

**EXPERIMENTAL COMPERATIVE STUDY  
BETWEEN TABULAR AND NON TABULAR  
DATABASES ON HALAL SUPPLY CHAIN  
SYSTEM FOR POULTRY BASED PRODUCT**

**SITI NOOR IZATUL SHAFIQAH BINTI  
ZULKEPLI**

**BACHELOR OF COMPUTER SCIENCE  
UNIVERSITI MALAYSIA PAHANG**

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EXPERIMENTAL COMPERATIVE STUDY BETWEEN TABULAR AND NON-  
TABULAR DATABASES ON HALAL SUPPLY CHAIN SYSTEM FOR POULTRY  
BASED PRODUCT

SITI NOOR IZATUL SHAFIQAH BINTI ZULKEPLI

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## **ABSTRACT**

Non tabular data known as NoSQL databases is one of the alternative platform to store big data. These Databases are claimed to be easy scalable, high available and can execute faster queries compared to tabular data which is known as SQL (Structured Query Language). Even though, SQL are the powerful query language for managing data in Relational Database Management System but NoSQL databases contain model data in the form of BSON (Binary JSON) it's identify clearly what data to retrieve from database ability to be scalable with the sharding method. This mean that the query language contains all amounts of SQL features or even more. The research have done to measure query processing on both database. To achieve the objective of research all selected queries will be transform into RDMS and MongoDB. These queries has been execute through Halal Supply Chain System (HSCS) for poultry based product because the ability to stored huge data and the way that it doesn't need schema at all because the same collection can contain data with a different structure and also it act as an intermediary between user and databases. The Query processing for each databases compared by measured the query processing time for database. The research result show query processing for MongoDB is faster than RDBMS.



## ABSTRAK

Data tidak tabular yang dikenali sebagai pangkalan data *NoSQL* adalah salah satu platform alternatif untuk menyimpan data besar. Pangkalan data ini dikatakan mudah berskala, mudah didapati dan dapat mengeluarkan kueri lebih cepat berbanding dengan data tabular yang dikenali sebagai *SQL*. Walaupun, *SQL* adalah bahasa kueri yang paling bagus untuk menguruskan data dalam *RDBMS* tetapi pangkalan data *NoSQL* mempunyai data model dalam bentuk *BSON (Binary JSO)* ia dapat mengenal pasti dengan jelas data apa yang diambil dari pangkalan data dan sangat sesuai jika digunakan sebagai metode *sharding*. Ini bererti bahawa bahasa kueri ini mempunyai ciri-ciri *SQL* atau lebih bagus lagi dari *SQL*. Kajian ini dibuat untuk mengukur proses *kueri* pada kedua-dua pangkalan data..Untuk mencapai objektif kajian ini kueri yang terpilih akan ditukar dalam bentuk *RDBMS* dan MongoDB. Setiap eksekusi kueri akan diimplementasikan dalam (*Halal Supply Chain System*) untuk produk berasaskan ayam kerana kemampuan untuk menyimpan data besar dan tidak memerlukan skema kerana koleksi yang sama dapat diisikan data dengan struktur skema yang berbeza dan ia jugak bertindak sebagai perantaraan antara pengguna dan pangkalan data. Proses kueri untuk setiap pangkalan data ini akan diukur melalui masa yang diambil untuk melaksanakan perintah kueri dalam pangkalan data. Hasil kajian menunjukkan proses kueri untuk MongoDB lagi cepat dari *RDBMS*.

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## **LIST OF ABBREVIATIONS**

HSCS	Halal Supply Chain System
SQL	Structure Query Language
RDBMS	Relational Database Management System
PHP	Hypertext Preprocessor
NoSQL	Not only SQL

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background Of Study

Nowadays, there are two types of DBMS, relational database and non-relational database (Parker Zachary, Poe Scott, Vrbsky Susan., 2013). The most popular relational database is a DBMS that used to stored structure data (data with a format and size that has been identify (Hurwitz Judith, Nugent Alan, Fern Halper Dr., Kaufman Marcia, 2013) for example Oracle, MySQL and Microsoft SQL Server. The most widely used by companies in Malaysia is a Oracle (IT., 2014) . Usually Relational Databases are commonly used in a huge scope of applications because it contain set of features, query capabilities and transaction management, but Relational Databases are not be able to make transactions and join operations efficiently because it does not support big data (Veronika Abramova, 2013).

But now as a technology has emerge, NoSQL databases has been introduce to support big data in we environment. The function of this NoSQL databases are to stored and process unstructured data (Hurwitz Judith, Nugent Alan, Fern Halper Dr., Kaufman Marcia, 2013). MongoDB has been ranking as a first NoSQL database that usually used in industry such as Cisco, EA and eBay (IT., 2014). As we all know, both of this DBMS are very different in terms of performance of the query execution, scalability reliability and structure of data storage in storing structured data (Hadjigeorgiou Christoforos, 2013). Currently, there are lot of number studies have been done to compare these DMS, but not many studies compare the query processing on these DBMS for big data (Parker Zachary, Poe Scott, Vrbsky Susan., 2013) and to support idea “is it possible query processing cost

reduction for using big data compared to RDMS and XML?” and is it possible for using big data to keep supply chain system.

This research conducted by develop a web based Halal Supply Chain for poultry based product this is because the awareness of the Muslim consumers in Malaysia over the halal issue has lately increasing and it is not only limited to meat and poultry but also with dairy products and food ingredients. According to PewResearch, it has been declared that the Muslim population will increase from 1.6 billion in 2010 to 2.2 billion in 2030 (PerResearch, 2011). This scenario can be observed when there is an issue arises, there are many parties will come forward to clarify the status halal of the products.

For example nowadays Malaysia having halal issues regarding local poultry that are sold in the market because JAKIM have found some slaughter poultry houses are not conduct by a Muslim slaughter man and they are not following the halal slaughter process properly this problem will bring negative impact for Muslim consumers. From past research, in Arabic term halal is describe as an act or product that is lawful and permitted (Al-Qaradawi, 2007). In Islamic society's halal is a very important factor that contributes to achieving a better quality of life (Zailani, 2010) .

In Malaysia, to make sure the halal food integrity is maintain and trusted it need to be travel through supply chain process because the tendency of the halal products to be handled together with non halal products quite high. It can happen in many stages of the halal poultry supply chain processes usually in these five stages warehousing, storage, manufacturing, transportation, slaughter house and farm. This research uses MongoDB to store website halal supply chain information and implement the user interface. Finally, we compare the query processing using disk access between NoSQL MongoDB and SQL.

## 1.2 Problem Statement

From the study, the researcher found that in Malaysia has not set up a website regarding Halal supply chain yet. It also did not have a repository that store information about the participant of Halal supply chain itself. It's difficult for participant halal supply chain to share, track and retrieve all the information in order to use all the information. Therefore, the researcher needs to identify which DBMS that are most suitable to be implement in the Halal Supply Chain system.

The first problem is, despite of wide use of NoSQL for big data, the level of features is very low. This is because NoSQL database system are still developing and new architecture is still on progress to ensure that RDBMS, DBMS and NoSQL technologies have a role and can be implement to solve the requirement of optimization and economic database usage (Krishnan K, 2013).

Next problem is, there are not much researches devoted to the evaluation of the query processing cost reduction for using big data in NoSQL compare to SQL databases. Nowadays, the researches only aim to focus on doing research about query processing in SQL only, for them SQL has a lot more benefit than NoSQL.

Another problem faced by the current system now, it does not provide in details about halal poultry supply chain. That is means that, the current system now only display status of halality of products but the system does not provide in details regarding information how the processes behind supply chain happens and because of that to get assurance of halality' of the product consumers need to call directly to supplier. So, because of that they got wrong information or never got the information about halal well and it will gives hesitation to consumers to buy.

### **1.3 Objectives of the Research**

From the topic, there is three objectives that can figure out, These objectives have to be stated to know whether the guidelines have been followed and the objectives have been achieved.

- i. To do the cost of query evaluation using disk accesses between tabular and non-tabular data.
- ii. To build the prototype for halal poultry supply chain system
- iii. To evaluate function requirement of the system within big data researcher

### **1.4 Research Question**

There are two research question stated as below:

- i. Is it possible for query processing for using big data compared to RDMS and XML ?
- ii. What is the possibility of using big data to keep supply chain system?

### **1.5 Scope**

From the topic, there is three scopes that can figure out:

- i. The system development will be developed on big data using MongoDB (NoSQL database) , PHP language, XAMPP server and Notepad ++.
- ii. Due to lack of time the system it will only be used by the most crucial participant which is Farmer, Slaughterhouse and Retailer.
- iii. By using the system it will enable all the consumer trace share data by the participant.

## **1.6 Significance of the Research**

In order to achieve this research, there are three significance which are:

- i. Providing shared data store for Halal Supply Chain System participant to share their product status halal information.
- ii. Assisting consumer to alert and trace the status of halal poultry that they consumed.
- iii. Increase the awareness among of the food related industry to maintain a good halal food practice.

## **1.7 Report Organization**

This research is divided into five chapters :

### **Chapter 1**

Discuss about the introduction that contains of background of the study, consists of the research problem statement, research objective, research questions, scope of the study and finally focus to significance of the study.

### **Chapter 2**

Discuss about the literature review that generally discuss similar, past, current related research and some terminologies that are being used in this research.

### **Chapter 3**

Discuss about the research methodologies being used in the process of conducting the whole research .It consist of the methods that were used in this research: systematic literature review,development of interview with participant of supply chain. This chapter also covers the system framework and database diagram that is used to develop halal poultry supply chain system such as context diagram, data flow diagram.

## **Chapter 4**

Discusses results and findings. This chapter shows the results that have been achieved based on the analysis of data, obtained from the survey following methodology in chapter 3.

## **Chapter 5**

A conclusion derived from result and findings and the proposed of recommendations for this research is presented in this final chapter.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In this chapter, some terminologies related to the research including past research, similar topics will be describe including review of literature for some keywords. All data collection are collected from existing literature and research including materials that are published and unpublished for example books,journals,research reports ,articles and web articles.

#### **2.2 Definition of Pertinent Terminology**

##### **2.2.1 Tabular Database**

Generally, Tabular database defined as relational database and it's written in Structured Query language (SQL).It is used for store data in a structured way for example like a phonebook. Sometimes it consists of two or more tables with row and columns. Each entry will be consider as row and for each column it will sort specific type of information.The relationship between filed types and tables is called a schema.The schema must be clearly defined.The data that been stored must be in structured and organized.The reason is to avoid tables from becoming out-of-sync.If the designed of schema is poor ,surely it give organizational headaches due to its rigidity (University, 2012).

### **2.2.2 Non Tabular Database**

Non tabular database is define as Not Only SQL ,basically it was originated from a hashtag #NoSQL about a discussion where people can talk about ideas and the new types of emerging databases. It was totally different from traditional database management systems (RDBMS) it was designed to store data in very large scale and retrieve data in different formats.The most popular NoSQL database is MongoDB because it is a document-oriented database and it uses JSON objects for data storing.Mongodb also stored in JSON format in the database,tables will be called collections and rows of JSON objects are stored as documents.Futhermore,we can use MongoDB to store structured data it also supports query operation for database (Nyati, Pawar, & Ingle, 2014).

### **2.2.3 Halal Supply Chain**

Halal supply chain also has the same definition with basic supply chain but it must followed Islamic law as a guideline for a proper process.The main function of halal supply chain is to handle the procurement,movement,storage ,handling of materials ,parts livestock related information flows through the organization and supply chain in compliance with the principles of Shariah Law. (Jaafar, 2014).For industry poultry, the process must complete the supply chain cycle .Starting from farm to retailer.All activities along the supply chain must be halal in order to make sure the effectiveness of halal supply chain.In the poultry industry halal process can be achieved after completing through all stages in the halal food supply chain (Omar E. N., 2015).

### 2.3 Comparison between Tabular and Non- Tabular

Between Tabular and Non tabular database,SQL and MongoDB has been chosen so that study can be made to decide which would be the most suitable database to be used in the halal supply chain system.Below are some tables showing comparison of terminologies ,characteristic and operations on data between a (Tabular )NoSQL and SQL(Non tabular).

**Tables 2.1 : Comparison characteristic between Tabular and Non Tabular database**

	<b>Tabular</b>	<b>Non Tabular</b>
Types	Only one type database	Many different types <ul style="list-style-type: none"> <li>- Key-value stores</li> <li>- Document databases</li> <li>- Wide column store</li> <li>- Graph database</li> </ul>
Development History	Developed in 1970s	Developed in 2000s
Examples	MySQL, Oracle database and Postgres	MongoDB, Cassandra, HBase, Neo4j
Data Storage Model	For example students record are stored as rows in tables,with each column store specific of data .Different data types are stored in separate tables and it will combine together when the complex queries	Key value store exactly similar like SQL database,but it only has two columns which is “key” and “value” .If the information is complex it will be store at the “value” column.

	are executed. If the user wants to find the specific information database engine will joins the tables together to get the information	Document database store all data together in single document in JSON and XML.
Schema	If the user wants to store new information about a new data ,the whole database must be altered,structured and data types are fixed.	Totally dynamic,record can add new information on that time and different with SQL dissimilar data can be stored together as necessary.
Scaling	Vertical  - To deal with increased demand a single server must be made.	Horizontal  - Can add commodity server or cloud.
Development Model	Mix of open source and closed source.	Open source
Data Manipulation	Select, Insert, and Update statements, ( SELECT fields FROM table WHERE)	Object-oriented APIs
Consistency	For strong consistency ,it can be configured.	Depends on product
Transaction	ACID	No

Support Agile Practices	No	Yes
Query language	SQL	JSON
Company	Microsoft	MongoDB
Implementation language	C++	C++
Drive for programming language	.NET, Java, PHP, Python, Ruby, Visual Basic	Actionscript, C, C#, C++, Clojure, ColdFusion, D, Dart, Delphi, Erlang, Go, Groovy, Haskell, Java, JavaScript, Lisp, Lua, MatLab, Perl, PHP, PowerShell, Prolog, Python, R, Ruby, Scala, Smalltalk

**Tables 2.2 : Terminologies in Tabular and Non Tabular database**

The table below are the corresponding terminology between SQL and MongoDB.

