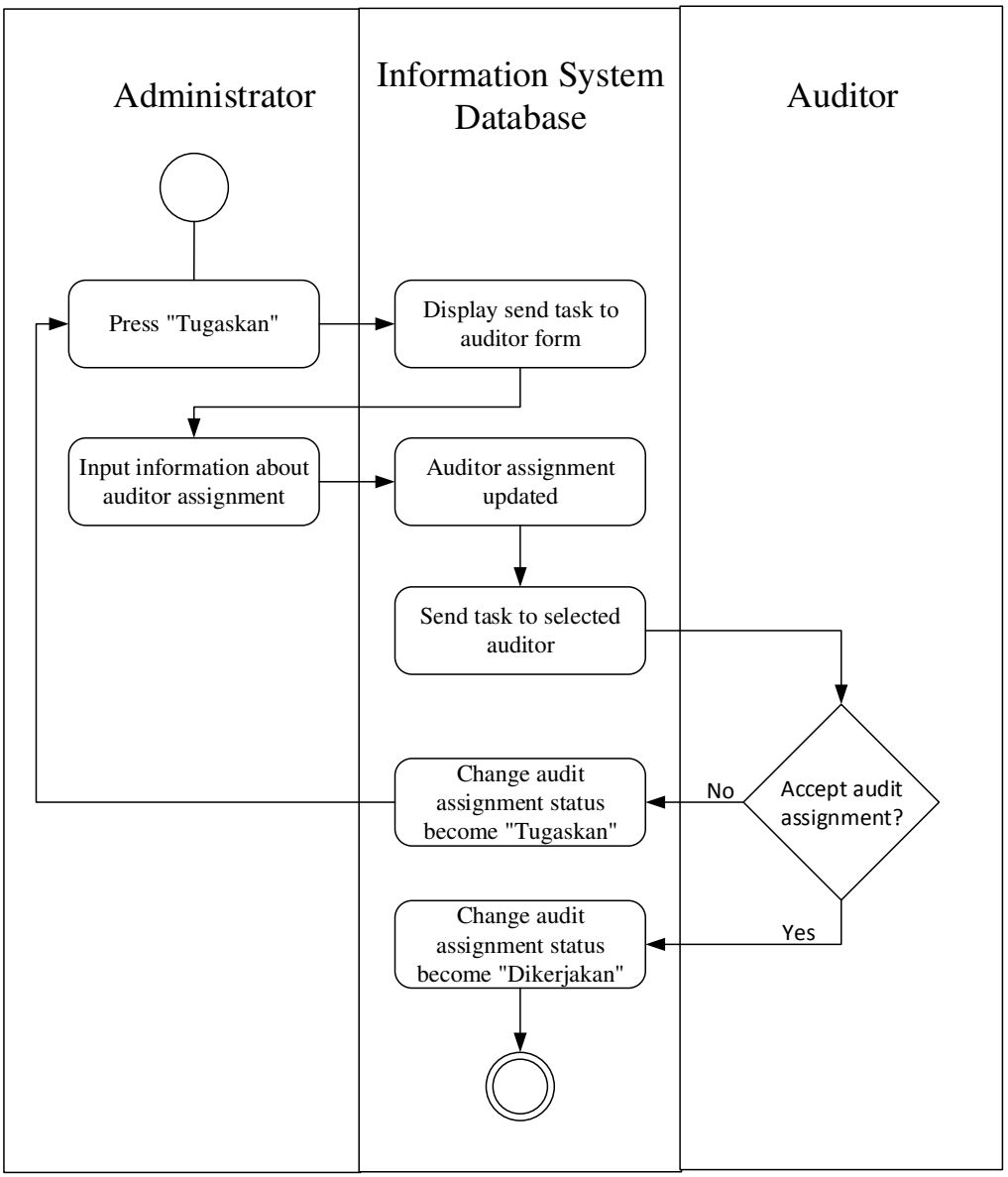


Figure 5. 4 Activity diagram assign an auditor

The activity of assign auditor starts when auditor press "*tugaskan*" button on the home menu, then the system will display send task to 2 auditors form to be filled by the administrator. The system will store new auditor assignment into the data base, and new task notification will automatically appear in the home menu of the auditor, auditor able to accept/reject the task. If auditor rejects the task, audit assignment status will change become "t*ugaskan*", and administrator needs

to assign new auditor. If the auditor accepts the task, then the status of audit assignment become *dikerjakan*.

5.2.4 Activity Diagram Audit Company

Activity diagram to audit company will explain the flow activity of audit company done by the auditor. Figure below show activity diagram to audit company.

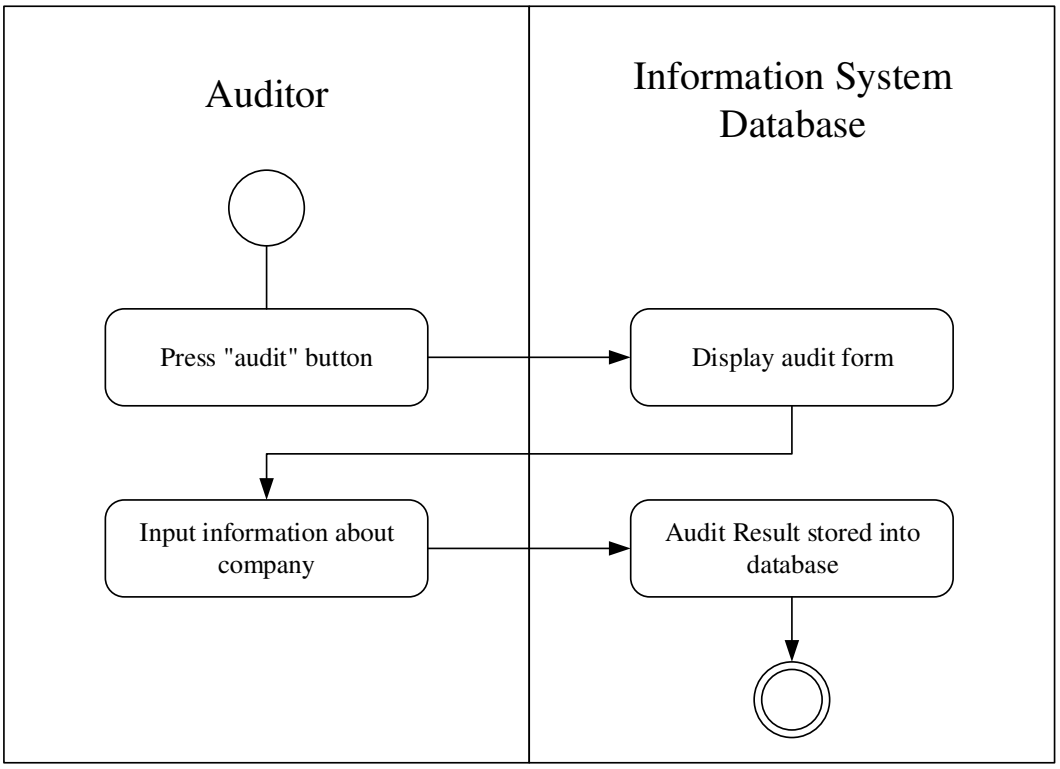


Figure 5. 5 Activity diagram audit company

The activity of assign auditor starts when auditor press “audit” button on the auditor home menu, then the system will display audit form to be filled by the auditor. After all, form has been filled, the audit result will store into the database and both auditor and administrator ale to view the audit result.

5.3 Designing Sequence Diagram

Sequence diagram will show how the entity in the system interacts as well as the message delivered in each interaction. There are five sequence diagrams

will be designed which are: sequence diagram audit assignment, sequence diagram add auditor, sequence diagram audit company, sequence diagram audit company.

5.3.1 Sequence Diagram Input Audit Assignment

The actor who plays a role in the audit assignment process is an administrator. Sequence diagram below show sequential action to be done by the administrator.

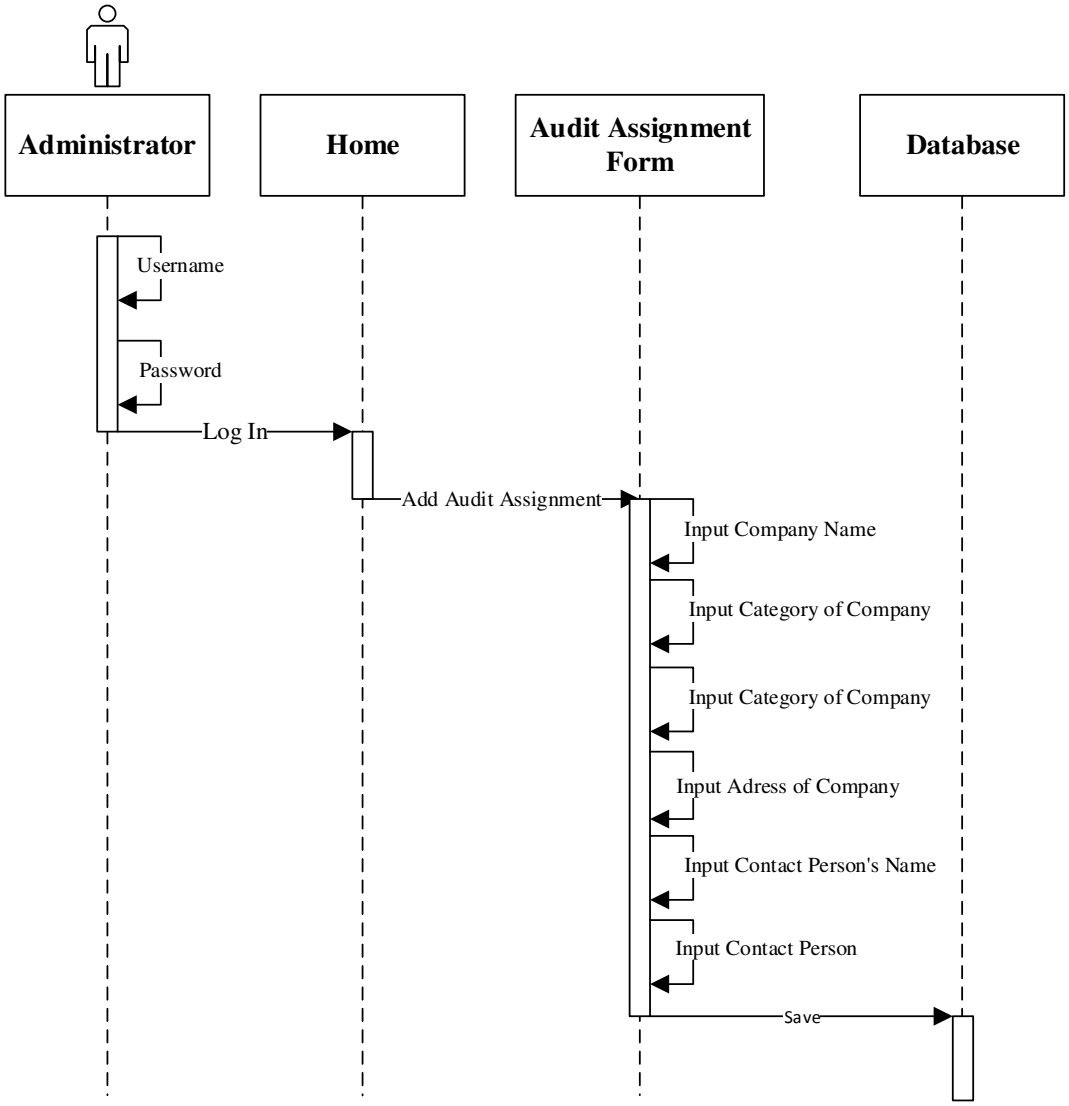


Figure 5. 6 Sequence diagram input audit assignment

The process started with Actor log in to the information system, by inputting username and password. Then the author will assign the audit by pressing “add audit assignment” button and input some information as displayed in the figure above into the audit form.