<b>Tabular (SQL)</b>	<b>Non Tabular (MongoDB)</b>
Database	Database
Table	Collection

Row	BSON document
Column	Field
Index	Index
table joins	embedded documents
Primary key has a unique column	Primary key automatically set to <code>_id</code> field in MongoDB
Aggregation by group	Aggregation by pipeline

**Tables 2.3 : Create Statement in MongoDB and SQL**

<b>MongoDB Schema</b>	<b>SQL Schema</b>
Create Table Users ( Id Mediumint Not Null Auto_Increment, User_Id Varchar(30), Age Number,	<code>db.createCollection("userAccount")</code> or <code>db.users.insert( { user_id: "cb15053", age: 25 } )</code>
Drop Table userAccount	<code>db.userAccount.drop()</code>

**Tables 2.4 : Insert Statement in MongoDB and SQL**

<b>MongoDB insert</b>	<b>SQL insert</b>
db.users.insert( { user_id: "cb15053", age: 25 } )	INSERT INTO UserAccount(User_Id, Age) VALUES("cb15053", 25, "A")

### **2.3.1 Advantage of Non Tabular database over Tabular**

According to the website (Xplenty, 2017) he stated that there are many advantages of Non tabular database over tabular. The advantages has been stated in the website are list as follow.

- i. Non tabular database is dynamic schema
- ii. Non tabular database is horizontally scalable
- iii. The database can be used by both developers and administrator
- iv. High performance for simple queries
- v. Can add new column or field on database without affecting existing row or other application performance

**Tables 2.5 : Retrieve Statement in MongoDB and SQL**

MongoDB insert	SQL insert
Db.userAccount.find().pretty()	Select * from userAccount

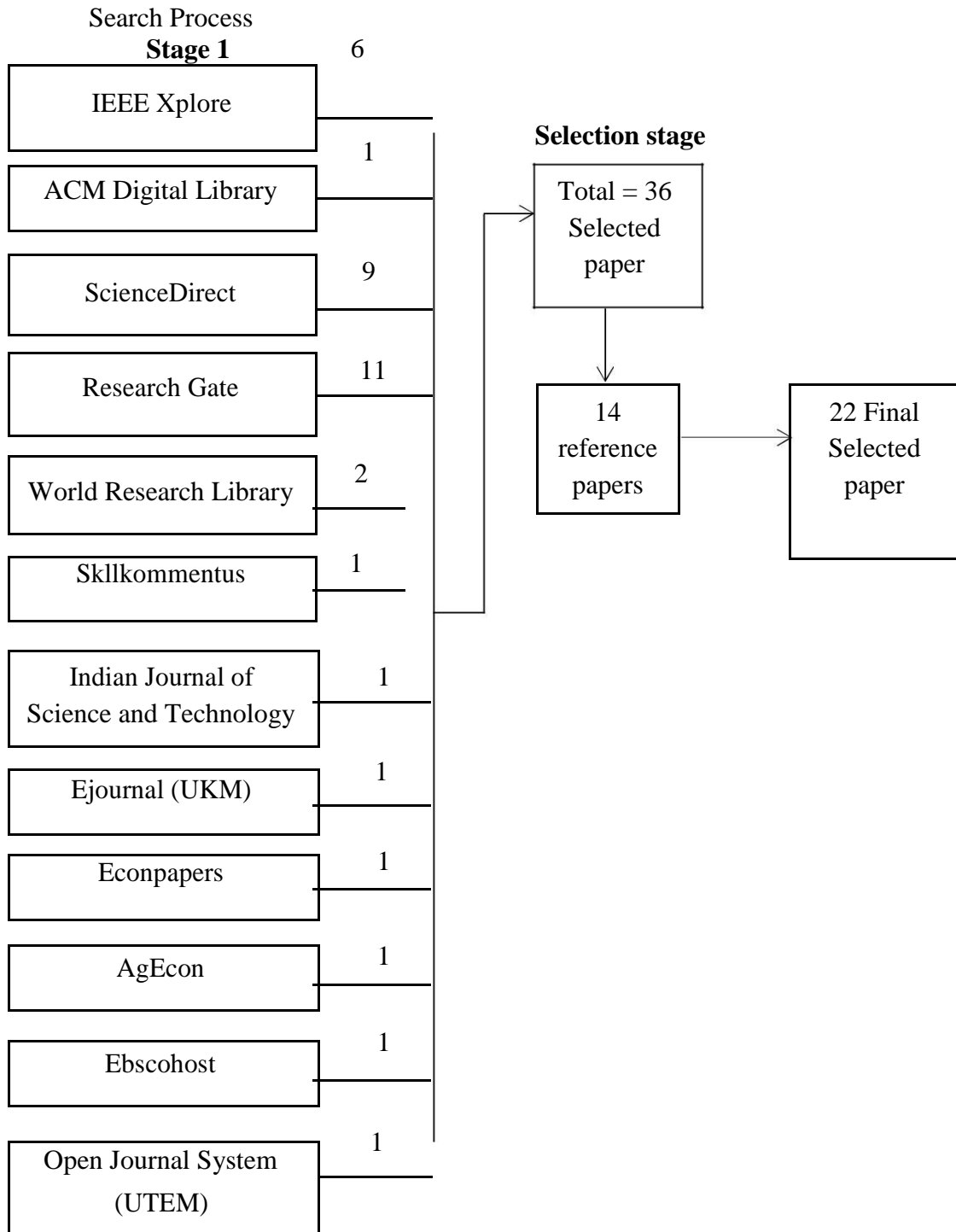
#### **2.4 Systematic Literature Review Analysis Of Data**

The purpose of analysis of data is to find the any paper that related to HSC and SQL and NoSQL, the process starts by searching literature with keywords HSC U blockchain, HSC U big data and  $\cap$  HFSCMS. After that it will restrict the results only to journal published between 2009 and 2018. Reports, magazines and any other paperwork are excluded. Twelve electronic database resources were used to primarily extract data for synchronizations in this research. But the main electronic database is IEEE Xplore, ACM Digital Library, ScienceDirect, World Research Library, and Research Gate. Title, abstract and key terms were used to conduct search for published journals papers.



## 2.5 Search Process

The search processes in this research consists of the following steps see Figure 1:



**Figure 2.1: Search and Selection process.**

The search processes used in this research consisted of the following steps as stated in Figure 1. Search for stage was launched on the twelve electronic database sources and the returned papers were chosen. From the first search level, 36 research papers have been selected.

However, the title of this study is used to examine and compile reference research. This task is needed to eliminate duplicate and irrelevant reviews and found only 14 research papers. Hence, 22 related papers were selected. But, the references for each selected study have been reviewed to identify important studies that may be missed during the initial search process was considered to be able to give a question to the research objective.

From Figure 2.1, 36 research papers are obtained during the first search process. Therefore, observation is necessary to align these studies to the relevant ones. Firstly, the title of each study is considered then its content is learned briefly. Therefore, all papers that do not reflect the topic of discussion or are unable to address any formulated research inquiries are not included in the list of relevant studies. Additionally, only researches written and published in English from reviewed journals, conference proceedings and the IEEE bulletin are considered for inclusion in the relevant research list. However, when multiple copies of the same paper appear, the most complete, recent and better ones are included in the search process while others are excluded.

## **2.6 Related Work**

This section will elaborates more details about some of the chosen paper that related to HSC NoSQL and SQL:

**Table 2.6 : Comparative Analysis of different approach in Tabular , Non-Tabular database and study that related to Supply Chain or Blockchain.**

<b>Paper</b>	(C. Györödi, 11-12 June 2015)	(Z. Parker, April 4-6, 2013.)	(A. Oussous) (Eltaieb, April 2015.)	(Wisal K., 2017)	(Kumar, 2017 International Conference on. IEEE, 2017.)
<b>Approach Method</b>	This experiment is between MongoDB and MySQL .The result shows that MongoDB shows faster performance in terms of insert huge data to database.They also stated the features that dynamic schema NoSQL offer.	This experiment is between MongoDB and Microsoft SQL.The researcher notice that MongoDB perform faster in insert,simple query and update; the SQL Server is perform better in query with non key attributes and for aggregates and update.	This experiment elaborate about the features between NoSQL and relational database. By listing ,advantage and disadvantage for both database.The y also explain why we should choose NoSQL.	This experiment is between Oracle and NoSQL graph database using optimization queries and physical database tuning techniques. They also has done experiment by execute various queries and it shows that whenever data becomes more connected	The Experiment is conduct to analysed the problem of different data format and effectiveness in store and processing data by using relational database technology.

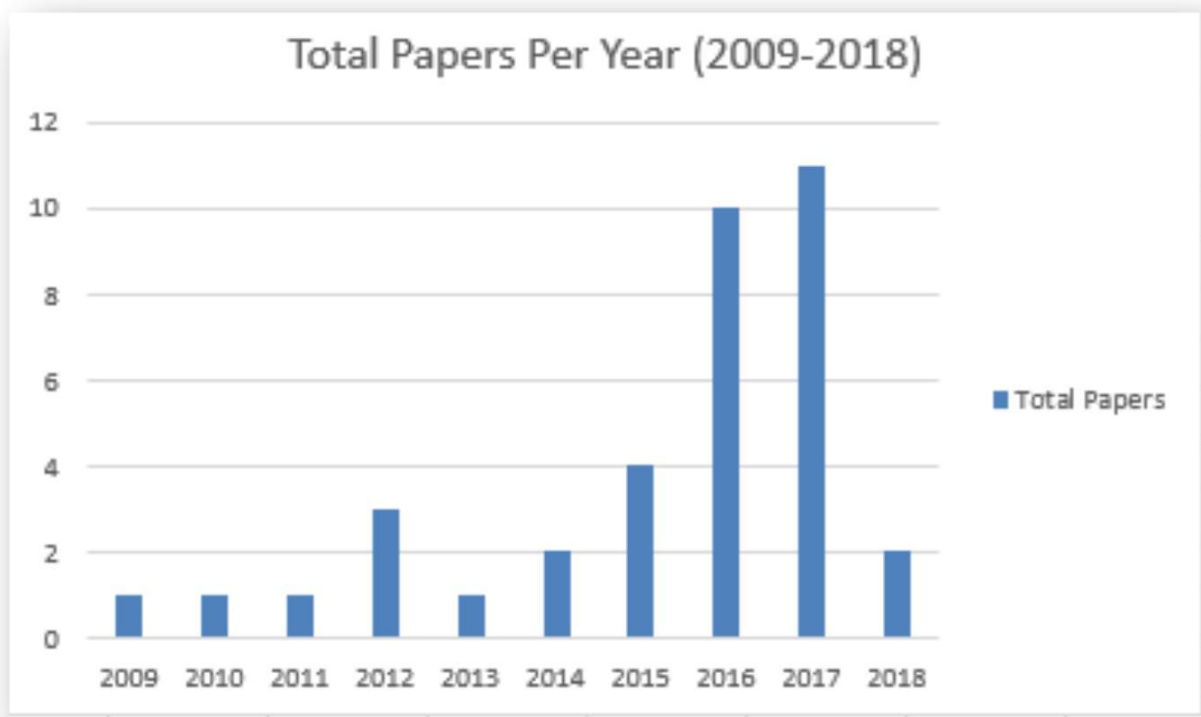
				and the size is large the relational database will show worse performance than NoSQL.	
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<b>Paper</b>	(Ikh san Bani Bukhori a, 2014)	(D aniel Tse, 2017)	(Tom ohiro, 2016)	(su haiza zailani, 2010)	(Abdelr ahman Abbas Ibrahim, 2015)
<b>Approach Method</b>	This paper explains about using AHP measurement to measure d <sup>3</sup> worst performance which is supply order	This papers described about, how block chain technology is worthy for helping government to track, monitor and audit the food supply chain and helping manufactur ers to	This papers explain about how they used big data in food supply information security, because big data has changed from a static utilization for supporting human judgement and operation to utilization for	This papers described that, Halal traceability and tracking comprise a very dynamic area in which new techniques are being introduced and it rapidly evolve using RFID	This papers described how frame work for insuring halal food interlocking institutional world integrity by using a new technology; the ontology server, this frame work provides interlocking institutional worlds' participants with