5.3.2 Sequence Diagram Add Auditor

The actor who plays a role in the add auditor process is an administrator. Sequence diagram below show sequential action to be done by the administrator.

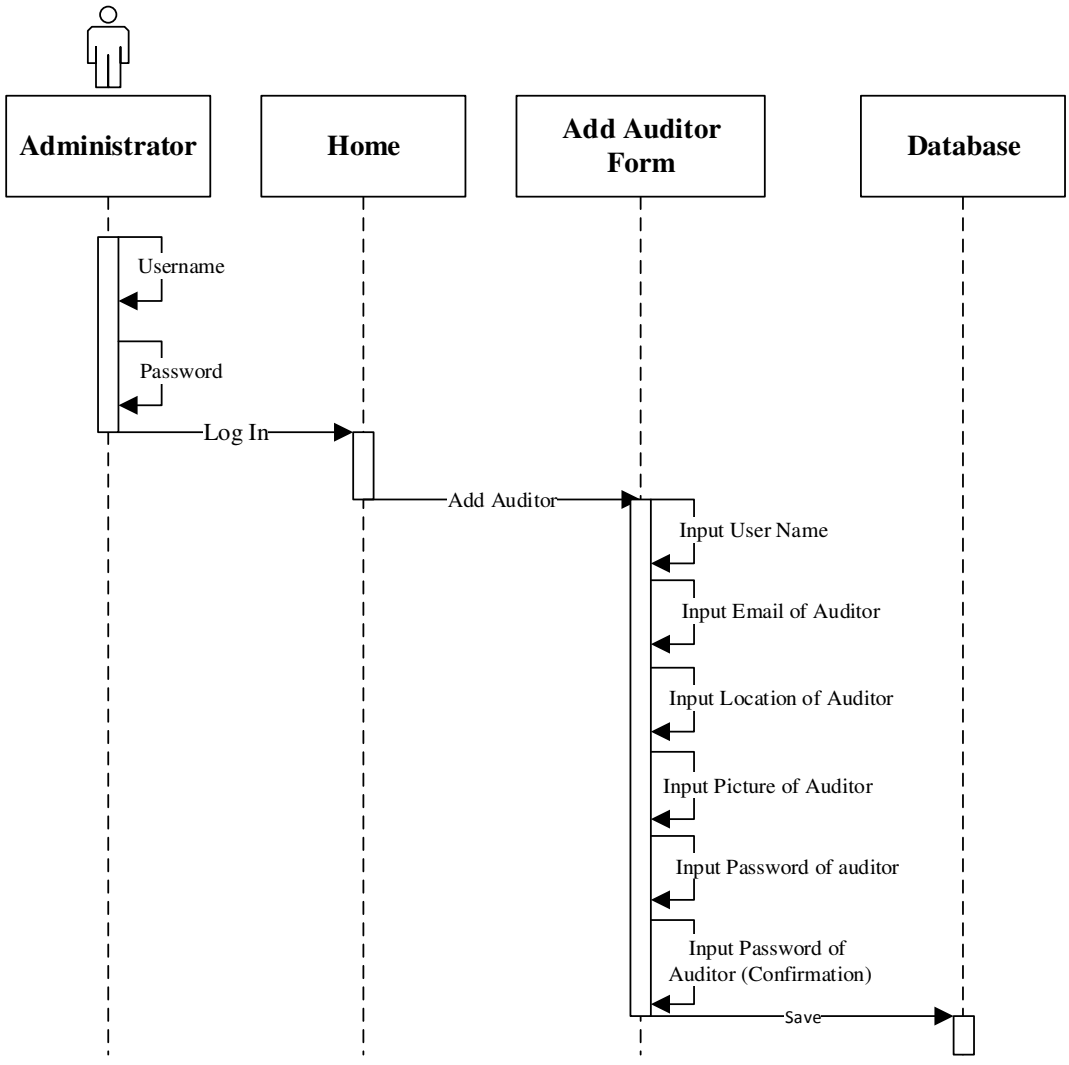


Figure 5. 7 Sequence diagram add auditor

The process started with Administrator login to the information system, by inputting username and password. Then the administrator will add new auditor by pressing “add auditor” button and input some information as displayed in the figure above into the audit form. All information will be stored into auditor database. After administrator finish adds new auditor, email and password of the new auditor can be used to log in as a new auditor.

5.3.3 Sequence Diagram Assign Auditor

The actor who plays a role in the add auditor process is administrator and auditor. Sequence diagram below show sequential action to be done by administrator and auditor.

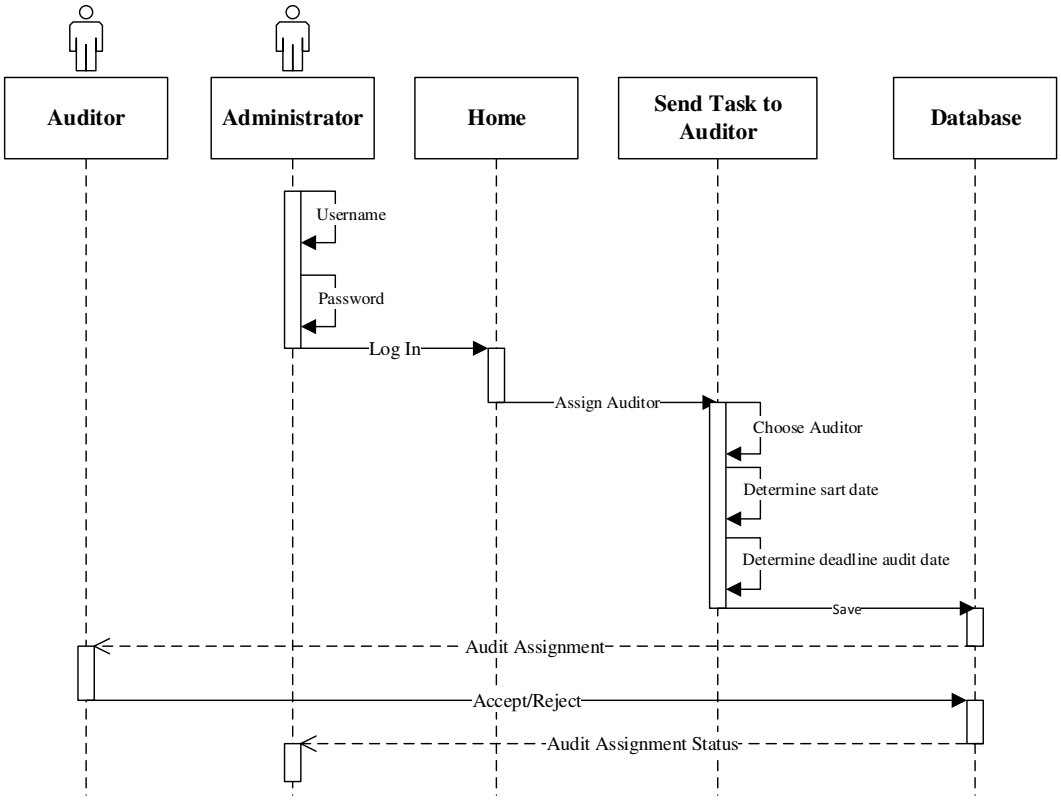


Figure 5. 8 Sequence diagram assign an auditor

The process started with Administrator login to the information system, by inputting username and password. Then the administrator will send a task to the 2

auditors by pressing "*tugaskan*" button and input some information as displayed in the figure above into the send task to auditor form. After administrator finish adds a new assignment to the auditor, the notification of new audit assignment will appear on the home menu of the auditors. Auditors able to accept/reject the audit assignment, and the audit assignment status will be changed depending on weither the auditor accepts/reject the audit assignment.

5.3.4 Sequence diagram audit company

The actor who plays a role in the add auditor process is administrator and auditor. The diagram below show sequential action to be done by administrator and auditor/

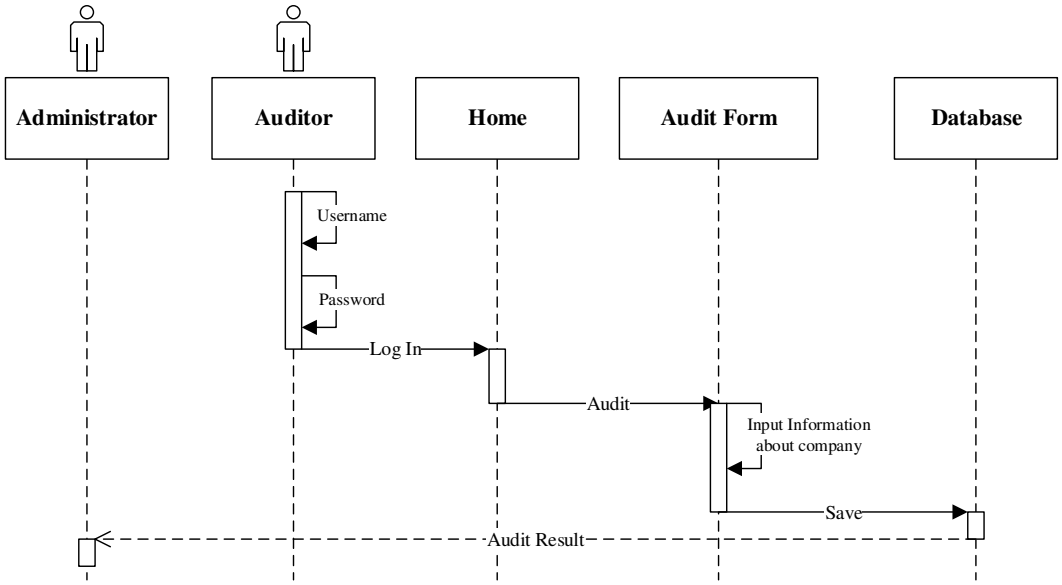


Figure 5. 9 Sequence diagram audit company

The process started with Auditors log in to the information system, by inputting username and password. Then the auditor can start audit company by pressing "audit" button. Audit form will be displayed, and auditor needs to fill the audit form based on the observation of the company. Then the audit result will be stored into the database, so the administrator able to view the audit result.

5.4 Halal Auditor Information System User Interface

This subchapter will discuss user interface of Halal Auditor information system and the explanation of the user interface.

5.4.1 Main User Interface

Main user interface is a beginning interface for every user before the actors do the activity. Main user interface used as input email address and password to check the identity of the user. The figure below show the interface of the main user page.

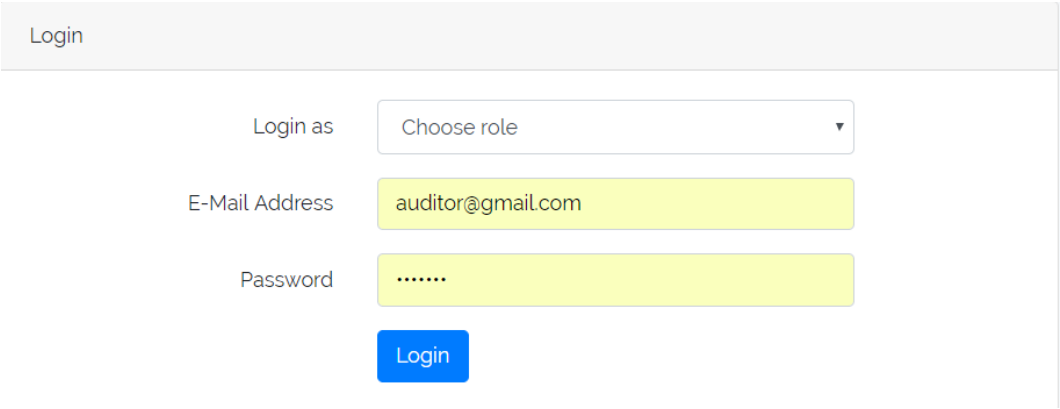


Figure 5. 10 Main user interface

Table below shows the explanation of each form

Table 5. 4 Field in the main user interface

No	Field	Type	Explanation
1	Choose Role	Combo Box	There is an option to choose, based on available role
2	Email Adress	Text Box	Manually inputted
3	Password	Textbox	Manually inputted

5.4.2 Administrator User Interface

This subchapter will discuss all user interface for all administrator activities.

1. Homepage

The homepage is a first user interface will be displayed after administrator successfully logs in. In the home page, there are all audit list information shown and the status of audit list.

Figure 5. 11 Administrator homepage interface

The table below explains the function of every button on the administrator home page.

Table 5. 5 Button in administrator homepage

No	Button	Explanation
1	Home	Go to the homepage
2	Edit profile	To edit administrator profile information such as password
3	Log Out	To log out from HAIS
4	View Auditor Database	To view auditor database
5	New Audit List	To add new audit list and go to
6	Add Auditor	To add new auditor data and go to
7	*Tugaskan*	To assign audit task to the auditor, and go to Audit Assignment form
8	*Telah ditugaskan*	It appears in the status column when administrator already assign the auditor and auditor has not accepted the assignment
8	*Dikerjakan*	It appears in the status column when administrator already assign the auditor and auditor accept the assignment

9	*Selesai*	It appears in the status column when the audit process already is done by the auditor if this button pressed administrator will see the audit result.

2. New Audit Assignment Form

This page will be displayed, when the administrator press “new audit list” button. The function of this page is to input all information about the new assignment. The administrator will press submit button when administrator already finish input all information needed.

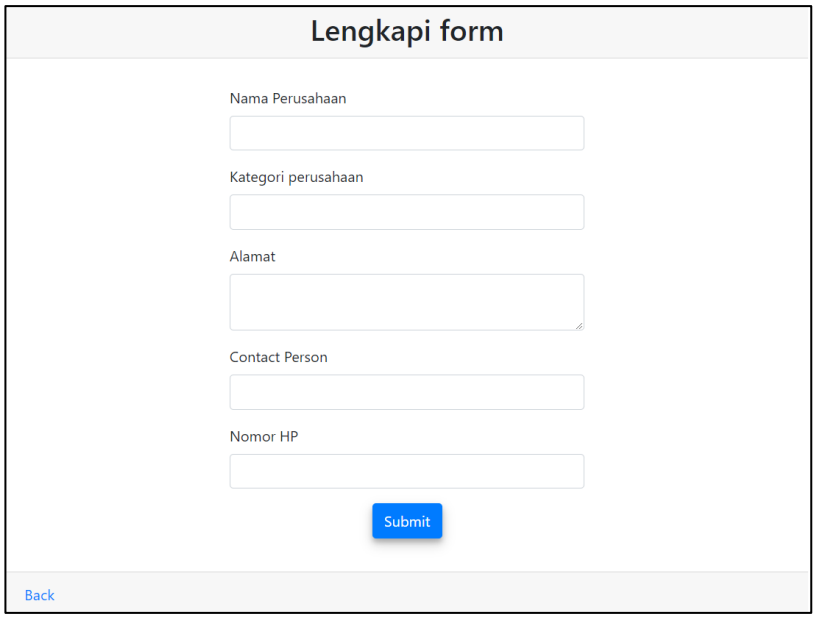


Figure 5. 12 New audit assignment form interface

Table below shows the explanation of each field form in new audit assignment page.

Table 5. 6 Field in new audit assignment form

No	Field	Type	Explanation
1	*Nama Perusahaan*	Text Box	Manually Inputted
2	*Kategori Perusahaan*	Text Box	Manually Inputted
3	*Alamat*	Text Box	Manually Inputted
4	Contact Person	Text Box	Manually Inputted
5	*Nomor HP*	Text Box	Manually Inputted

3. Add Auditor Form

This page will be displayed, when the administrator press “new audit list” button. The function of this page is to input all information about new auditor. The administrator will press submit button when administrator already finish input all information needed.

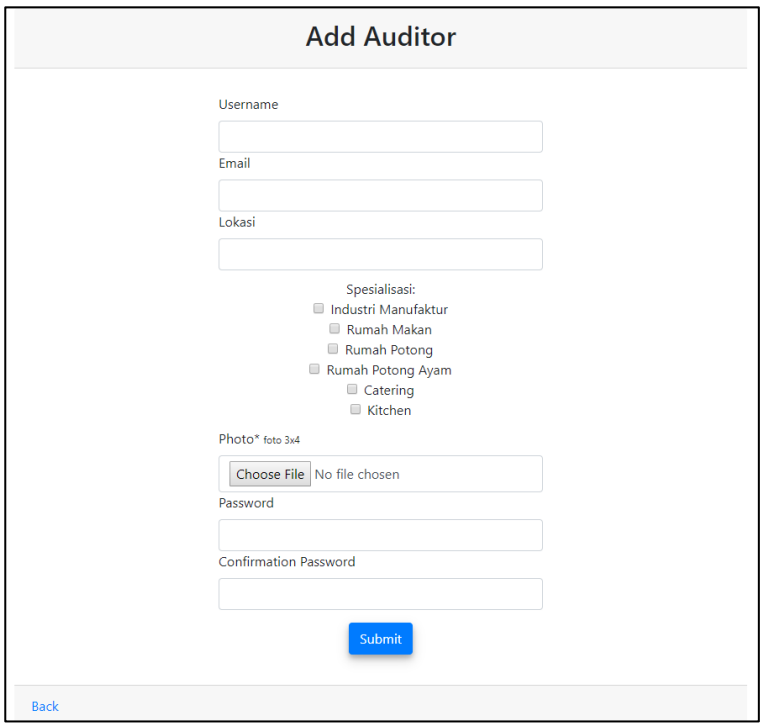


Figure 5. 13 Add auditor form user interface

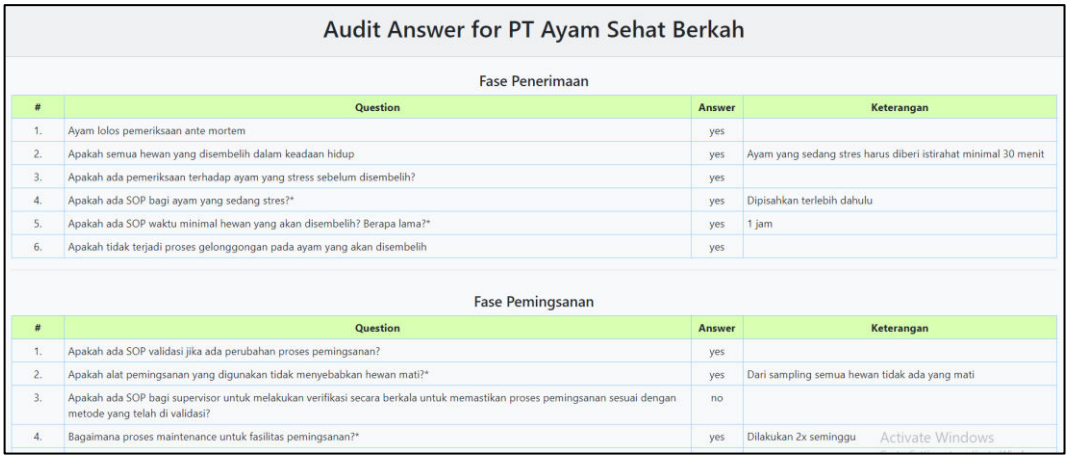
Table below shows the explanation of each field form in add auditor form user interface.

Table 5. 7 Field in add auditor form page

No	Field	Type	Explanation
1	Username	Text Box	Manually Inputted
2	Email	Text Box	Manually Inputted
3	Lokasi	Text Box	Manually Inputted
4	*Spesialisasi*	Option Box	Choose at least one option
5	Photo	Text Box	To upload a picture
6	Password	Text Box	Manually Inputted
7	Confirmation password	Text Box	Manually Inputted, need to be the same with the password field

4. Audit Result Page

This form will be displayed when the administrator press "*selesai*" button on the homepage. The function of this page only to show the audit result of each audit assignment.



Audit Answer for PT Ayam Sehat Berkah

Fase Penerimaan

#	Question	Answer	Keterangan
1.	Ayam lolos pemeriksaan ante mortem	yes	
2.	Apakah semua hewan yang disembelih dalam keadaan hidup	yes	Ayam yang sedang stres harus diberi istirahat minimal 30 menit
3.	Apakah ada pemeriksaan terhadap ayam yang stress sebelum disembelih?	yes	
4.	Apakah ada SOP bagi ayam yang sedang stres?*	yes	Dipisahkan terlebih dahulu
5.	Apakah ada SOP waktu minimal hewan yang akan disembelih? Berapa lama?*	yes	1 jam
6.	Apakah tidak terjadi proses gelonggongan pada ayam yang akan disembelih	yes	

Fase Pemingsanan

#	Question	Answer	Keterangan
1.	Apakah ada SOP validasi jika ada perubahan proses pemingsanan?	yes	
2.	Apakah alat pemingsanan yang digunakan tidak menyebabkan hewan mati?*	yes	Dari sampling semua hewan tidak ada yang mati
3.	Apakah ada SOP bagi supervisor untuk melakukan verifikasi secara berkala untuk memastikan proses pemingsanan sesuai dengan metode yang telah di validasi?	no	
4.	Bagaimana proses maintenance untuk fasilitas pemingsanan?*	yes	Dilakukan 2x seminggu

Figure 5. 14 Audit result user interface

5.4.3 Administrator User Interface

This sub chapter will discuss all user interface for all administrator activities.

1. Home page

The home page is a first user interface will be displayed after auditor successfully logs in. In the home page, there are all audit list information shown and the status of audit list.