	<p>fulfilment, supplier lead time and product cycle time</p>	<p>record the transaction in authenticity . Not only this technology can benefit the customers, manufacturers and the supervision department s but also improving the efficiency of food supply chain's processing circulation.</p>	<p>realizing automated and real time system integration without human intervention. However, the growing interest in IoT and Artificial Intelligent will continue to accelerate this trend.</p>	<p>.However, the impact of traceability and tracking is expected to increase at the company and farm levels, the chain level and for society as a whole.</p>	<p>a consensus vocabulary to enable them to interoperate semantically on one hand and provide halal food consumers with an API to query the ontology server for halal food product on the other hand. The ontology server manages both ontology of enduring and ontology of perdurant to store and retrieve both structural and behavioral data.</p>
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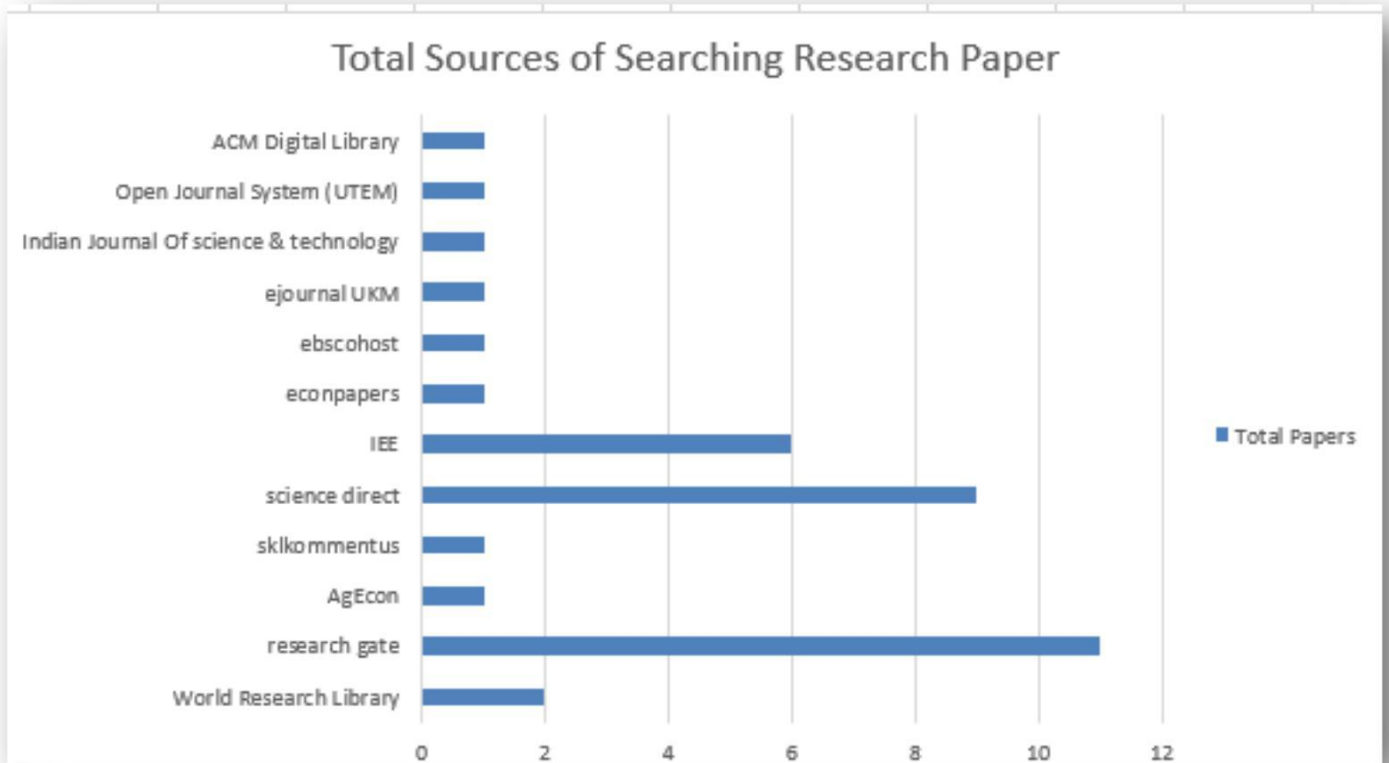
## 2.7 Data Synthesis

The aim for data synthesis is to analyse selected paper based on how much paper about halal food supply chain and SQL and NoSQL being published, how many source of database involved to searching this paper , what participant of halal food supply chain involved in selected papers and the most importantly is what system component most popular used based on the paper. To summarize proofs from the selected studies in order to address or answer the research objectives. To synthesize data, the 36 selected research papers were used to assess the detailed contents of each study with respect to the criteria.



**Figure 2.2: Total number of paper published per year.**

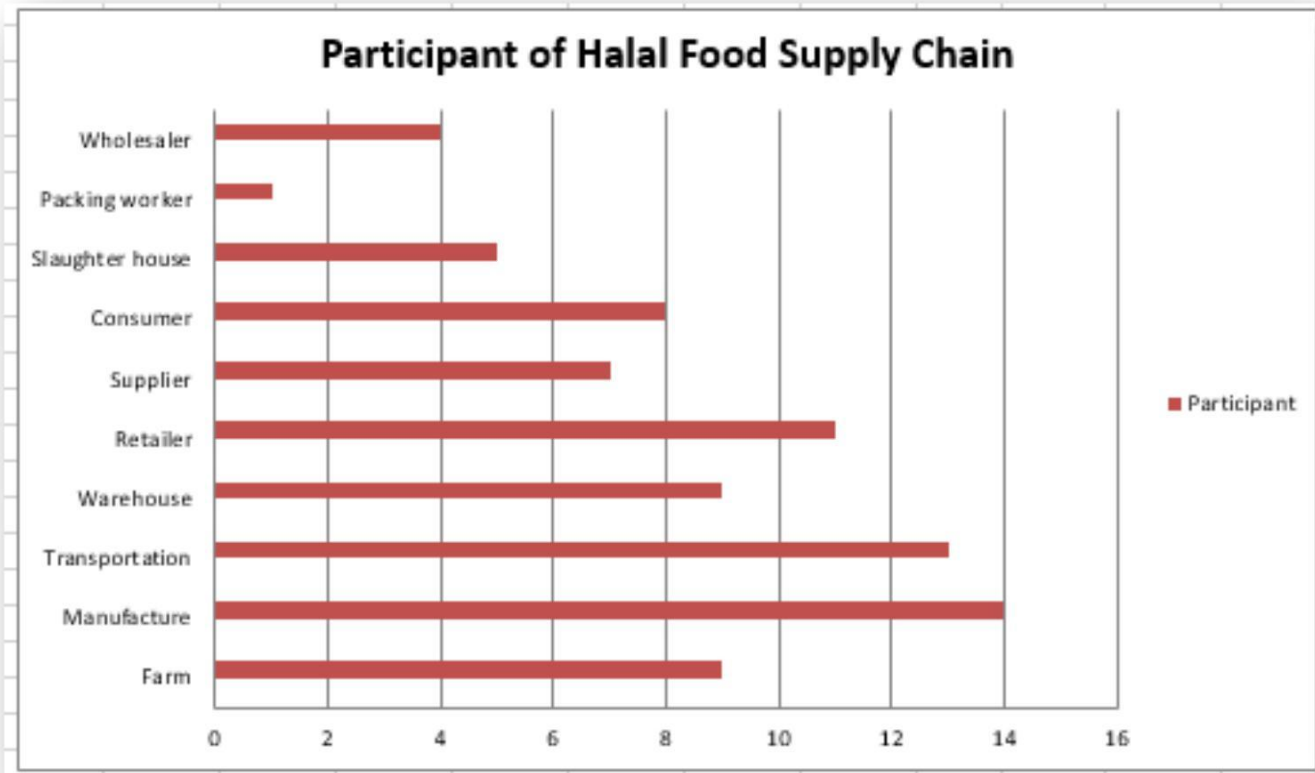
Figure 2.2 shows the number of paper by year of publication. It shows an upward trend manifesting the increasing number of paper published per year. Figure 2.2 demonstrates that the interest in halal research started to grow mainly since 2015. To be conclude the most recent year that HFSC has been published is the year 2018.



**Figure 2.3: Total number of source for searching research paper.**

The number of source for searching research paper are shown in figure 2.3. The number indicates that the majority of the amount of papers 11 are search from research gate. Approximately total numbers of papers 9, 6 and 2 are search by using science direct, IEEE Explore and World Research Library respectively. Only 8 papers are search from independent database which is ACM Digital Library, Open Journal System (UTEM), Indian Journal of Science and Technology, Ebscohost, Econpapers, Skillkommentus and AgEcon. There are a lot of search resources but only twelve's databases provide a relevant research paper based on the halal supply chain. To be conclude the most source of database to find the related research paper is Research Gate.

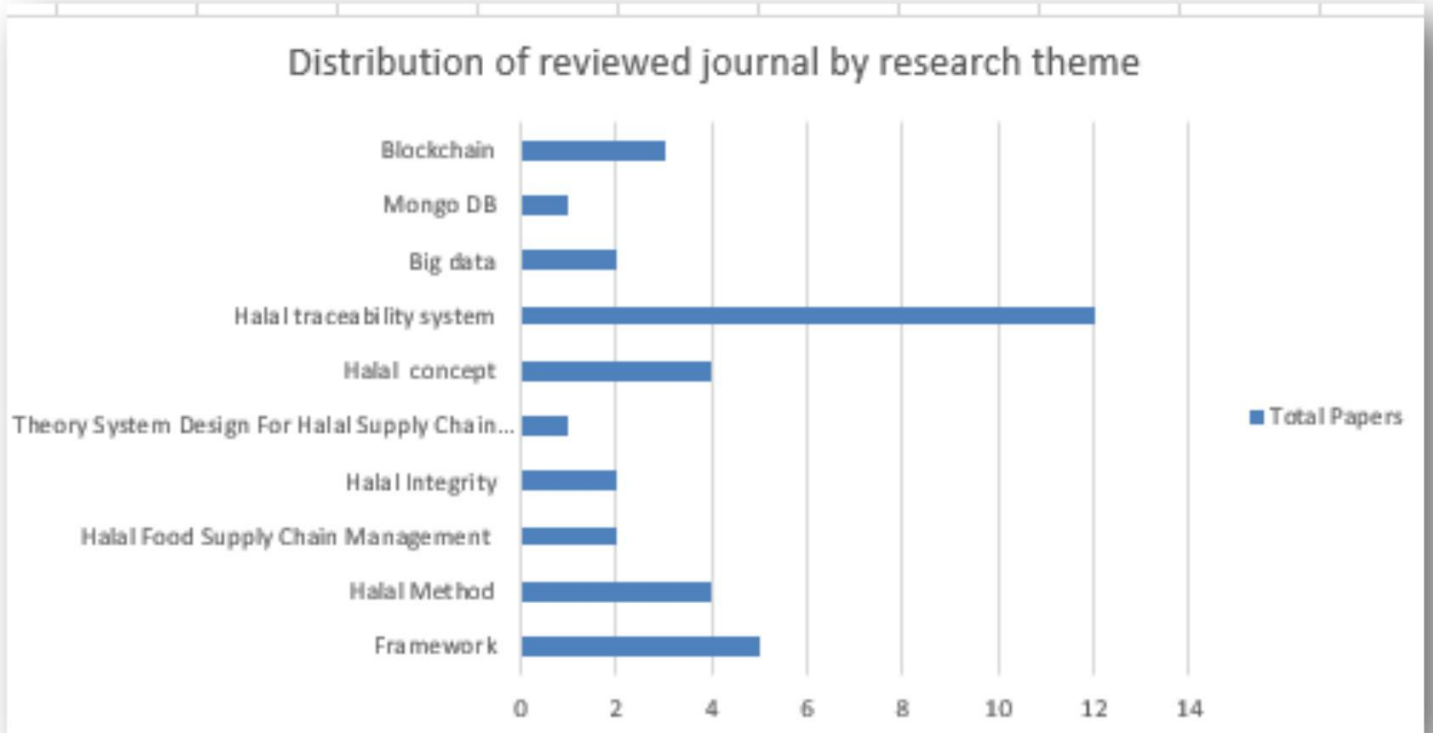
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**Figure 2.4: Total number of participant in halal food supply chain**

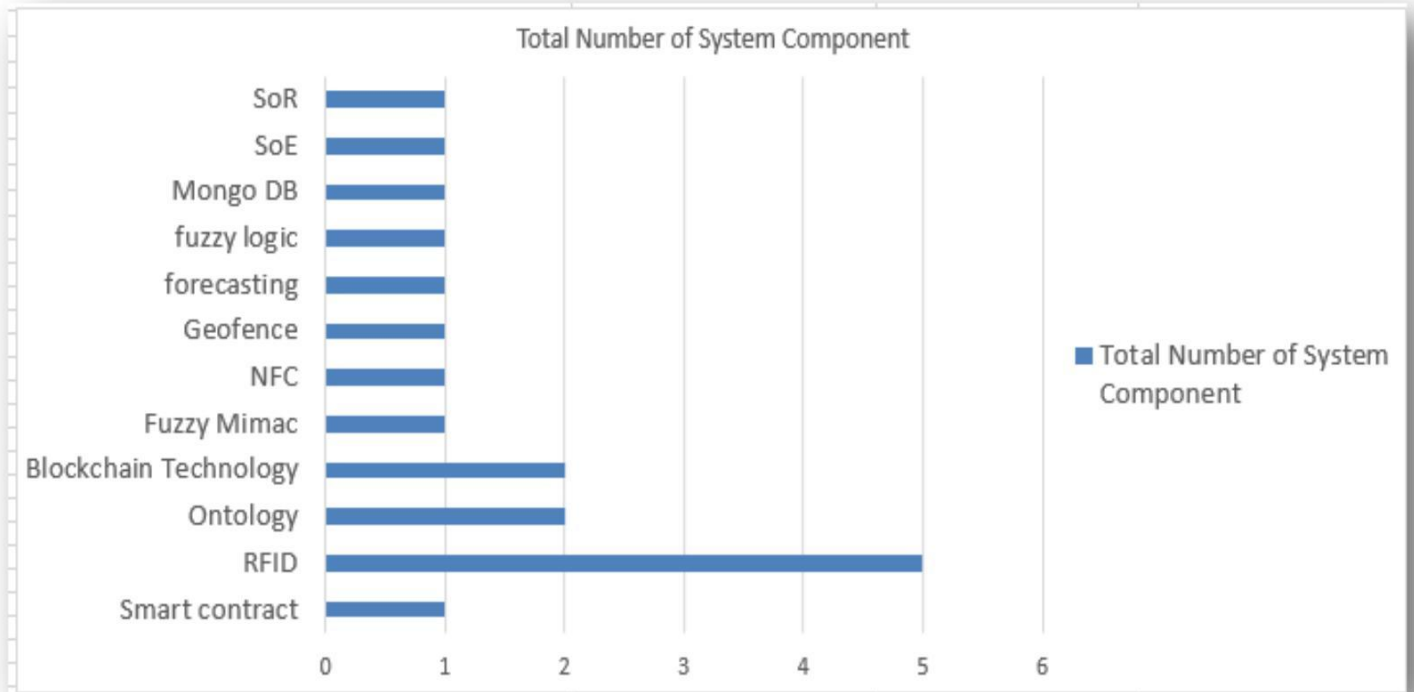
A systematic study of component in halal food supply chain system was carried out between 2009 and 2018 resulted in ten different research participant. These participant related to halal food supply chain. Figure 2.4 shows the total number of participant in halal food supply chain, it shows that from 36 selected papers, amount of manufacture has been discussed is 14. More than 13 transportation has been talked about it. More than 11 studies addressed the retailer participant and the rest of selected has been discussed about farm, warehouse, supplier, consumer, slaughter house, parking worker and wholesaler. To be conclude it shows that among of the selected paper the most popular participant has been discussed is retailer, transportation and manufacture, we can said that this papers only focused to discussed about three of this participant.