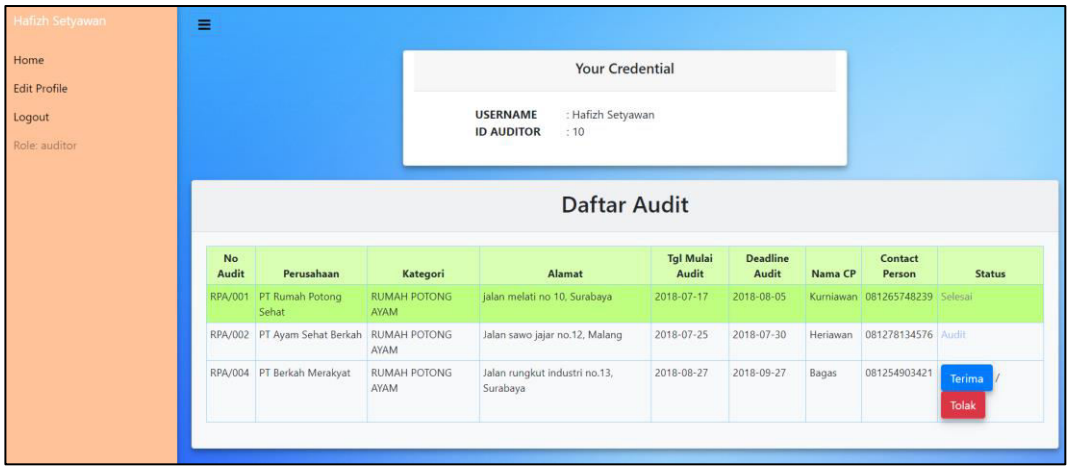


Figure 5. 15 Auditor home page user interface

The table below explains the function of every button on the administrator home page.

Table 5. 8 Button in auditor home page

No	Button	Explanation
1	Home	Go to the home page
2	Edit profile	To edit administrator profile information such as password
3	Log Out	To log out from HAIS
4	*Selesai*	It appears in the status column when the audit process already is done by the auditor, if this button pressed auditor will see the audit result.
5	Audit	To audit company and input information about the company based on the observation of the auditor, when this button pressed "audit form" will be displayed
6	*Terima*	It appears in the status column when administrator already assign the auditor and auditor has not accepted the assignment. When the auditor press the button the audit list will be disappear
7	*Tolak*	It appears in the status column when administrator already assign the auditor and auditor has not accepted the assignment. When the auditor press the button the audit list will be disappear

2. Audit Form Page

This page will be displayed, when the administrator press “audit” button. The function of this page is to input all information about observation result of the company. There is 12 phase on the audit form. The administrator will press submit button when administrator already finish input all information needed.

Figure 5. 16 Audit form user interface

When the auditor selects a phase, the audit form will appear as shown below

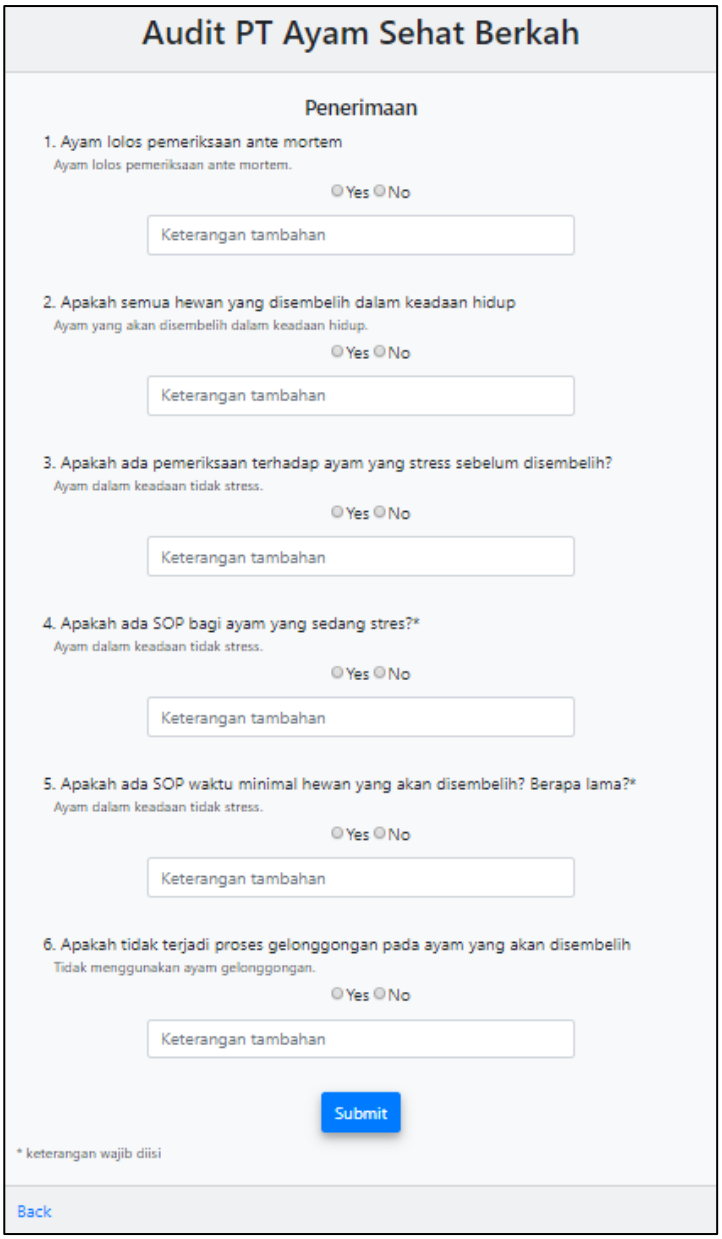


Figure 5. 17 Auditor form Questionnaire user interface

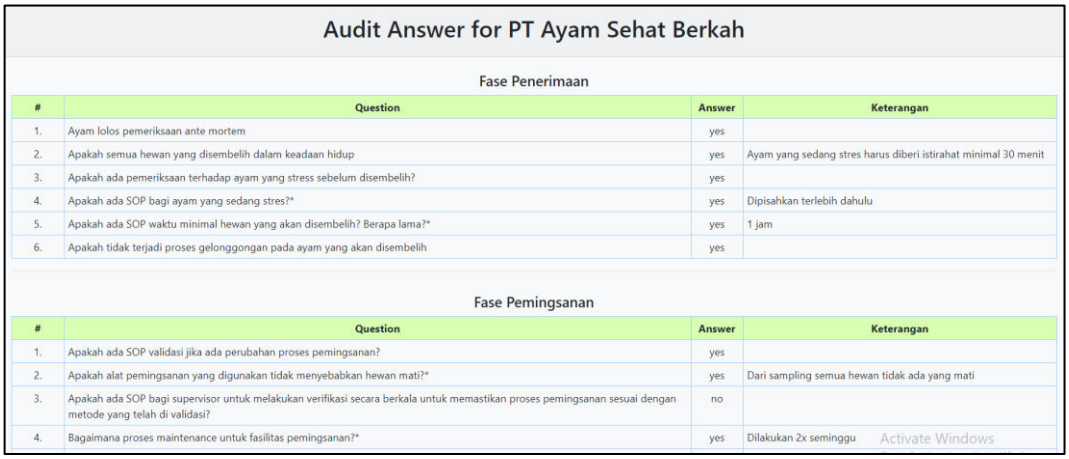
There are 2 type of box to be fulfilled in this page table below shows the explanation of each box.

Table 5. 9 Field in auditor Questionnaire form

No	Field	Type	Explanation
1	Yes/no	Option Box	Need to select one option for each question
2	*Keterangan Tambahan*	Text Box	Need to input manually, the only question with "*" mark must be inputted

3. Audit Result Page

This form will be displayed when the auditor press “view answer” button on the audit form page. The function of this page only to show the audit result of each audit assignment.



Audit Answer for PT Ayam Sehat Berkah

Fase Penerimaan

#	Question	Answer	Keterangan
1.	Ayam lolos pemeriksaan ante mortem	yes	
2.	Apakah semua hewan yang disembelih dalam keadaan hidup	yes	Ayam yang sedang stres harus diberi istirahat minimal 30 menit
3.	Apakah ada pemeriksaan terhadap ayam yang stress sebelum disembelih?	yes	
4.	Apakah ada SOP bagi ayam yang sedang stres?*	yes	Dipisahkan terlebih dahulu
5.	Apakah ada SOP waktu minimal hewan yang akan disembelih? Berapa lama?*	yes	1 jam
6.	Apakah tidak terjadi proses gelonggongan pada ayam yang akan disembelih	yes	

Fase Pemingsanan

#	Question	Answer	Keterangan
1.	Apakah ada SOP validasi jika ada perubahan proses pemingsanan?	yes	
2.	Apakah alat pemingsanan yang digunakan tidak menyebabkan hewan mati?*	yes	Dari sampling semua hewan tidak ada yang mati
3.	Apakah ada SOP bagi supervisor untuk melakukan verifikasi secara berkala untuk memastikan proses pemingsanan sesuai dengan metode yang telah di validasi?	no	
4.	Bagaimana proses maintenance untuk fasilitas pemingsanan?*	yes	Dilakukan 2x seminggu

Figure 5. 18 Audit result page user interface

5.5 Halal Auditor Information System Implementation

Before Halal Auditor Information System is ready to use, there are some activities needs to be done. Every activity has two options, each option has different duration and a different cost. The faster duration of the activity the more expensive cost of the activity. Below is the explanation of each activities and its options :

1. Planning software implementation

In this stage all possible plan will be designed and manage such as conducting timeline, budget, deadline. Minimum monthly labor salary (UMK) in Surabaya is Rp. 3.580.000, Assume there are 30 days in a month, so daily minimum salary in Surabaya is Rp. 119.333. Estimated cost for planning software implementation activity for each option is:

Table 5. 10 Planning software implementation activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
Planning software implementation	1st	10 Planners	4	4.773.333
	2nd	15 Planners	3	5.370.000

2. Programming

In this stage the programmer will develop the software by using a programming language. By using Rp. 119.333 as minimum salary in Surabaya. Estimated cost for programming activity for each option is:

Table 5. 11 Programming activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
Programming	1	1 Programmer	45	5.370.000
	2	2 Programmers	25	5.966.667

3. Design user interface

In this activity the designer will design the user interface to make the information system is easy to use, eye-catching and simple. By using Rp. 119.333 as minimum salary in Surabaya. Estimated cost for programming activity for each option is:

Table 5. 12 Design user interface acitvity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
Design user interface	1st	1 Designer	20	2.386.667
	2nd	2 Designers	12	2.864.000

4. Preparing physical facilities

The purpose of this stage is to preparing all physical facilities to implement an information system, such as purchasing hardware and its installment. By using Rp. 119.333 as minimum salary in Surabaya with Rp. 50.000 for transportation allowance. Estimated cost for preparing physical facilities is:

Table 5. 13 Preparing physical facilities activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
Preparing physical facilities	1st	One staff/office	3	508.000
	2nd	2 staffs/office	1	338.667

5. Program testing

After information system developed, program tester will test a bug in information system and check the operation of an information system. By using Rp. 119.333 as minimum salary in Surabaya. Estimated cost for programming activity for each option is:

Table 5. 14 Program Testing activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
Program testing	1st	1 Programmer	5	596.667
	2nd	2 Programmers	3	716.000

6. System testing

The information system will be used in the trial to check either the information system working or not. By using Rp. 119.333 as minimum salary in Surabaya. Estimated cost for programming activity for each option is:

Table 5. 15 System testing activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
System testing	1st	1 Crew	4	477.333
	2nd	2 Crews	1	238.667

7. Personnel Training

In this stage all auditor will be trained to use the information system. Table below show the estimated cost to train auditor:

Table 5. 16 Personnel training activity

Activity Description	Activity Number	Option	Explanation	Duration (Day)	Facilities	Cost (Rp)

Personnel Training	7	1	City scale training	30	Room and facilities	16000000
					Auditor transportation	15000000
					Consumption	20000000
		2	Province scale training	15	Room and facilities	20000000
					Auditor transportation	45000000
					Consumption	20000000

8. System Conversion

The purpose of this stage is to implement the information system to new system, before MUI use the full system. Table below show the estimated cost of system conversion.

Table 5. 17 System Conversion activity

Activity Description	Option	Explanation	Duration (Day)	Cost (Rp)
System testing	1st	Direct Conversion	15	10000000
	2nd	Paralel Conversion	30	6000000

Table below show the summary of all activities and its option.

Table 5. 18 Summary of all activities of HAIS implementation

Activity Description	Activity Number	Explanation	Duration (Day)	Cost (Rp)
Planning software implementation	1	10 Planners	4	4.773.333
		15 Planners	3	5.370.000
Programming	2	1 Programmer	45	5.370.000
		2 Programmers	25	5.966.667
Design User Interface	3	1 Designer	20	2.386.667
		2 Designers	12	2.864.000
Preparing physical facilities	4	One staff/office	3	508.000
		2 staffs/office	1	338.667
Program testing	5	1 Programmer	5	596.667
		2 Programmers	3	716.000
System testing	6	1 Crew	4	477.333

Activity Description	Activity Number	Explanation	Duration (Day)	Cost (Rp)
		2 Crews	1	238.667
Personel Training	7	City scale training	27	51.000.000
		Province scale training	15	85.000.000
System Conversion	8	Direct Conversion	15	10.000.000
		Paralel Conversion	30	6.000.000

Not all the activity above can be done parallel, there are some activities which has a predecessor. Table below shows predecessor of each activity.

Table 5. 19 HAIS implementation activity predecessor

Activity ID	Task Name	Predecessor
1	Planning software implementation	-
2	Programming	Planning software implementation
3	Design User Interface	Planning software implementation
4	Preparing physical facilities	Planning software implementation
5	Program Testing	Programming, Design user interface
6	System Testing	Preparing physical facilities and software testing
7	Personel Training	Testing the system
8	System Conversion	Personel Training

From the table above, a figure below show flow chart of Halal Auditor Information System.

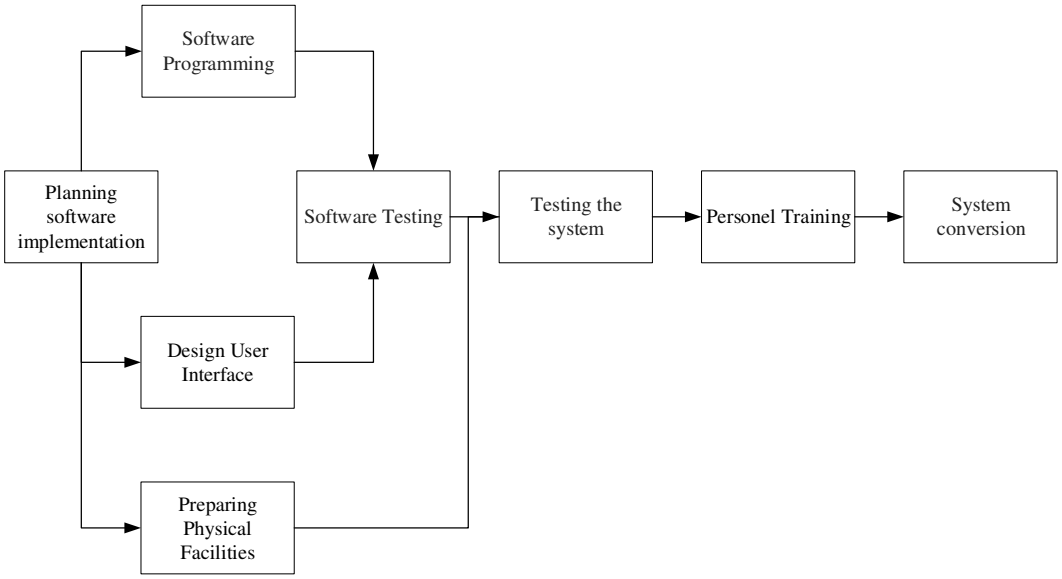


Figure 5. 19 HAIS implementation activity

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CHAPTER 6
INVESTMENT EVALUATION AND SENSIVITY ANALYSIS

This chapter will discuss the investment evaluation of Halal Auditor Information System. There are 3 evaluations was performed which are: Determining best option of HAIS implementation, Net Present Value, and Sensitivity Analysis. Each study has a difrent purpose.

6.1 Determining Best Option of HAIS Implementation

Based on the chapter 5.5, each activity of HAIS implementation has 2 options. This chapter will discuss how to determine the best option of HAIS implementation, which gained maximum profit. The time-cost tradeoff analysis was performed to determine the best option of Halal Auditor information system implementation. To perform Time-Cost trade-off analysis, potential benefits, potential expenses, and linear programming will be determined to choose the best option of Halal Auditor Information System implementation.

6.1.1 Potential Benefit

This subchapter will discuss potential benefit of Halal Auditor Information System implementation. Potential benefits are the sum of the maximum amounts that people would pay to gain outcomes that they view as desirable achieved by the investment. There are three potential benefits of Halal Auditor Information System implementation, which are audit halal certification lead time reduction, the paper used reduction, and document delivery cost reduction.

1. Halal certification lead time reduction

The implementation of Halal Auditor Information System predicted to reduce Halal certification lead time reduction five days because before the implementation of information system there is idle time to deliver audit result to Majelis Ulama Indonesia (MUI). By implementing Halal auditor information system, all audit information will be stored into database and MUI able to check the result immediately. The potential benefit of Halal certification lead time reduction explains below.

Table 6. 1 Halal certification lead time

Halal Certification lead time	Duration
Average Lead time	45 Days
Potential lead time reduction	5 Days
Percentage time reduction	**11%**

Table 6. 2 Halal certification cost

Halal Certification income	Ammount
The minimum cost of halal certification income	Rp 1.500.000
The maximum cost of halal certification income	Rp 4.500.000
The average cost of halal certification income	**Rp 3.000.000**

Because the implementation of *Undang-Undang* no.33 2014 which obliges all product distributed in Indonesia must register by Halal in 2019. There are 1157 slaughterhouses in Indonesia, and the duration of the halal certificate is two years. Then the potential annual benefit of halal certification is

$$Annual\ potential\ income\ of\ halal\ certification\ in\ slaughterhouse = 1157 * Rp\ 3.000.000/2$$

$$Annual\ potential\ income\ of\ halal\ certification\ in\ slaughterhouse = Rp\ 1.735.500.000$$

By assuming the percentage of the number of chicken slaughterhouse compare to all slaughterhouse in Indonesia is 25 %

$$Daily\ Potential\ income\ of\ chicken\ slaughterhouse\ salal\ certification = Rp\ 1.735.500.000 * 25\%/365$$

$$Daily\ potential\ income\ of\ chicken\ \ slaughterhouse\ halal\ certification = Rp\ 1.186.669$$

$$Daily\ potential\ benefit\ of\ halal\ certification = Rp\ 1.186.669 * 11\%$$

$$\textbf{\textit{Daily potential benefit of Halal Certification}} = \textbf{\textit{Rp}}\ 132.708$$

2. Paper used reduction

The implementation of Halal Auditor Information System predicted to reduce the used of paper because of the auditing process done by using information system with no paper needed. Table below shows potential benefit of paper used reduction.

Table 6. 3 Paper used potential reduction benefit

Paper Used Reduction	
Number of monthly estimate paper used reduction	2500 sheets
Number of daily estimate paper used reduction	83,333 sheets
Paper Used Reduction Benefit	
Price of paper/sheet	Rp 150
The daily potential paper used reduction benefit	**Rp 12.500**

3. Delivery cost reduction

The implementation of Halal Auditor Information system predicted to reduce document delivery cost. Because the system will store the result into database, the auditor does not need to deliver all audit document to MUI.

Table 6. 4 Delivery cost reduction potential benefit

Delivery Cost Reduction Benefit	
Reduced document delivery cost for each province (monthly)	Rp 300.000
Total document delivery cost reduced (monthly)	Rp 10.200.000
Total document delivery cost Reduced	**Rp 340.000**

6.1.2 Potential Expenses

This chapter will discuss potential expenses of the implementation Halal Auditor Information System. Potential Expenses is an amount of money which occurs because of the implementation of Halal Auditor Information System. There are two potential expenses of Halal Auditor Information System implementation which are: internet data package for auditor, and electricity.

1. Internet data package for auditor

All auditor need to be connected to the internet to use Halal Auditor Information System, MUI needs to provide internet package for the auditor. The expense of internet data package is shown in the table below:

Table 6. 5 Monthly internet expense

Monthly internet package price	
Monthly internet package price (Simpati 16GB)	Rp 100.000
Number of auditor LPPOM MUI	998
Estimate monthly expense internet package for all auditor	Rp 99.800.000

Because not all auditor is chicken slaughterhouse auditor, then chicken slaughterhouse daily internet expense estimation is shown in the table below.

Table 6. 6 Percentage slaughterhouse compare to all company

Daily internet expense	
Number of Company Certified Halal	8636
Number of Slaughterhouse Certified Halal	120
Percentage of halal-certified slaughterhouse compare to all certified halal company	1,390%

Table 6. 7 Daily internet expense estimation

Monthly internet package price	
Internet Expense estimation monthly (only for chicken slaughterhouse auditor)	Rp 1.386.753
Internet expense estimation daily (only for chicken slaughterhouse auditor)	**Rp 46.225**

2. Electricity

Halal auditor information system used three hardwares, each hardware needs different Watt of electricity. Table below shows the potential expense for the electricity.