**Figure 2.5: Type of research theme**

Figure 2.5 shows the type of research theme from the collected studies paper. Firstly, from the graph it shows that majority of the studies paper choose halal traceability system to studies with total numbers who discussed is 12, then the second highest is about framework 5 total numbers of papers who discussed about it and lastly the third highest is between halal concept and halal method which is 4 papers. Therefore, it can be conclude that the most popular theme that existing journal discussed is about Halal traceability system.



**Figure 2.6: Total number Of System Component**

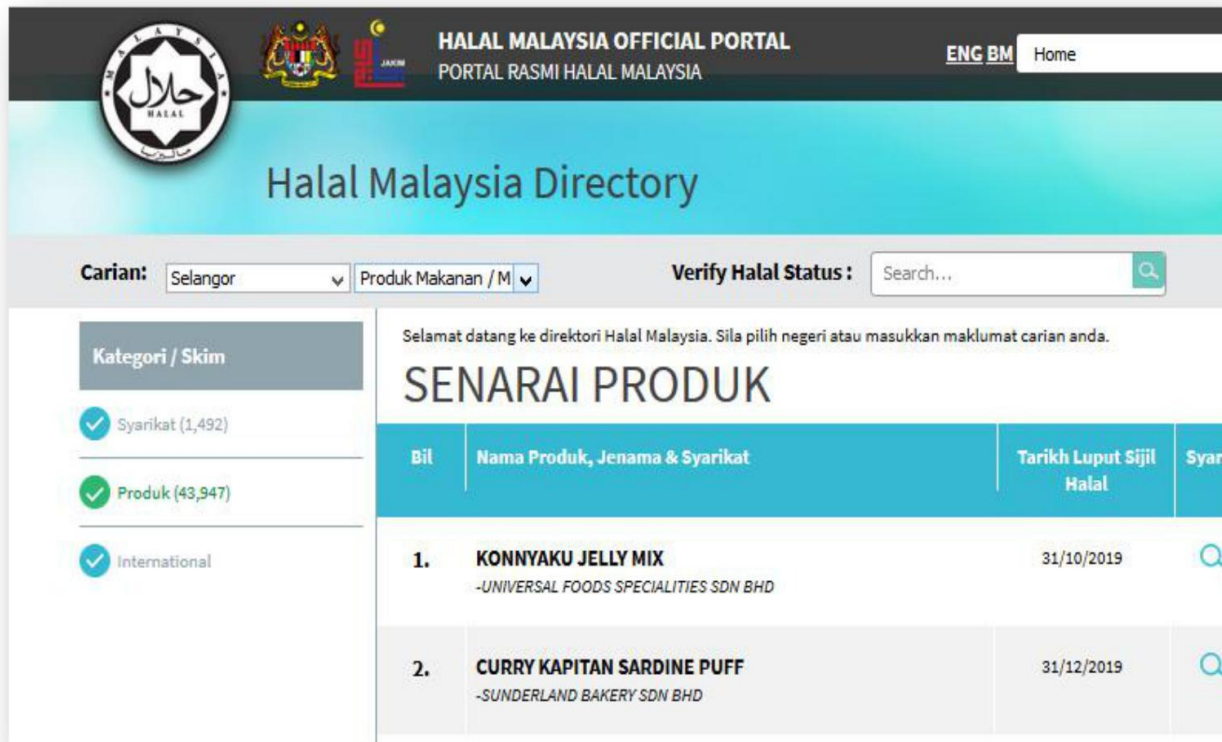
Based on the analysis from the selected papers, it shows that the most system component has been introduced is RFID which 5 paper has mention about it, and the second highest is between blockchain technology and ontology server ,therefore it can be conclude that RFID is the most popular used in Halal traceability system because it can uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate hundreds of meters from the RFID reader.

## **2.8 Studies on Existing System Halal Checker**

There are exist many Halal portal in Malaysia to check the halality of the product but none of the Halal portal provide information within the supply chain and verify any of the supplier in the supply chain has achieved all processes according Halal food safety .To accomplish this verification all supplier need to collect all information regarding the sources of the products since it need to be in specific position in supply chain cycle. One of the important questions for Muslims in Malaysia is “Halal Meat” and how they can trust it because before meat products reaching consumer’s hand, it need to process through a number of suppliers and distributors, and during this process it involve a series of activities such as warehouse, storage, material and transportation and all handling processes of “Halal Meat”. For existing system there are three system that provides the same information regarding Halal product info which is Halal Portal Islamic (JAKIM) (See Figure 2.7), Halal Guider (See Figure 2.8) and Halal Verified Engine (See Figure 2.9).

### **2.8.1 Halal Portal Islamic (JAKIM)**

See Figure 2.7 Halal Portal Islamic (JAKIM) was developed to obtain halal information in the country. Information can be found at [www.halal.gov.my](http://www.halal.gov.my) which specializes in the search of information to three groups of users, industry and global. In addition, it includes announcements, latest news and latest media statements. It also provides quick links to halal related information. Halal checks can be browsed over the website. It’s specially designed for entrepreneurs to get information and make halal certification.



**Figure 2.7: Halal Portal Islamic (JAKIM)**

## 2.8.2 Halal Guider

See Figure 2.8 Halal Guider was established to help Muslim consumer that lives in USA. Consumer can search and review halal and haram food or product in Europe it divided into variety search attributes .Other than that, it also provide list of product food that are not registered with Halal certificate and this website also provide some information regarding Halal food according to Quran and Hadith.

Click here to search any food product under food category/Brand [A - Z] or [Apple Juice - Yogurt]

Search: Crakers, Cookies, Cheese , Poston .....

Search by PRODUCT NAME   
 Search by PRODUCT CATEGORY   
 Search by PRODUCT BRAND   
 Search Product by MEDICINES  
 Search Product by COSMETICS   
 Search by PERSONAL CARE PRODUCTS   
 Search Product by INGREDIENT

SEARCH

**Q LATEST FOOD PRODUCTS**

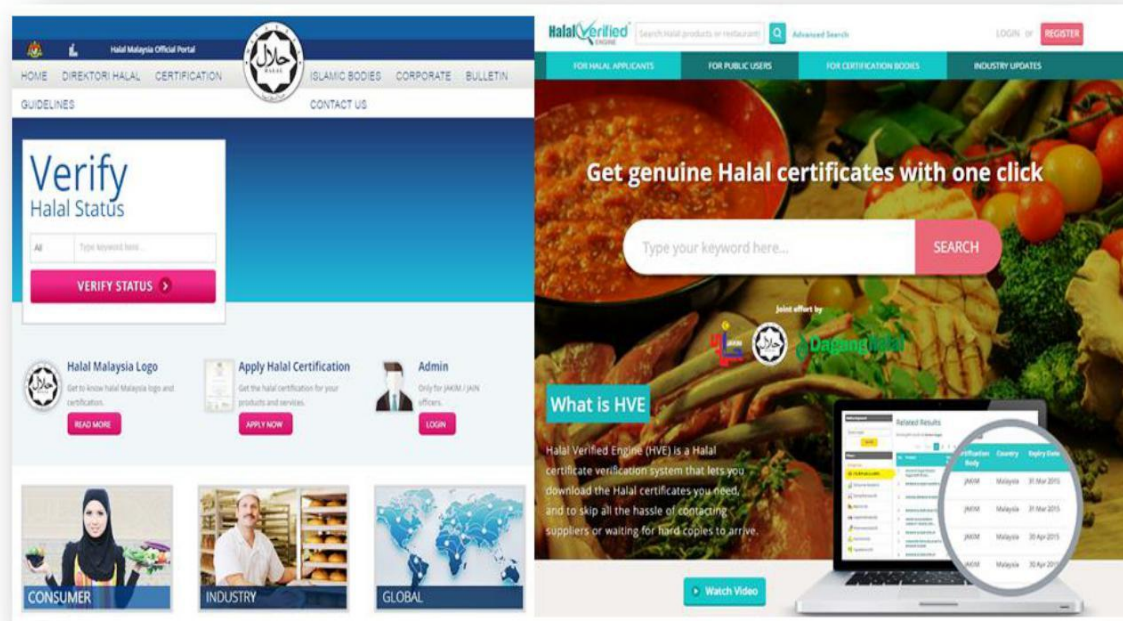
Next Records

Status	Product name	Brand Name	UPC	Category Name	Comments
halal	Dried Mango	Happy Squeeze		Mango	Brand:Happy Squeeze.Store:Costco Supermarket.city:Lake In The Hills, IL,Illinois
haram	Dove Original Clean Invisible Solid Antiperspirant & Deodorant	Dove	079400507303	Antiperspirant & Deodorant	lease do not use any Dove Antiperspirant and Deodorant because Unilever company will not guarantee that they are free from animal byproductsrnrnThe Unilever company said that they use vegetable or animal fat including pork fat or synthetic based ingredients which ever available during the time of manufacturingrnrnThey do not have information about presence or absence of use of hidden alcohol in fragrance (Reference Number 155454)
halal	Natural Peanut Butter	Krema		Peanut Butter	Brand:Krema.Store:Albertson Supermarket.city:Redmond, WA,Washington State
halal	Distilled White Vinegar	Heinz	013000008549	Vinegar	
haram	Sour Cream & Chive Crackers	Triscuit	044000037833	Crackers	Alcohol in flavor
haram	Newtons Soft & Chewy Fig Cookies	Nabisco	044000046545	Cookies	Due to presence of Natural Flavor.
halal	Salted Butter European Style	Plugra		Butter	Brand:Plugra.Store:Safeway Supermarket/von Supermarket.city:CALIFORNIA,California
haram	E L Fudge Original Cookies	Keebler	030100112990	Cookies	Due to presence of Natural Flavor

**Figure 2.8 : Halal Guider**

### 2.8.3 Halal Verified Engine

See Figure 2.9 Halal Verified Engine is a special online system to facilitate the sharing of information related to the validity of halal certification of materials, products, and related services. It is accessible to regular users and applicants for halal certification certificates. It was produced by “Dagang Halal Bhd” was launched on 11 December 2013. Search for access is available via <http://www.halalverified.com>. This initiative is a joint venture between JAKIM and “Dagang Halal Bhd”. It was built to simplifying and expediting the application system and renewal of certificates by allowing users to search, view and download valid halal certificates.



**Figure 2.9 : Halal Verified Engine**

## 2.8.4 Outcome Of Comparison Existing System

The following is a summary comparison of the three existing system that are being tested:

**Table 2.7: Summary of Comparison Existing System**

Types	EXISTING SYSTEM		
	Halal Portal Islamic	Halal Guider	Halal Verified Engine
Interface Design	Consistent in terms of colour used ,font size,position of the elements and the contents	Messier,a lot of text are being used.	Simpler compare to Halal Portal Islamic and Halal Guider

Web Elements	Only certain element has been used. But the colour used in this website is appropriate because different colour are being used to show different between links of different section.	No much web element has been used.	Contain related image which attract user to viewing. This elements shows that the page is related to Halal website.
Features	Contain brief idea introduction on the halal info on their main page. It also has section for announcements with the date is being updated.	No introduction or guide in the main page.	Same like halal portal Islamic contain brief idea introduction on the halal info on their main page. Contain guide for user to used it.

Table 2.7 shows, that the use of technology should make it easier for all users to access halal search easily and quickly. The selection of applications or systems that are compatible with most gadgets or equipment can make the technology a reality and the data that are stored in the database should be fully accessible with a simple search and because of that developers need to think of applications that are minimalist, lightweight and can be used by all levels of society.