Table 6. 8 Electricity expense

No	Hardware	Unit	Operating Hours	Cost/Kwh	Daily Total Cost
1	Wifi Router	0,018	24 Hours	Rp 1.467,28	Rp 634

No	Hardware	Unit	Operating Hours	Cost/Kwh	Daily Total Cost
2	Server	0,015			Rp 528
3	Computer	0,1			Rp 3521
Total					**Rp 4.683,6**

6.1.3 Proposed Integer Linear Programming

In this final assignment, Integer Linear Programming (ILP) was used to evaluate the best implementation of HAIS. Based on the data in the table 5.12 each activity has two options with different cost and a different duration. The faster the implementation of the project the more expensive the implementation will be. But the benefit of the implementation of the information system only can be achieved if the information system already implemented. So the Integer Linear Programming was used to find the best option of each activity in HAIS implementation to gain maximal benefit. The ILP model for HAIS implementation evaluation was developed based on the model from Patterson and Huber (1974) as well as modified from Burns (1996), the following is the original model from reference :

Objective Function

$Minimize \ \sum_{i=1}^{n} C_i$ (1)

Constraints

Subject to:

$\forall\, S_i \geq 0 \qquad i = 1, 2, 3, \ldots, n$ (2)

$S_a + D_a \leq S_b \qquad for\ each\ precedence\ a \rightarrow b$ (3)

$\sum_{j=1}^{O_i} C_{ij} X_{ij} = C_i \qquad for\ all\ activity\ i$ (4)

$\sum_{j=1}^{O_i} D_{ij} X_{ij} = D_i \qquad for\ all\ activity\ i$ (5)

$\sum_{j=1}^{O_i} X_{ij} = 1 \qquad for\ all\ activity\ i$ (6)

$\forall\, X_{ij} \geq 0$ (7)

$\forall\, X_{ij} \leq 1$ (8)

$\forall X_{ij}\ are\ integer$ (9)

Where:

C_i : Cost of Activity i

C_{ij} : Cost of Option j within Activity i

D_i : Duration of Activity i

D_{ij} : Duration of Option j within Activity i

N : Total Number of Activities

O_i : Number of Inequalities within Time-Cost Constraints Set for Activity i

S_i : Start Time of Activity i

X_{ij} : Decision Variable for Option j within Activity i

B_i : Total Potential Benefit (i) because of Information System Implementation

B_d : Daily Potential Benefit (i) because of Information System Implementation

C_i :Total Potential expense (i) because of Information System Implementation

D_i : Daily Potential expense (i) because of Information System Implementation

S_l : Start Time of Latest Activity

D_l : Duration of Latest Activity

F_l : Finish time of Latest Activity

Based on the integer linear programming formulation above, equation (1) is the objective function of the problem, to minimize total costs of the implementation of Halal Auditor Information System (HAIS). Equation (2) – (4) are the constraints to represent the precedence relationship between the activities. The equation (5) – (10) are used to ensure there is only one option within each activity will be chosen as the optimal solution. However the model above does not consider the expected benefit and monthly expense for the investment. While the purpose of the used of ILP was to evaluate the best option of Halal Information System implementation which gains maximum benefit in a year. In this final

assignment, author develops new objective function as well as add new variables to solve the problem which are:

Objective Function

$$Maximize \sum_{i=1}^{n} B_i - C_i - M_i$$

New Constraints used

$F_l = S_l + D_l$

$B_i = B_{di} * (365 - F_l)$

$M_i = M_{di} * (365 - F_l)$

Where:

B_i : Total Potential Benefit (i) because of Information System Implementation

B_{di} : Daily Potential Benefit (i) because of Information System Implementation

M_i : Total Potential expense (i) because of Information System Implementation

M_{di} : Daily Potential expense (i) because of Information System Implementation

S_l : Start Time of Latest Activity

D_l : Duration of Latest Activity

F_l : Finish time of Latest Activity

The proposed model for this final assignment will use Halal Auditor Information System Implementation data on the table 5.19. Then the proposed model can be described as follows:

Objective Function

$$Maximize \sum_{i=1}^{3} B_i - \sum_{i=1}^{3} M_i - \sum_{i=1}^{8} C_i$$

Constraints

Subject to:

$\forall S_i \geq 0, \qquad i = 1, 2, 3, \ldots, 8$

$S_1 + D_1 \leq S_2$

$S_1 + D_1 \leq S_3$

$S_1 + D_1 \leq S_4$

$S_2 + D_2 \leq S_5$

$S_3 + D_3 \leq S_5$

$S_4 + D_4 \leq S_5$

$S_5 + D_5 \leq S_6$

$S_6 + D_6 \leq S_7$

$S_7 + D_7 \leq S_8$

$S_8 + D_8 = F_l$

$B_1 = 63402 * (365 - F_l)$

$B_2 = 12500 * (365 - F_l)$

$B_3 = 34000 * (365 - F_l)$

$M_1 = 46225 * (365 - F_l)$

$M_2 = 4684 * (365 - F_l)$

$C_1 = 4733333X_{11} + 5370000X_{12}$

$C_2 = 5370000X_{21} + 5966667X_{22}$

$C_3 = 2386667X_{31} + 2864000X_{32}$

$C_4 = 508000X_{41} + 338667X_{42}$

$C_5 = 596667X_{51} + 716000X_{52}$

$C_6 = 477333X_{61} + 238667X_{62}$

$C_7 = 51000000X_{71} + 85000000X_{72}$

$C_8 = 10000000X_{81} + 6000000X_{82}$

$D_1 = 4X_{11} + 3X_{12}$

$D_2 = 45X_{11} + 25X_{12}$

$D_3 = 20X_{11} + 12X_{12}$

$D_4 = 3X_{11} + 1X_{12}$

$D_5 = 5X_{11} + 3X_{12}$

$D_6 = 4X_{11} + 1X_{12}$

$D_7 = 30X_{11} + 15X_{12}$

$D_8 = 30X_{11} + 15X_{12}$

$$\sum_{j=1}^{2} X_{1j} = 1$$

$$\sum_{j=1}^{2} X_{2j} = 1$$

$$\sum_{j=1}^{3} X_{3j} = 1$$

$$\sum_{j=1}^{4} X_{4j} = 1$$

$$\sum_{j=1}^{5} X_{5j} = 1$$

$$\sum_{j=1}^{6} X_{6j} = 1$$

$$\sum_{j=1}^{7} X_{7j} = 1$$

$$\sum_{j=1}^{8} X_{8j} = 1$$

$\forall\, X_{ij}\ are\ binary$

X_{ij} = 1 if X_{ij} activity is selected

X_{ij} = 0 if X_{ij} activity is not selected

The model proposed below was run by using LINGO software, the result of Lingo Software determine the best option for HAIS implementation as shown in the table below:

Table 6. 9 HAIS implementation best option

Activity Description	Activity Number	Option	Duration (Day)	Cost (Rp)	Option Chosen
Implementation Planning	1	1	4	4.773.333	1
		2	3	5.370.000	
Programming	2	1	45	5.370.000	2
		2	25	5.966.667	
Design User Interface	3	1	20	2.386.667	1
		2	12	2.864.000	
Preparing physical facilities	4	1	3	508.000	2
		2	1	338.667	
Program testing	5	1	5	596.667	2
		2	3	716.000	
System testing	6	1	4	477.333	2
		2	1	238.667	
Personel Training	7	1	30	51.000.000	1
		2	15	85.000.000	
System Conversion	8	1	30	6.000.000	1
		2	15	10.000.000	

Table below shows the optimum decision of Halal Auditor Information Software implementation. If the start date is on 1st January 2019, the information system will be ready to use on 02nd April 2019. With a total cost of HAIS implementation is Rp 71.420.000

Table 6. 10 HAIS implementation duration and cost

Activity ID	Task Name	Duration (day)	Start	Finish	Cost
1	Planning software implementation	4	01/01/2019	04/01/2019	Rp 4.773.333
2	Programming	25	05/01/2019	29/01/2019	Rp 5.966.667
3	Design User Interface	20	05/01/2019	24/01/2019	Rp 238.6667

Activity ID	Task Name	Duration (day)	Start	Finish	Cost
4	Preparing physical facilities	1	05/01/2019	05/01/2019	Rp 338.667
5	Program Testing	3	30/01/2019	01/02/2019	Rp 716.000
6	System Testing	1	02/02/2019	02/02/2018	Rp 238.667
7	Personel Training	30	03/02/2019	02/03/2019	Rp 51.000.000
8	System Conversion	30	03/03/2019	03/04/2019	Rp 6.000.000
Total					Rp 71.420.000

With the value of objective total potential benefits, total potential monthly expenses, and total cost.

Table 6. 11 Potential benefit result

Benefit	Daily benefit	Benefit Duration (Days)	Total benefit
Halal audit lead time reduction	Rp 132.078	272	Rp35.925.114
Paper used reduction	Rp 12.500	272	Rp3.400.000
Delivery cost reduction	Rp 340.200	272	Rp 92.480.000
Total			**Rp131.805.114**

Table 6. 12 Potential expense result

Expense	Daily expense	Expense Duration (Days)	Total expense
Internet expense estimation daily	Rp 46.225	272	Rp 12.573.228
Electricity	Rp 4.684	272	Rp 1.273.928
Total			**Rp 13.847.156**

$$Maximize \sum_{i=1}^{3} B_i - \sum_{i=1}^{3} M_i - \sum_{i=1}^{8} C_i =$$

$$Rp\ 131.805.114 - Rp\ 13.847.156 - Rp\ 71.420.000$$

$$\boldsymbol{Maximize} \sum_{i=1}^{3} \boldsymbol{B_i} - \sum_{i=1}^{3} \boldsymbol{M_i} - \sum_{i=1}^{8} \boldsymbol{C_i} = \boldsymbol{Rp.46.537.958}$$

6.2 Net Present Value

Net Present Value was performed to determine the feasibility of the Halal Auditor Information System investment. In this final assignment, the author set 9,75 % annual interest rate which follows Business corporate credit interest rate of Bank Central Asia.
Business credit is intended to help Company which need fresh funds to grow the business or support the company's operational activities.
Customer credit application is classified based on its business scale. The bank will then determine whether a company consider as a micro, retail, or corporate group. Micro credit is intended for company/entrepreneur which need small capital such as farmer, Retail credit intended for small medium enterprises, while corporate credit intended for big company. Because Majelis Ulama Indonesia is a big organization with high turnover money, then it will be suitable if Majelis Ulama Indonesia use Business corporate credit.

The Net Present Value will be counted quarterly, the formula to calculate effective interest rate is:

$$Inflation\ Rate\ (Indonesian\ Bank)\ (i) = 9.75\ \%$$

$$Effective\ Interest\ Rate\ Quarter\ (r) = \left(1 + \left(\frac{i}{m}\right)^{m}\right) - 1$$

Because the NPV calculated quarterly, then $m = 4$.

$$Effective\ Interest\ Rate\ Quarter\ (r) = \left(1 + \left(\frac{3.23\%}{4}\right)^{4}\right) - 1$$

$$Effective\ Interest\ Rate\ Quarter\ (r) = 10.11\ \%$$

In Net Present Value Calculation, a discount factor also needs to be calculated for every period. The formula to calculate discounted factor for every period is:

$$Discount\ Factor = \ (1/(1+r)^n)$$

With

$$n = number\ of\ quarter$$

For example, to calculate discounted factor r for 3rd quarter will be :

$$n = 3$$

$$Discount\ Factor = \ (1/(1+10.11\%)^3)$$

$$Discount\ Factor = \ 0.75$$

To calculate net present value, all cash flow in every period need to be provided. The cash flow comes from: project implementation cost, hardware investment, potential benefit and potential expense of Halal Auditor Information System. Project implementation cost, potential benefit and potential expense of halal auditor information system already provided in chapter 6.1. However, to implement the information system MUI need to provide some hardware as the investment. Table below show the hardware required to operate HAIS.

No	Hardware	Type	Number	Price	Total Price
1	Wifi Router	Netgear AC1200 Smart WiFi Router R6220	1	Rp 957.500	Rp 957.500
3	Server	HP ProLiant ML10G9-678 (1TB)	1	Rp 10.500.000	Rp 10.500.000
4	Computer	PC All In One AIO Lenovo AIO310 20IAP F0CL000KID	1	Rp 5.750.000	Rp 5.750.000
Total					Rp 17.207.500

Table below shows Net Present Value of HAIS investment for every quarter:

Table 6. 13 NPV quarter 0 until 4

	Quarter 0	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Information System Development	-Rp73.568.001				
Wi-Fi router	-Rp957.500				
Computer	-Rp5.750.000				
Server	-Rp10.500.000				
Internet Package		-Rp4.160.259	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259
Electricity		-Rp421.520	-Rp421.520	-Rp421.520	-Rp421.520
Hardware Maintenance					-Rp300.000
Information System Maintenance		-Rp1.050.000	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000
Expense	**-Rp90.775.501**	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.931.780**
Paper used reduction		Rp1.125.000	Rp1.125.000	Rp1.125.000	Rp1.125.000
Effectivity Increase		Rp11.886.986	Rp11.886.986	Rp11.886.986	Rp11.886.986
Delivery cost reduction		Rp30.600.000	Rp30.600.000	Rp30.600.000	Rp30.600.000
Benefit		**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**
Net Balance	-Rp90.775.501	Rp37.980.207	Rp37.980.207	Rp37.980.207	Rp37.680.207
Discount Factor	1,00	0,91	0,82	0,75	0,68
Discounted Balance	-Rp90.775.501	Rp34.492.243	Rp31.324.602	Rp28.447.865	Rp25.631.247
Cumulative Discounted Balance	**-Rp90.775.501**	**-Rp56.283.257**	**-Rp24.958.656**	**Rp3.489.209**	**Rp29.120.456**

Table 6. 14 NPV quarter 5 until 8

	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Information System Development				
Wifi router				
Computer				
Server				
Internet Package	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259
Electricity	-Rp421.520	-Rp421.520	-Rp421.520	-Rp421.520
Hardware Maintenance				-Rp300.000
Information System Maintenance	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000
Expense	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.931.780**
Paper used reduction	Rp1.125.000	Rp1.125.000	Rp1.125.000	Rp1.125.000
Effectivity Increase	Rp11.886.986	Rp11.886.986	Rp11.886.986	Rp11.886.986
Delivery cost reduction	Rp30.600.000	Rp30.600.000	Rp30.600.000	Rp30.600.000
Benefit	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**
Net Balance	Rp37.980.207	Rp37.980.207	Rp37.980.207	Rp37.680.207
Discount Factor	0,62	0,56	0,51	0,46
Discounted Balance	Rp23.462.696	Rp21.307.967	Rp19.351.121	Rp17.435.171
Cumulative Discounted Balance	**Rp52.583.152**	**Rp73.891.119**	**Rp93.242.241**	**Rp110.677.411**

Table 6. 15 NPV table quarter 9 until 12

	Quarter 9	Quarter 10	Quarter 11	Quarter 12
Information System Development				
Wifi router				
Computer				
Server				
Internet Package	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259
Electricity	-Rp421.520	-Rp421.520	-Rp421.520	-Rp421.520
Hardware Maintenance				-Rp300.000
Information System Maintenance	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000
Expense	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.931.780**
Paper used reduction	Rp1.125.000	Rp1.125.000	Rp1.125.000	Rp1.125.000
Effectivity Increase	Rp11.886.986	Rp11.886.986	Rp11.886.986	Rp11.886.986
Delivery cost reduction	Rp30.600.000	Rp30.600.000	Rp30.600.000	Rp30.600.000
Benefit	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**
Net Balance	Rp37.980.207	Rp37.980.207	Rp37.980.207	Rp37.680.207
Discount Factor	0,42	0,38	0,35	0,31
Discounted Balance	Rp15.960.055	Rp14.494.341	Rp13.163.234	Rp11.859.945
Cumulative Discounted Balance	**Rp126.637.466**	**Rp141.131.807**	**Rp154.295.042**	**Rp166.154.986**

Table 6. 16 NPV table quarter 13 until 16

	Quarter 13	Quarter 14	Quarter 15	Quarter 16
Information System Development				
Wifi router				
Computer				
Server				
Internet Package	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259	-Rp4.160.259
Electricity	-Rp421.520	-Rp421.520	-Rp421.520	-Rp421.520
Hardware Maintenance				-Rp300.000
Information System Maintenance	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000	-Rp1.050.000
Expense	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.631.780**	**-Rp5.931.780**
Paper used reduction	Rp1.125.000	Rp1.125.000	Rp1.125.000	Rp1.125.000
Effectivity Increase	Rp11.886.986	Rp11.886.986	Rp11.886.986	Rp11.886.986
Delivery cost reduction	Rp30.600.000	Rp30.600.000	Rp30.600.000	Rp30.600.000
Benefit	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**	**Rp43.611.986**
Net Balance	Rp37.980.207	Rp37.980.207	Rp37.980.207	Rp37.680.207
Discount Factor	0,29	0,26	0,24	0,21
Discounted Balance	Rp10.856.525	Rp9.859.501	Rp8.954.041	Rp8.067.503
Cumulative Discounted Balance	**Rp177.011.511**	**Rp186.871.013**	**Rp195.825.054**	**Rp203.892.557**

6.3 Sensitivity Analysis

Sensitivity analysis was used to find out how sensitive the change of a variable to the objective function. In this final assignment Sensitivity analysis will be performed to test the sensitivity of audit lead time reduction, delivery cost reduction, annual interest rate, internet package cost and electricity cost to Net Present Value of Halal Auditor Information System on the last period.

6.3.1 Audit Lead Time Reduction Sensitivity Analysis

Sensitivity analysis of lead time reduction was performed because there is a high probability of lead time reduction to changes, there is no exact number of time reduction. The change of time reduction will affect the amount of the potential benefit of lead time reduction achieved by LPPOM MUI every quarter as well as Net Present Value (NPV) of the investment. The table showed the value of NPV on the 16th Quarter (Last Periode), as well as the time when the amount of NPV is positive (Turning point) for every new lead time reduction.

Table 6. 17 Audit lead time reduction sensitivity analysis

Initial Lead Time Reduction (Days)	New Lead Time Reduction (Days)	Change	NPV	Turning Point
5	2,5	-50%	Rp 157.701.695	4th Quarter
5	3,8	-25%	Rp 181.720.943	4th Quarter
5	5,0	0%	Rp 203.892.557	3rd Quarter
5	6,3	25%	Rp 227.911.805	3rd Quarter
5	7,5	50%	Rp 250.083.419	3rd Quarter

From the table above the NPV of the investment for all New Lead Time reduction are positive, and the turning point occurs in the 3rd quarter and 4th quarter.

6.3.2 Delivery Cost Reduction Sensitivity Analysis

Sensitivity analysis of Delivery cost reduction of each province was performed because there is the probability of delivery cost reduction to changes, it is dependent on the location of auditor and location of chicken slaughterhouse.

The change of delivery cost reduction of each province will affect the amount of the potential benefit of total delivery cost achieved by LPPOM MUI every quarter as well as Net Present Value (NPV) of the investment. The table showed the value of NPV on the 16th Quarter (Last Periode), as well as a turning point for every new delivery cost reduction of each province.

Table 6. 18 Delivery cost reduction sensitivity analysis

Initial Delivery Cost Reduction of Each Province	New Delivery Cost Reduction of Each Province	Change	NPV	Turning point
Rp300.000	Rp150.000	-50%	Rp 84.986.020	6th Quarter
Rp300.000	Rp225.000	-25%	Rp 144.439.288	4th Quarter
Rp300.000	Rp300.000	0%	Rp 203.892.557	3rd Quarter
Rp300.000	Rp375.000	25%	Rp 263.345.825	3rd Quarter
Rp300.000	Rp450.000	50%	Rp 322.799.094	2nd Quarter

From the table above the NPV of the investment for all New delivery cost reduction are positive, and the higher delivery cost reduction of each province the higher NPV in the last quarter. How ever the turning point occurs in different quarter, from 2nd quarter until 6th quarter.

6.3.3 Annual Interest Rate Sensitivity Analysis

The sesnitivty analysis annual interest rate was performed because the annual interest rate used can be changed. In the calculation of NPV author used 9,75 % interest rate follows interest rate of Bank Rakyat Indonesia (BRI). The shift in interest rate will affect the discounted factor for every quarter as well as Net Present Value (NPV) of the investment. The table showed the value of NPV on the 16th Quarter (Last Periode), as well as a turning point for every new annual interest rate.

Table 6. 19 Annual interest rate sensitivity analysis

Initial Annual Interest Rate	New Annual Interest Rate	Change	NPV	Turning point
9,75 %	4,88%	-50%	Rp321.120.438	4th Quarter
9,75 %	7,31%	-25%	Rp255.458.977	4th Quarter
9,75 %	9,75%	0%	Rp203.892.557	3rd Quarter

Initial Annual Interest Rate	New Annual Interest Rate	Change	NPV	Turning point
9,75 %	12,19%	25%	Rp162.942.023	3rd Quarter
9,75 %	14,63%	50%	Rp130.059.215	3rd Quarter

From the table above the NPV of the investment for all New interest rate are positive, and the turning point occurs in the 3rd quarter and 4th quarter. With the higher interest rate, the less NPV on the last period. It is because of the higher interest rate, the less discounted factor on every quarter.

6.3.4 Monthly Internet Package Price Sensitivity Analysis

Sensitivity analysis of monthly internet package price was performed because the Internet package rate used can be changed, it can use another provider with another internet package. In the calculation of NPV author set the internet package expense for every auditor is Rp 100.000. The change of monthly internet package price will affect daily internet expense as well as Net Present Value (NPV) of the investment. The table below shows the value of NPV on the 16th Quarter (Last Periode), as well as a turning point for every new monthly internet package price.

Table 6. 20 Monthly internet package sensitivity analysis

Initial Annual Interest Rate	New Annual Interest Rate	Change	NPV	Turning Point
Rp100.000	Rp50.000	-50%	Rp321.120.438	3rd Quarter
Rp100.000	Rp75.000	-25%	Rp255.458.977	3rd Quarter
Rp100.000	Rp100.000	0%	Rp203.892.557	3rd Quarter
Rp100.000	Rp125.000	25%	Rp162.942.023	4th Quarter
Rp100.000	Rp150.000	50%	Rp130.059.215	4th Quarter

From the table above the NPV of the investment for all New monthly internet package are positive, and the turning point occurs in the 3rd quarter and 4th quarter. By the higher monthly internet package price, the less NPV on the last period. It is because monthly internet package considers as an expense.

6.3.5 Daily electricity Cost Sensitivity Analysis

Sensitivity analysis of electricity cost was performed because the daily electricity cost can be change depending on the usage of the hardware. In the calculation of NPV author set the daily electricity cost Rp 4.864. The change of daily electricity cost will affect Net Present Value (NPV) of the investment. The table showed the value of NPV on the 16th Quarter (Last Periode), as well as a turning point for every new daily electricity cost.

Table 6. 21 Annual interest rate sensitivity analysis

Initial Annual Interest Rate	New Annual Interest Rate	Change	NPV	Turning Point
Rp100.000	Rp2.342	-50%	Rp205.467.409	3rd Quarter
Rp100.000	Rp3.513	-25%	Rp204.711.536	3rd Quarter
Rp100.000	Rp4.684	0%	Rp203.892.557	3rd Quarter
Rp100.000	Rp5.854	25%	Rp203.073.578	3rd Quarter
Rp100.000	Rp7.025	50%	Rp202.254.599	3rd Quarter

From the table above the NPV of the investment for all New daily electricity cost are positive, and the turning point period occurs on the 3rd. By the higher monthly internet package price, the less NPV on the last period.