**Table 2.8: Comparison Of Search Attributes.**

<b>SEARCH ENGINE</b>	<b>EXISTING SYSTEM</b>		
	<b>Halal Portal Islamic</b>	<b>Halal Guider</b>	<b>Halal Verified Engine</b>
By Product Name	No	Yes	Yes
By Product Category	Yes	Yes	Yes
By Product Brand	No	Yes	Yes
By Medicines	Yes	Yes	Yes
By Cosmetics	Yes	Yes	Yes
By Personal Care	Yes	Yes	Yes
By e-Code	No	No	No
By Farm	No	No	No
By Slaughter House	Yes	No	No
By Storage	No	No	No
By Transportation	Yes	No	Yes
By Wholesaler	No	No	No
By Retailer	No	No	No
By Eating Premises	No	No	Yes
By Company	No	No	Yes
By Country	Yes	No	Yes

Table 2.8 shows, based on the comparison between existing system for searching Halal information engine it can be seen that all of the system does not provide searching engine by attributes in Halal food supply chain processes and because of that it can caused lack of standardization of Halal food lead to confusion and issue among customers and Halal retailers.

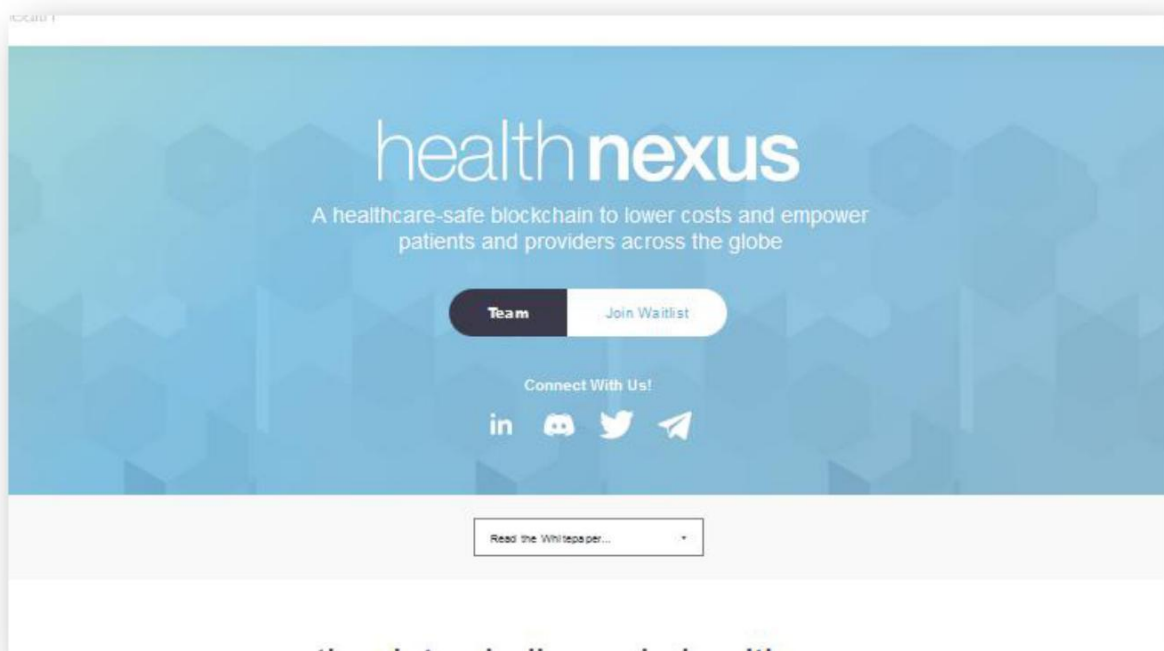


## 2.9 Studies on Existing System Blockchain Technology

Data contained in the blockchain is protected by by cryptography, making blockchain secure data storage for sensitive or personal information. There are three existing system that implement blockchain technology which is Health Nexus (See Figure 9), Abra (See Figure 10 ) and Augur(See Figure 11) .

### 2.9.1 Health Nexus (Healthcare)

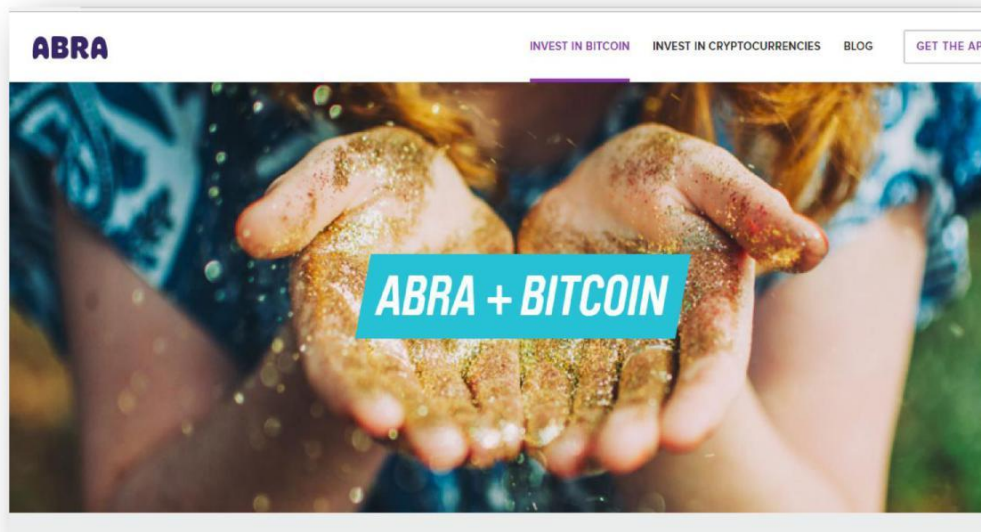
See Figure 2.10 Health Nexus, was developed by SimplyVital Health, is a blockchain-based healthcare protocol that empowers the transferee provider for payment for revenue, regardless of clinical mix. It uses the distributed hash tables combined with the ethereum base blockchain to provide unlimited data sharing and access to new revenue streams.



**Figure 2.10: Health Nexus**

### 2.9.2 Abra (Financial Services)

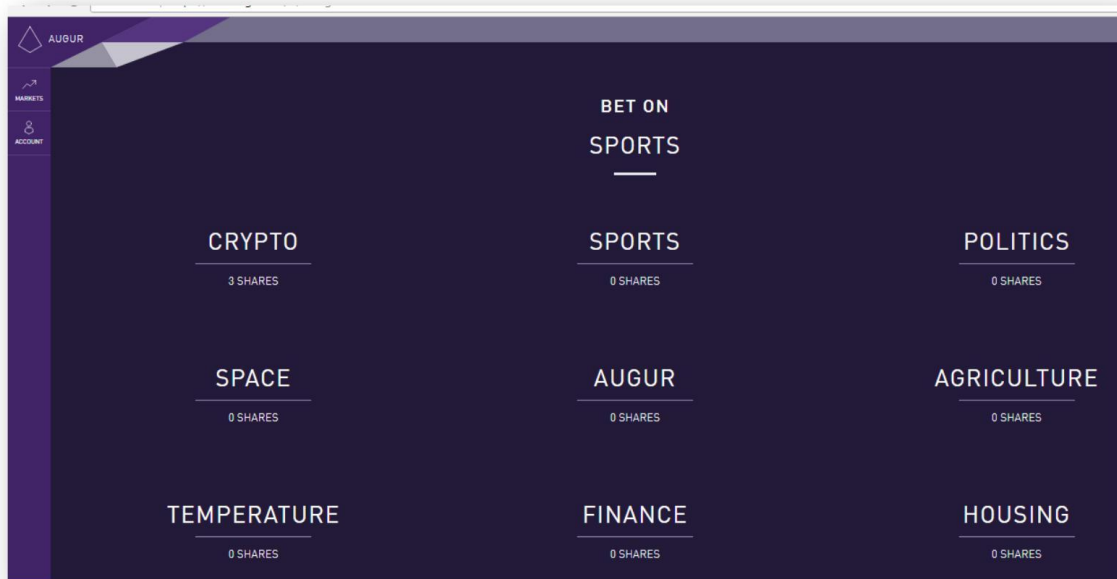
See Figure 2.11 , The function of the Abra is a cryptocurrency wallet which used the Bitcoin blockchain to hold and track balances are stored in different currencies. The company also developed for mobile application which is for Android and IOS mobile services it can deposit, withdraw and transfer funds using digital cash wallet stored directly on the device.



**Figure 2.11: Abra (Financial Services)**

### 2.9.3 Augur (Financial Services)

Bitoken was specific for budgetary administrations it was created on 2014 by Jack Peterson and Joey Krug .The thought for this application is engaged in forecast markets to enable individuals to exchange in view of their desire for instance more often than not individuals endeavor to anticipate who will win the following presidential decision, world container or different things that identified with encompassing. Essentially Augur not the same as other existing forecast advertise on the grounds that it is a decentralized stage and it based on the Ethereum blockchain.



**Figure 2.12: Augur**

## 2.10 Conclusion

In conclusion, this chapter describe in details about what previous study discuss. This chapter also elaborate more about comparison between tabular and non-tabular database, both have their own pros and cons. As we all know that, SQL is the most popular choice as in market and has been there for a long time. Mostly user already used to SQL, but when there is an option for choosing NoSQL database we need decide properly what architecture need to be used, how to manage, store and retrieve data. We need to make the right decision because if we take wrong decisions then our application can turn around to be useless.

## **CHAPTER 3**

### **RESEARCH APPROACH AND METHODOLOGY**

#### **3.1 Introduction**

The selection of suitable methodology is very important because it needs to meet the requirement of research project if the selection of methodology is correct, at the end the system produce will be easy to maintain and monitor. Methodology described as a set of process to express in the project development cycle, basically it's a standard guidelines that must be followed. In this chapter, it will briefly cover explanation of the methodology design and the procedures of Halal Supply Chain System by poultry based product design by implement method used, and hardware and software specification of the system and other than that, method to collect data also will be elaborate. It is a very important process since it will help to guide researcher through project development. Justification of the chosen methodology will be explain in detail, beside that this chapter also will depicts all the requirements of Halal Supply Chain System by poultry based product.

#### **3.2 Research Approach**

For figure 3.1 below shows a research model that has been chosen as the guideline for the research process. The following diagram below shows the step to be taken towards carrying out of this research so that progression of this project will going easy and successfully at the end.

<b>PHASE 1</b>	
<b><i>Problem Awareness</i></b>	<ul style="list-style-type: none"> <li>• Systematic Literature Review (SLR)</li> </ul>
<b>PHASE 2</b>	
<b><i>Identify Halal Food Supply Chain Component</i></b>	<ul style="list-style-type: none"> <li>• Identify component (HFSCM) system.</li> <li>• Searching for existing (HFSCM) system based on big data.</li> <li>• Searching for existing online halal checker system.</li> </ul>
<b>PHASE 3</b>	
<b><i>Planning and System Design</i></b>	<ul style="list-style-type: none"> <li>• Create system design : <ul style="list-style-type: none"> <li>i. Context Diagram (CD)</li> <li>ii. Data Flow Diagram (DFD)</li> <li>iii. Framework (System and Component)</li> </ul> </li> <li>• Create database design : <ul style="list-style-type: none"> <li>i. Entity Relationship Diagram (ERD)</li> <li>ii. Data dictionary</li> </ul> </li> <li>• Create interface design <ul style="list-style-type: none"> <li>i. Form and report design</li> </ul> </li> </ul>
<b>PHASE 4</b>	
<b><i>Development</i></b>	<ul style="list-style-type: none"> <li>• Develop user interface</li> <li>• Create code</li> <li>• Create database</li> </ul>
<b>PHASE 5</b>	
<b><i>Evaluation</i></b>	<ul style="list-style-type: none"> <li>• Evaluating the internal validity</li> </ul>

Figure 3.1 : Research Model

### **3.2.1 Problem Awareness (Phase 1)**

The phase 1 (problem awareness) started with carrying out feasibility study with supervisor by brainstorming the idea to proposed the title of the research. Second, a systematic literature review (SLR) will be conduct to identifying the objective, research question and scope the reason is to find the solution for problem statement. Finally to find the related information twelve's electronic database resources have been selected to search journal papers regarding main component of halal (FSC). Therefore, this phase need to check whether all collecting information is satisfy the user requirements.

### **3.2.2 Identify Halal Food Supply Chain Component (Phase 2)**

As mention earlier in phase 1, by conducting the SLR the main component of the (HSC) is identified and the studies about tabular and non-tabular database from previous study also has been discuss. Second, for phase 2 analysis on existing system based on halal (HSC) is done. The reviewed is targeted on identifying whether the system is based on blockchain technology or not. Third, the existing halal checker that available on the internet has been reviewed. Fourth, identify technology, tools and software used for developing this applications.

### **3.2.3 Planning And System Design (Phase 3)**

The phase 3 will started by transform the information into architecture design. First, context diagram will be created to see boundary between the system and its user. Second, data flow diagram (DFD) will be created to see the whole process of the system it will be divided into two level which are level 0 and level 1. Third, main component (HSC) will be convert into framework the reason is to see the relationship between objectives of research. Fourth, framework for the whole system will be created to see the interaction between the user and system. Fifth, for database design entity relationship diagram will be design to explain the relationship between entities and attributes of entities and data dictionary will be used to see the different between entities attributes. Lastly, interface design will be created to implement all the modules in the system for example form and report.

#### **3.2.4 Development (Phase 4)**

The phase 4 will be conduct once the system design is approved. First, user interface will be design. Second, the codes for this system will be develop module by module by using programming language (PHP), XAMPP server and notepad++. Finally, database of this system will be created by using selected database which is Mongo DB (No SQL).

#### **3.2.5 Evaluation (Phase 5)**

The phase 5, is to make sure the function of system is working or is it contain some error. First, the evaluation was done in every module of the system to ensure its meet system requirement. Finally, after the system already been evaluate it now will be ready to presented to the final user, they will test and check the system if there are any problem happened a suggestion and comment will be given to improve the system.

### **3.2.1.1 Research Method : Interview and Observation**

The intention of the research is to highlight questionable area within the issues to improve standards and quality of the current halal poultry process and practices. The research design elaborate the interviews and observation regarding the sharia rules in slaughtering procedures. The main purpose of this interview is to identify basic understanding and practices in farm and halal poultry slaughtering. The farm that be choose for doing the interview is

#### **3.2.1.1.1 Content of Questionnaire**

The interview question was designed to understanding basic about halal poultry laws regarding to manage animal in farms and animal stunning before the actual slaughter.

Below are the example question during interview explanation about :

- 1) Farmer description, in detail about how the farm process and manage all animals.
- 2) Understanding knowledge about slaughtering,slaughtering rules and conditions of slaughter.
- 3) Explanations about tools used, solely for halal slaughter,sharp and free from contamination.
- 4) Stunning process,electrical,mechanical and pneumatic.
- 5) Supervision and monitoring procedures of the slaughtering and slaughter also with in charge or the halal committee involved.



### 3.3 System Development Methodology

Rapid application development (RAD) is chosen as the methodology for the system development because RAD is a highly interactive systems development approach. RAD attempts to reduce development times and the difficulty in understanding a system from a paper-based description. During development, it also specifies testing at multiple points.

Therefore, the products can be developed faster with higher quality. After the comparison of advantages and disadvantages, Rapid application development (RAD) is a perfect methodology to choose for this prototype development. Below are briefly describes the four stages of RAD which is planning, user design, construction and cutover.

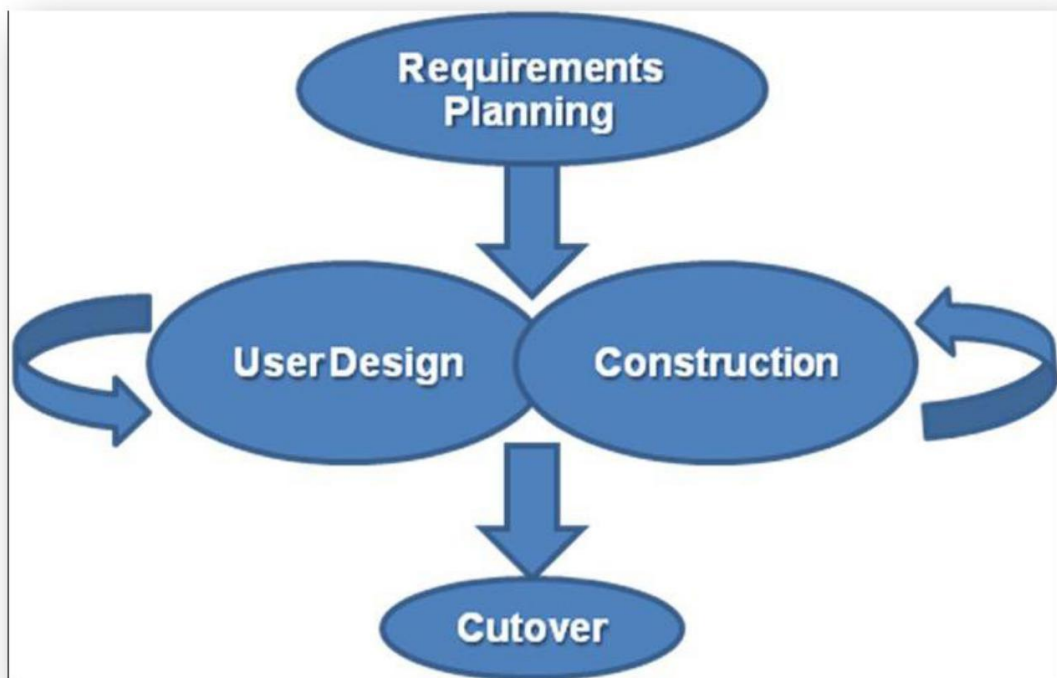
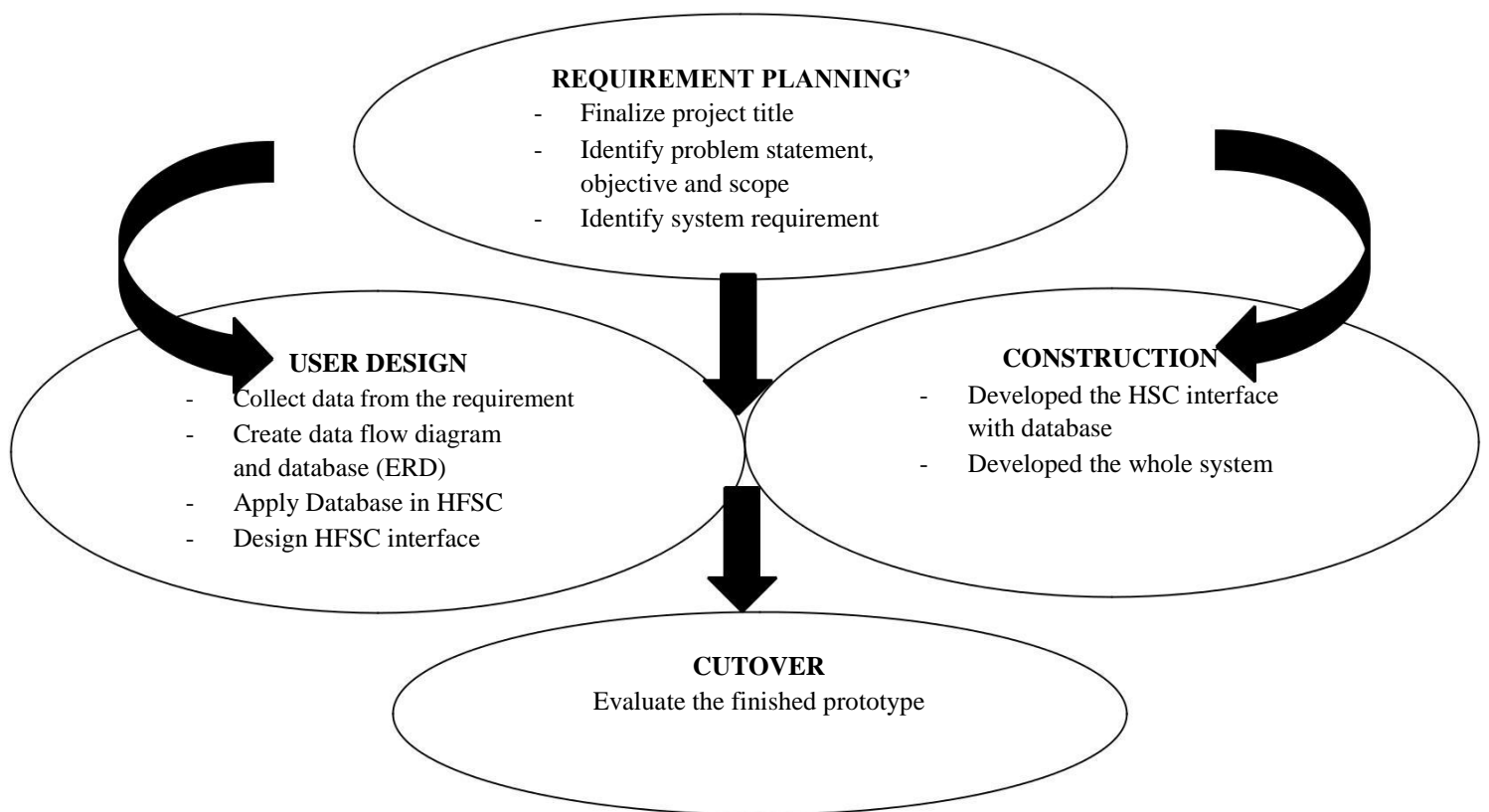


Figure 3.2: RAD Model Graphic



**Figure 3.3: Prototype RAD Methodology**

### 3.3.1 Requirement Planning

In this phase, the planning and the requirement are being combine together to minimize the time allocated. The framework type of RAD is iterative. This stage define the system function and determines the system’s scope and the data subject area that the system will support. The objective of this stage are to studies the existing system and establish a general understanding of the problem that faced its development and eventual operation and identify the process that will be support by the proposed application. The first step started in this stage is with a meeting with the client to collect the requirement from the client and discuss the requirement that they need in ordered to meet the user expectation of this system. In this phase, meeting with the supervisor as a client to develop the Halal Supply Chain System for poultry based product. All requirement from the client are gathered and collect the data needed to be analysis in this system.

### **3.3.2 User Design**

The user design phase involves the user interface of the system. The objectives of this phase actually to analyse in detail the project activities, project data associated with the proposed system. To model the system and process the data it use Structured Programming in order to build a working prototype of critical system component. It is produced a detail system area model, an outline system design and an implementation plan. After the requirement and planning phases, the diagram are formulated which is Context Diagram and Entity Relationship Diagram.

### **3.3.3 Construction**

This objective of this stage is to complete the detailed design of the proposed system. It is also to create and test the software that implements the proposed system. The design of the proposed system, initially describe in User Design stage, is completely in this stage, and application software to implement that design is developed and tested. So the coding process are involved in this stage. The coding process started after the design process and all the resources will be located in this phase to make sure that the system can be rapidly develop. The prototype of application system are construct and build the module of system to show to the client to confirm that the requirement that are being proposed is fulfil. The CASE tool and hardware are implement in this stage to complete the system.

### **3.3.4 Cutover**

The final cutover stage are normally include data conversion, testing, changeover to the new system and user training. At this time, the new system is build, delivered and placed in operation. At this stage data conversion, user testing and training are include and implementation of the application module by module to detect the error and finally integrated and tested the entire module. This is because to detect the error in the coding in early stage by determining which module have error before proceed to integration testing and acceptance testing. Therefore, User Acceptance test are the end activities of this phase. After the system free from error, the system can deployed to the client site to be use by the client.

### 3.4 System Requirement

The requirement of hardware and software play an important part in project development because it will help through the development of project and sometime a project can fail and malfunction if software and hardware requirement have a problem.

#### 3.4.1 Hardware Requirement

The hardware requirement to build this system are:

**Table 3.1: Hardware Requirements**

<b>ITEM</b>	<b>QUANTITY</b>	<b>MINIMUM REQUIREMENT</b>	<b>PURPOSE</b>
Computer	1	Intel i5 processor 4.00 GB RAM.	For presentation and develop system.
PendriveColor Turn	1	8 GB	To back up the sources code of the system and files related.

### 3.4.2 Software Requirement

The software requirement needed to build this system are:

**Table 3.2: Software Requirements for Pre-Early Development**

<b>SOFTWARE FOR DEVELOPMENT</b>
<p>Google Chrome :</p> <ul style="list-style-type: none"><li>- To access search information on internet</li></ul>
<p>Google Drawing IO :</p> <ul style="list-style-type: none"><li>- To create and design context diagram, data flow diagram (DFD) and system framework</li></ul>
<p>Google Drive:</p> <ul style="list-style-type: none"><li>- To save and update the document of this system. Other than that as a backup for files related it also a medium to sharing document with supervisor.</li></ul>
<p>Microsoft :</p> <ul style="list-style-type: none"><li>- <b>Microsoft Word</b> ( To write report and proposal)</li><li>- <b>Microsoft Power Point</b> ( To prepare slide for presentation)</li><li>- <b>Microsoft Project</b> (To planning , create schedule and prepare for gantt chart)</li></ul>
<p>Pidoco.com :</p> <ul style="list-style-type: none"><li>- To create early interface design of prototype</li></ul>

**Table 3.3 : Software Requirements for Development**

<b>SOFTWARE FOR DEVELOPMENT</b>
(Mongo - No SQL) : <ul style="list-style-type: none"><li>- Database platform to generate database.</li></ul>
Notepad ++ <ul style="list-style-type: none"><li>- Platform to write code and generate to build this system</li></ul>
XAMPP Server : <ul style="list-style-type: none"><li>- To connect with MongoDB database</li></ul>

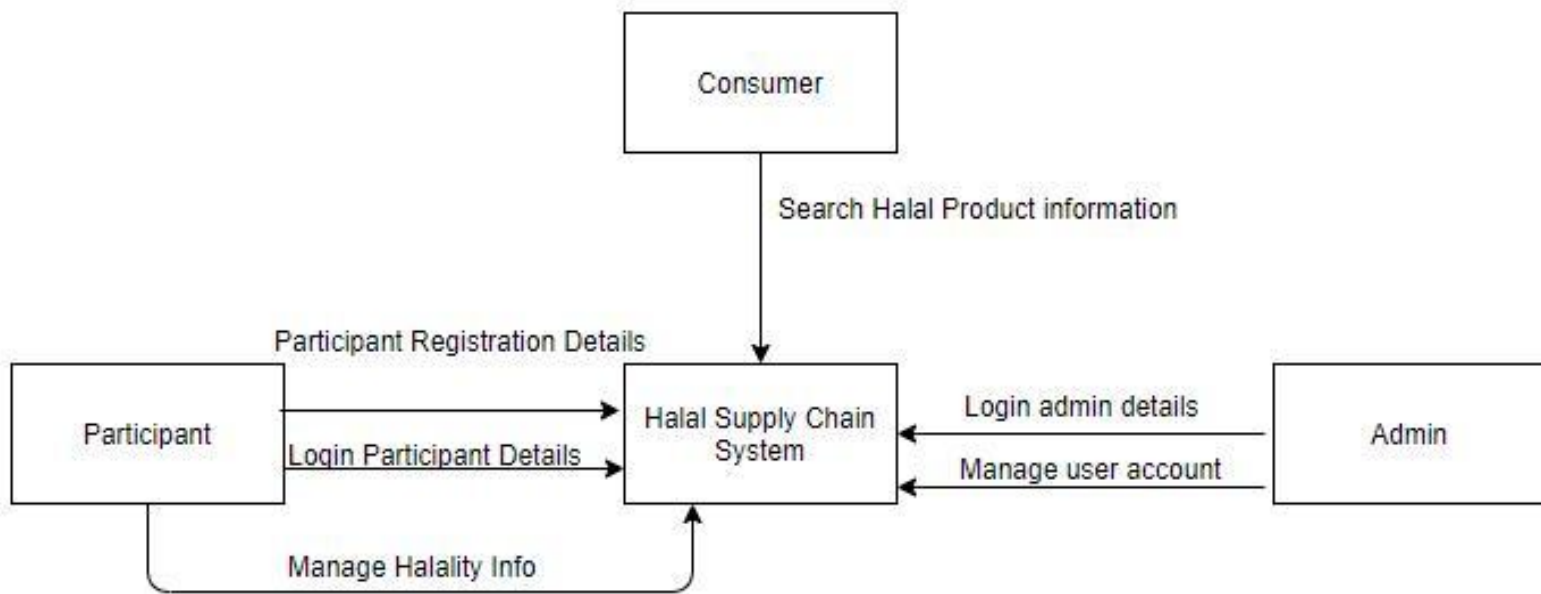
### **3.5 System Design**

In this system design phase, system development will be convert into process and flow and how it will be organized, so that the development of this project will be runs smoothly. It will be divided into two part of steps which is modelling process and conceptual data model. The function of modelling process is to represent the function and process for the whole development of system before developed the system, usually it involves graphical. Meanwhile, conceptual data modelling is to represent data that are available in the organization it will shows the overall structure of data available on the system and how the system will be implemented.