6.3.6 All Variables Sensitivity Analysis Comparison.

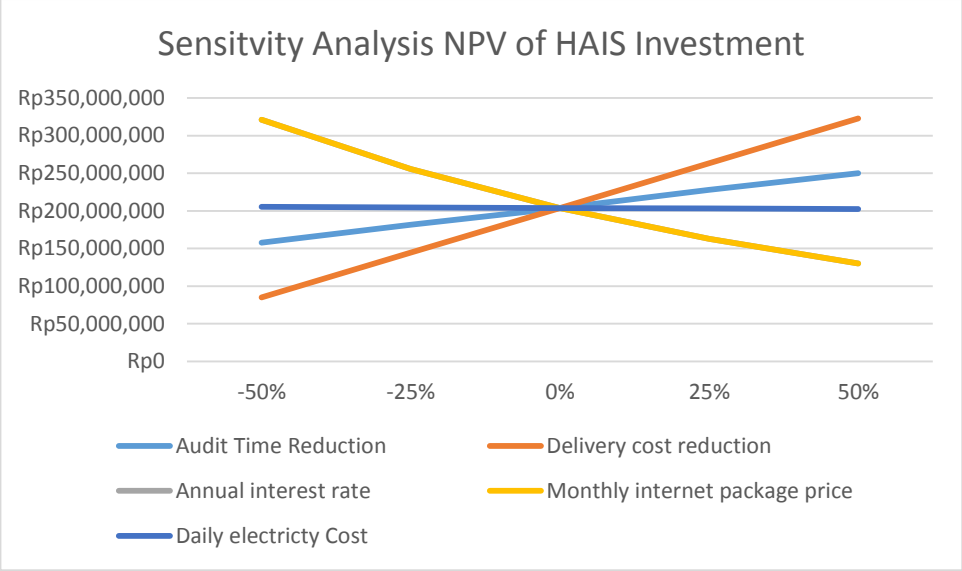
From the calculation on the previous subchapter, every change of the different variable have a different effect of Net Present Value calculation. Table and graphic below show the comparison between the Net Present Value when the variable is changed.

Table 6. 22 All variables sensitivity analysis comparison

Variable Changes	NPV				
	Time Reduction	Delivery cost reduction	Annual interest rate	internet package	Electricity Utility
-50%	Rp157.701.695	Rp84.986.020	Rp321.120.438	Rp321.120.438	Rp205.467.409
-25%	Rp181.720.943	Rp144.439.288	Rp255.458.977	Rp255.458.977	Rp204.711.536
0%	Rp203.	Rp203.892	Rp203.892.5	Rp203.892.	Rp203.892.

Variable Changes	NPV				
	Time Reduction	Delivery cost reduction	Annual interest rate	internet package	Electricity Utility
	892.557	.557	57	557	557
25%	Rp227.911.805	Rp263.345.825	Rp162.942.023	Rp162.942.023	Rp203.073.578
50%	Rp250.083.419	Rp322.799.094	Rp130.059.215	Rp130.059.215	Rp202.254.599

Table 6. 23 Sensitivity analysis of HAIS investment



From the graphic above, the most sensitive variables is monthly package internet price and delivery cost reduction. Delivery cost reduction has positive correlation with net present value, while monthly package internet price has negative correlation.

CHAPTER 7
CONCLUSION AND SUGGESTION

This chapter will discuss conclusion and suggestion of this final assignment Development of Halal Auditor Information System and its investment evaluation. The conclusion will answer the objective of the research. The recommendation given is intended for the next research.

7.1 Conclusion

Based on the research that has been performed it concluded that:

1. The Halal Auditor Information System (HAIS) developed based on website information system which needs an internet connection to access the website. HAIS can be accessed on link www.lifejourney.solork.xyz. There are 2 actors in Halal Auditor Information System (HAIS) which are Administrator and Auditor LPPOM MUI. HAIS provide auditor assignment, online auditor facilities as well as upload audit result document. The implementation of HAIS will make the halal certification process faster, more comfortable and cheaper.
2. Time-Cost Tradeoff integer linear programming was performed to determine the best option of HAIS implementation. The best option provides maximum benefit for MUI. Net Present Value was conducted to assess the feasibility of the investment. On the laster period (16^{th} Quarter) the Present Net Value of the HAIS investment is positive which is Rp 203.892.557. Sensitivity analysis was performed to analyse the sensitivity of the variable. The variable was examined are: Halal certification lead time reduction, delivery cost reduction, annual interest rate, monthly internet package expense and daily electricity cost. The most sensitive variables are Monthly package internet price and delivery cost reduction.

7.2 Suggestion

The recommendation given for the next research are:

1. In the future research, the scope of business should be more comprehensive, not only chicken slaughter house. It should accommodate another business such as restaurant, catering, manufacturing industry and other business.
2. The facility provided by HAIS should be added, such as the ability to print the halal audit result document with the signature of the head of MUI as authentic document evidence

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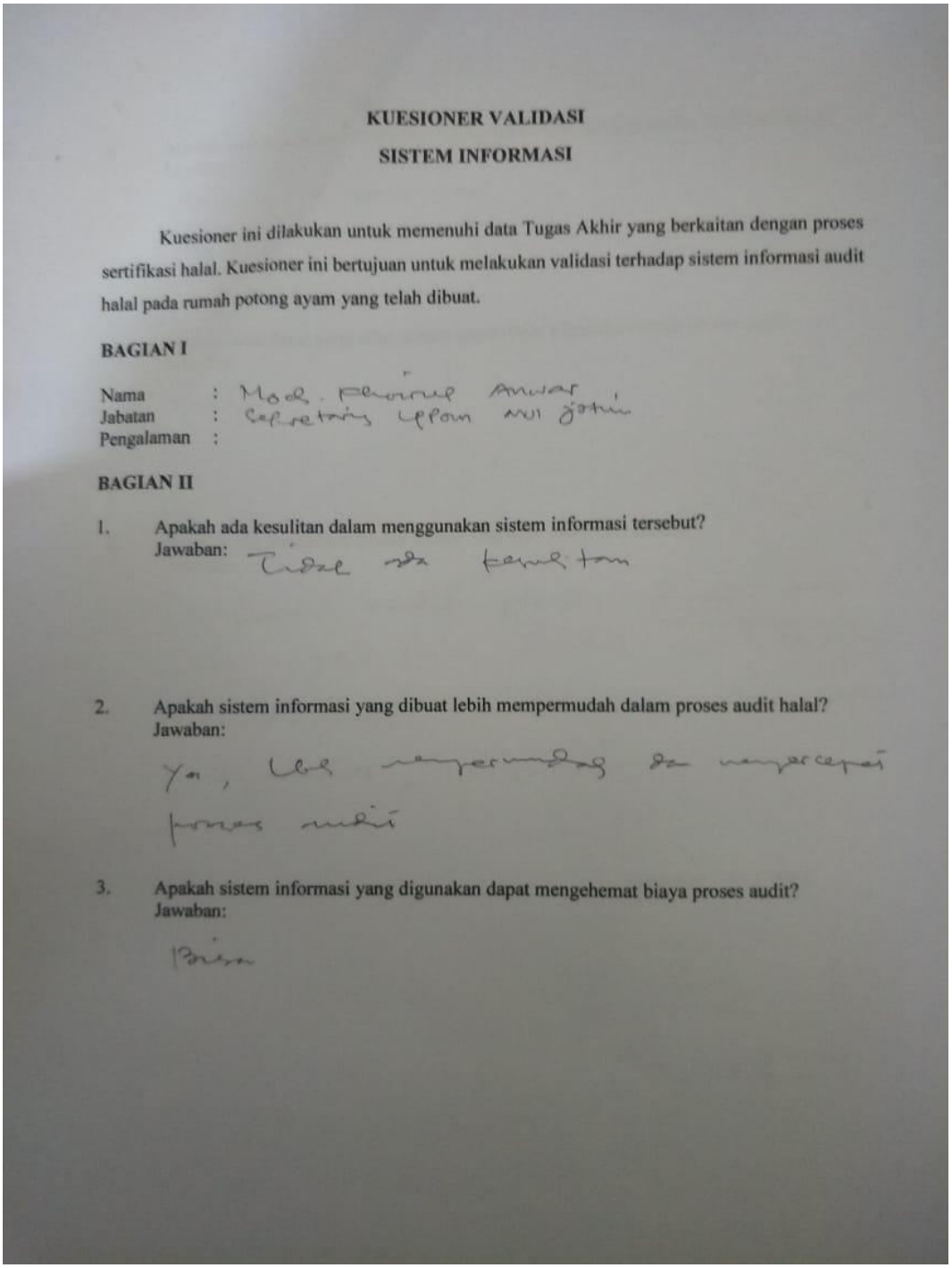
ATTACHMENT A

INFORMATION SYSTEM VALIDATION QUETIONAIRE



KUESIONER VALIDASI

SISTEM INFORMASI

Kuesioner ini dilakukan untuk memenuhi data Tugas Akhir yang berkaitan dengan proses sertifikasi halal. Kuesioner ini bertujuan untuk melakukan validasi terhadap sistem informasi audit halal pada rumah potong ayam yang telah dibuat.

BAGIAN I

Nama : Moch. Fhirul Anwar
Jabatan : Sekretaris LPPOM MUI Jatim
Pengalaman :

BAGIAN II

1. Apakah ada kesulitan dalam menggunakan sistem informasi tersebut?
   Jawaban: Tidak ada kesulitan

2. Apakah sistem informasi yang dibuat lebih mempermudah dalam proses audit halal?
   Jawaban:
   Ya, lebih mempermudah dan mempercepat proses audit

3. Apakah sistem informasi yang digunakan dapat mengehemat biaya proses audit?
   Jawaban:
   Bisa

4. Apakah sistem informasi yang digunakan dapat mempercepat proses sertifikasi halal?
Jawaban:

Bisa mempercepat

5. Apakah audit form yang telah dibuat dapat dapat digunakan untuk proses audit?
Jawaban:

Bisa

6. Apakah ada masukan terhadap sistem informasi yang telah dibuat?
Jawaban:

Laporan audit perlu diprint out
utk verifikasi audit yg dilakukan
Lembaga Auditor dan mengetahui
Direktur / pimpinan

Surabaya, Juni 2018

(Ahmad Anwar)

BIOGRAPHY

Faiz Rahman Arifin is the first child of Arifin and Desiyarni. The author was born in Jakarta, December 28th 1996 and started her formal education in SDN 01 Empang Bogor and SDN 02 Tanah Air Padang. Then, the author continued to SMP N 2 Padang for junior high school, and SMA N 1 Padang for Senior High school. He was acceleration class student. Before becoming student at Industrial Engineering Department of Institut Teknologi Sepuluh Nopember (ITS) on 2014, he was college student at Brawijaya University at 2013 for a year.

During the college years, he involved in several organizations and committees. The first organization that the author joined was Himpunan Mahasiswa Teknik Industri (HMTI) ITS as an *Pengembangan Sumber Daya Mahasiswa Department* staff (2015-2016). Besides HMTI, the author also actively participates in *Badan Eksekutif Mahasiswa ITS* as staff on 2015-2016 and *Direktorat Jendral Agitasi dan Propaganda* on 2016-2018. In 2015 the author had an experience to join student exchange program to Malaysia for one semester, in 2018 the author got a scholarship to join Lab Internship at Shibaura Institute of Technology Tokyo for a month, and in 2018 the author was Awarded as three best speaker in CommTECH ideas competition and selected as ITS representative to join strategic partnership forum between top universities such as Kyoto university, and Hongkong polytechnic university organized by National Cheng Kung University, Taiwan. For further discussion, the author can be reached through email: faiz.arifin@ymail.com