The design includes Context Diagram, Data Flow Diagram (DFD), and system and component framework as a physical design, while Entity Relationship Diagram (ERD) as logical design. Besides that, data dictionary also is used to explain more details about attributes of the database. Basically all the design of the system must be done accurately to make sure the main structure of the system can be seen and have a clear vision.

### 3.5.1 Context Diagram

Figure 3.5 below shows a context diagram that shows the main flow of the entire system, other than that the flows of the entities will be explained and their ability what can they do in this system. HSC System have three entities which are admin, consumer and participant each of them are assign with their own task.



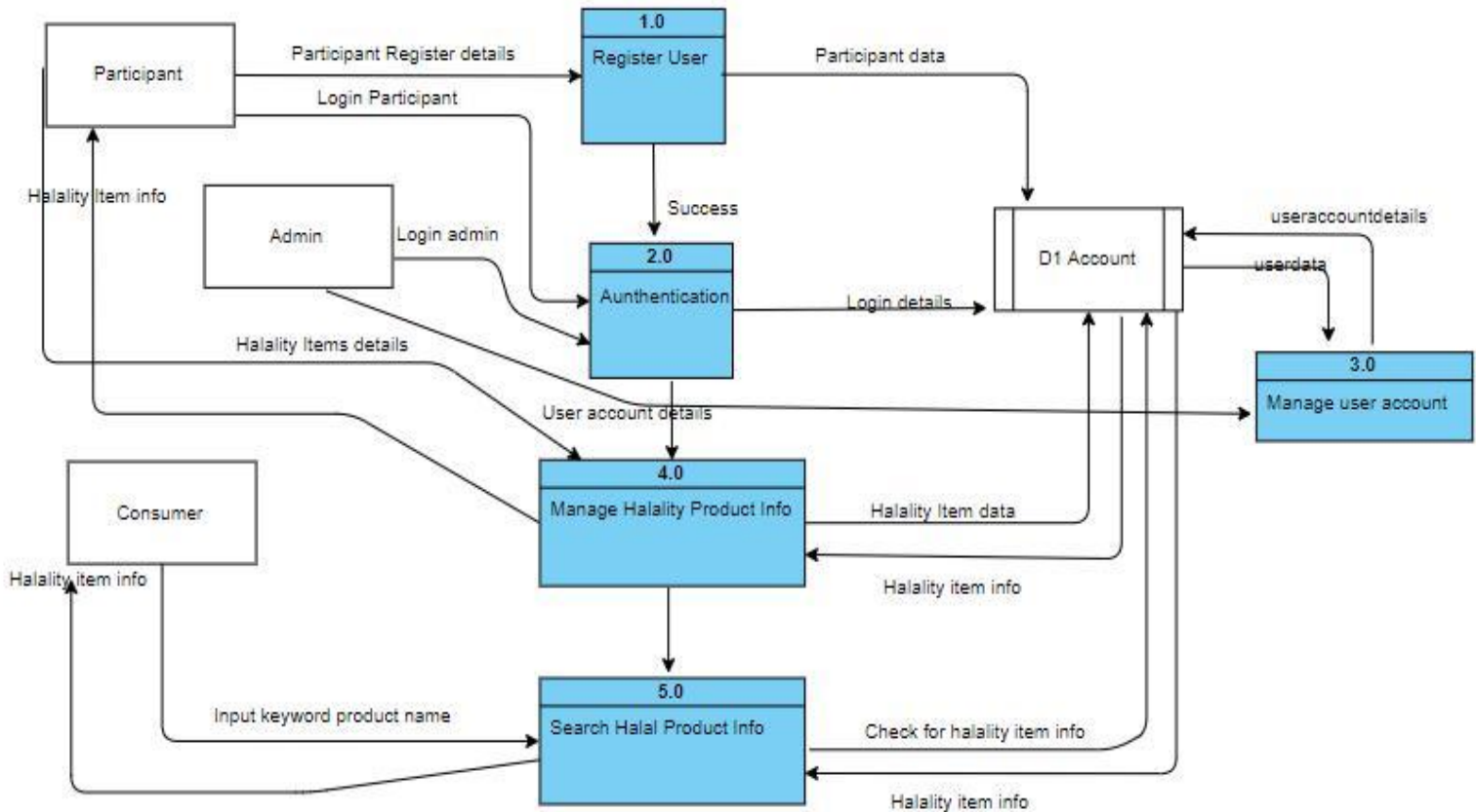
**Figure 3.4: Context Diagram for HSC System.**

### 3.5.2 Data Flow Diagram

Data Flow Diagram (DFD) is a diagram that shows the flow of process on which data store the data. The more details about the flow will be explained with DFD LEVEL 0 and followed by DFD LEVEL 1. The functionality for each process also will be described to help developer understand the system.

#### 3.5.2.1 Data Flow Diagram (DFD Level 0)

Data Flow Diagram Level 0 is an overview of the Halal (FSC) Management System to represent flow of data based on module that involves in this system. There are four module in this system and the details will be explain more in (DFD Level 1). Figure 16 below shows the structure of (DFD Level 0).



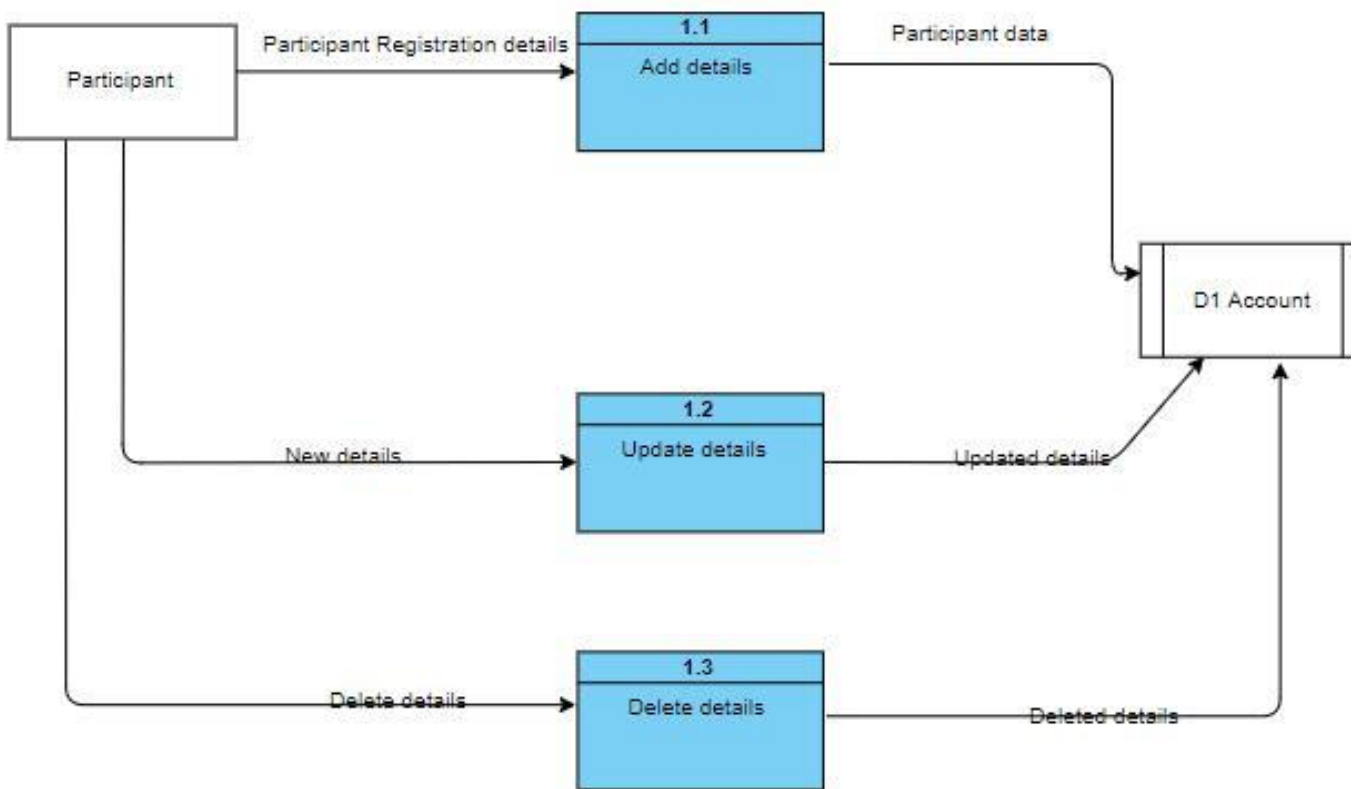
**Figure 3.5: Data Flow Diagram Level 0**

Figure 3.6 shows the flow of process that involve in HSC System. There are five process involves in this system that is Register User, Authentication, Manage User Account, Manage Halality Product Info and Search Halal Product Info. Basically every process of the system will interact with related table or data store in the databases in order to complete the process of the development.

### 3.5.2.2 DFD Level 1 (Register User)

Figure 3.7 below shows the Data Flow Diagram (DFD) level 1 for user registration process which involves all the users of the system which are farm, slaughterhouse, manufacture, transport, wholesaler and consumer. Only farm, slaughterhouse, manufacture, transport, wholesaler and consumer needs to fill in the registration form in order to access the HSC System.

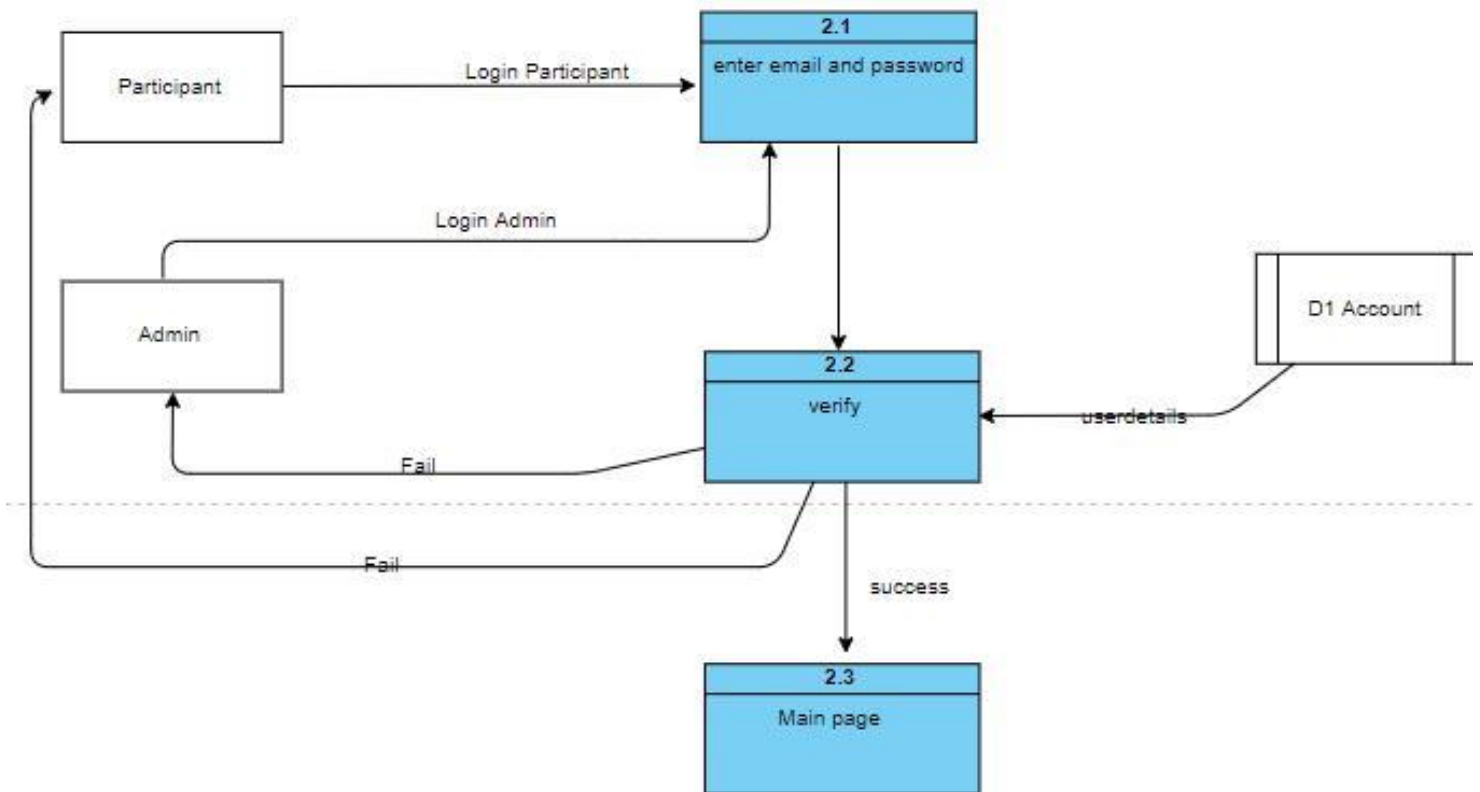




**Figure 3.6: Data Flow Diagram Level 1 (Process 1.0 - Register User)**

### 3.5.2.3 DFD Level 1 (Authentication)

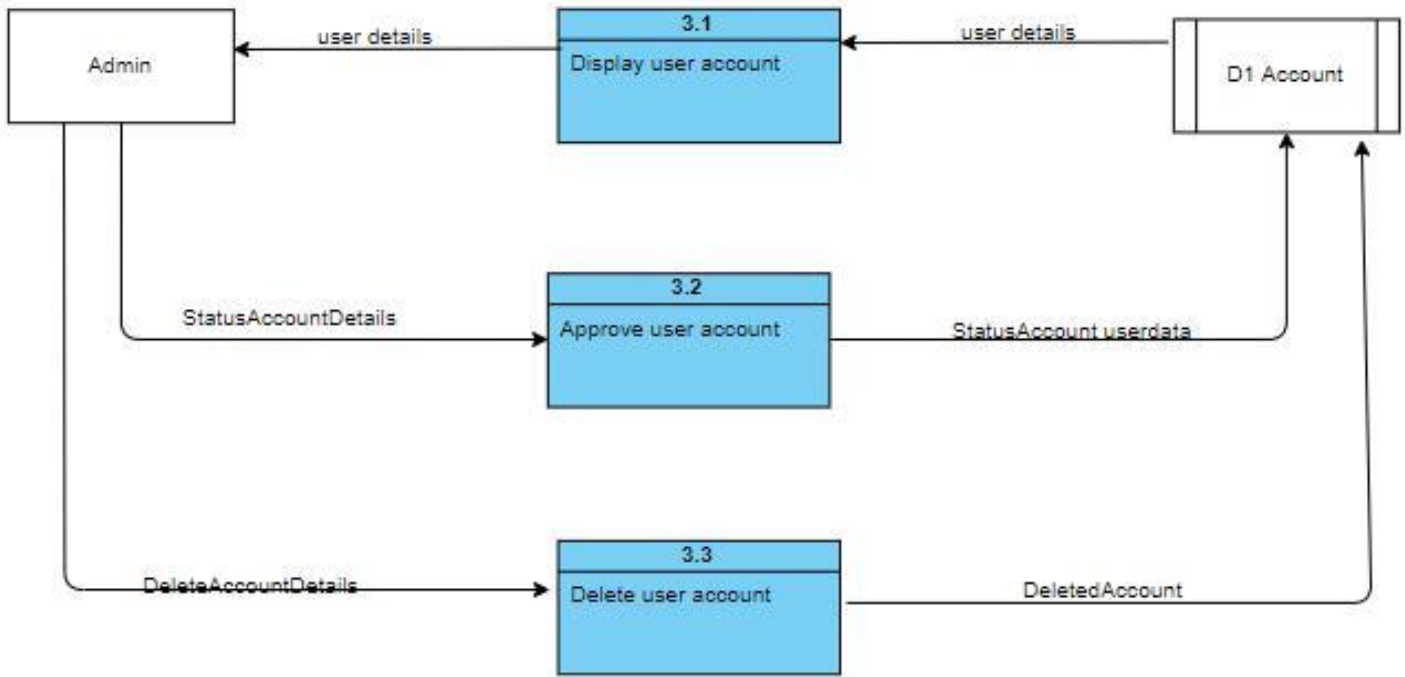
Figure 3.8 below shows the Data Flow Diagram (DFD) level 1 for authentication for all users which are admin, farm, slaughterhouse, manufacture, transport, wholesaler and consumer. The user need to enter username and password and click button Login to access system. System will check whether username and password is valid or not. If valid system will be display main page for each category of users interface and if not, system will pop up message to tell invalid username and password. They need to re-enter again username and password again.



**Figure 3.7: Data Flow Diagram Level 1 (Process 2.0 - Authentication)**

### 3.5.2.4 DFD Level 1 (Manage User Account)

Figure 3.9 below shows the Data Flow Diagram (DFD) level 1 for manage user account. After users completed the registration process, admin will received farm, slaughterhouse, manufacture, transport, wholesaler and consumer info and admin will approve their registration and all of the users will be able access to the system and admin also can view list of user account details. Finally, admin also have ability to delete user account that are inactive anymore.



**Figure 3.8: Data Flow Diagram Level 1 (Process 3.0 – Manage User Account)**

### 3.5.2.5 DFD Level 1 (Manage Halality Product Info)

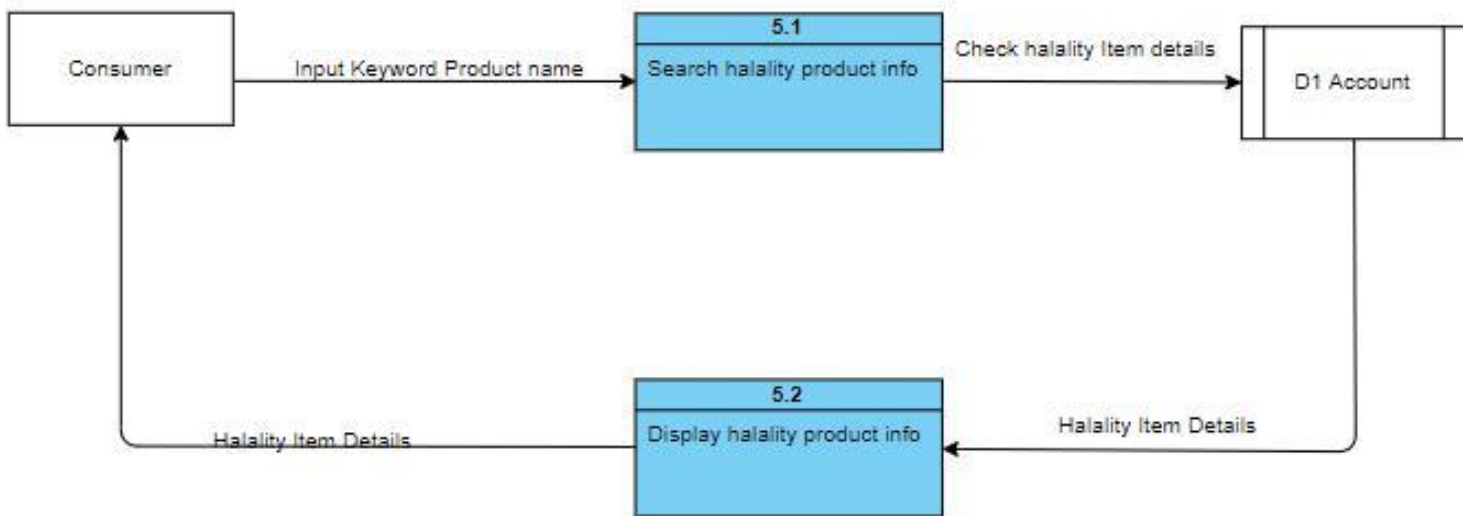
Figure 3.10 below shows the process for slaughterhouse. The task is to add new information regarding halality of the products which include information about supply chain activities. In addition, they also can update or delete the information. Finally, they can view information that has been insert to database and sharing all of the information together.



**Figure 3.9: Data Flow Diagram Level 1 (Process 4.0 - Manage Halality Product Info)**

### 3.5.2.6 DFD Level 1 (Process – Search Halal Product Info)

Figure 3.11 below shows the process only for consumer, consumer can search information of halality of the product by input keyword product name to the system. After that the system will check whether information of the product in database or not. Then consumer will be able to see the details of halality of product through supply chain information that being answer by slaughterhouse.



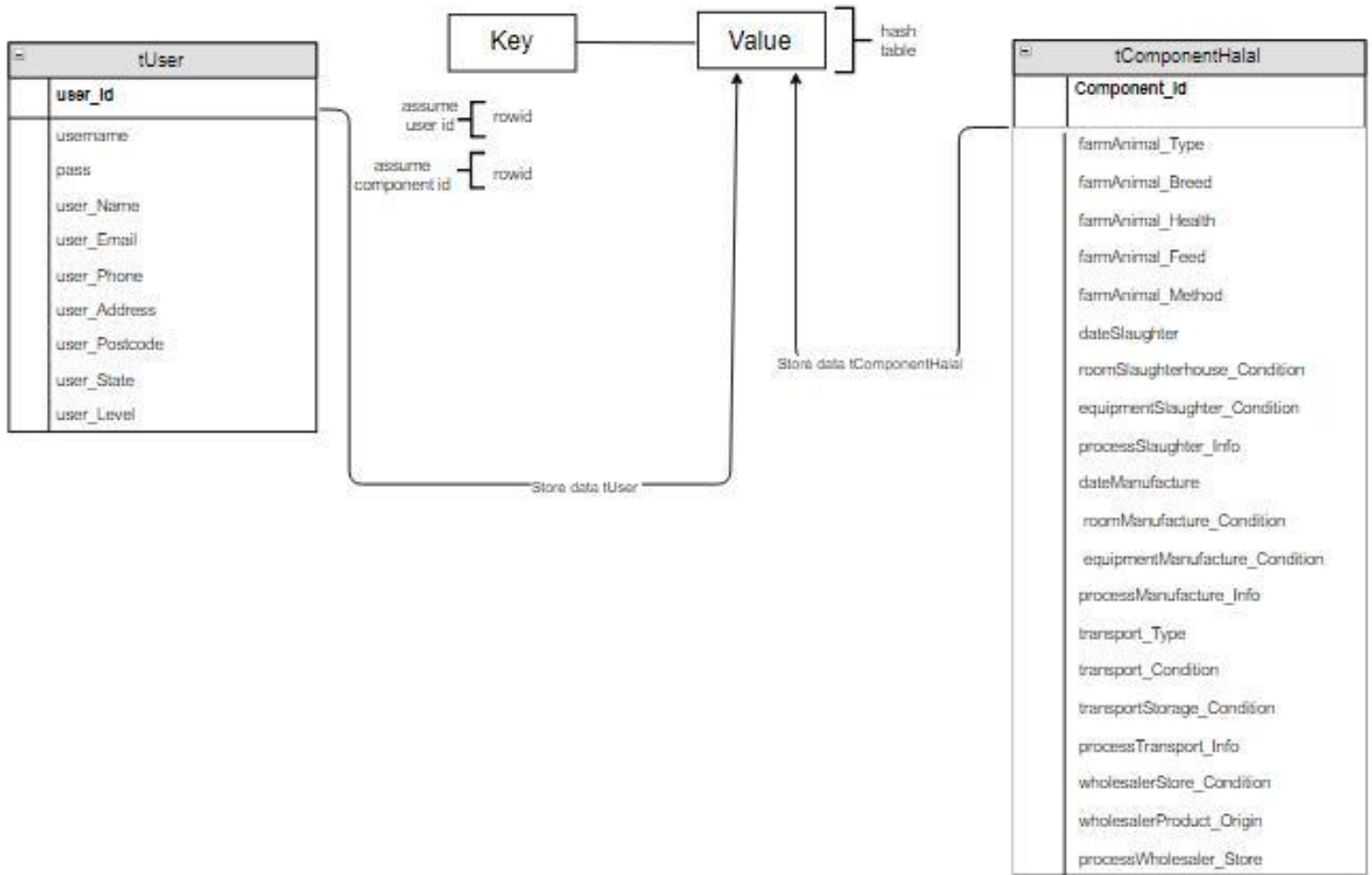
**Figure 3.10 : Data Flow Diagram Level 1 (Process 5.0 – Search Halal Product Info)**

### 3.6 Database Design

A Database is one of the main important part in the development of system because it will stored the data that will used by the system later. Basically, database contains collection of records that have been organized to accessed, create, manage and update it also have its own structure data type.

#### 3.6.1 No SQL (Key Value Stored) Diagram

No SQL (KEY VALUE STORED) is used to describe about data requirement and assumptions in the system from a top-down perspective. Figure 3.11 below show the main table that involve in halal supply chain system. The diagram below show example two tables which are tUserAccount and tComponentHalal that involves with key value stored in No SQL database.



**Figure 3.11: Entity Relationship Diagram (ERD) for HSC System**

### 3.7 Interface Design

#### 3.7.1 Dialogue Diagram

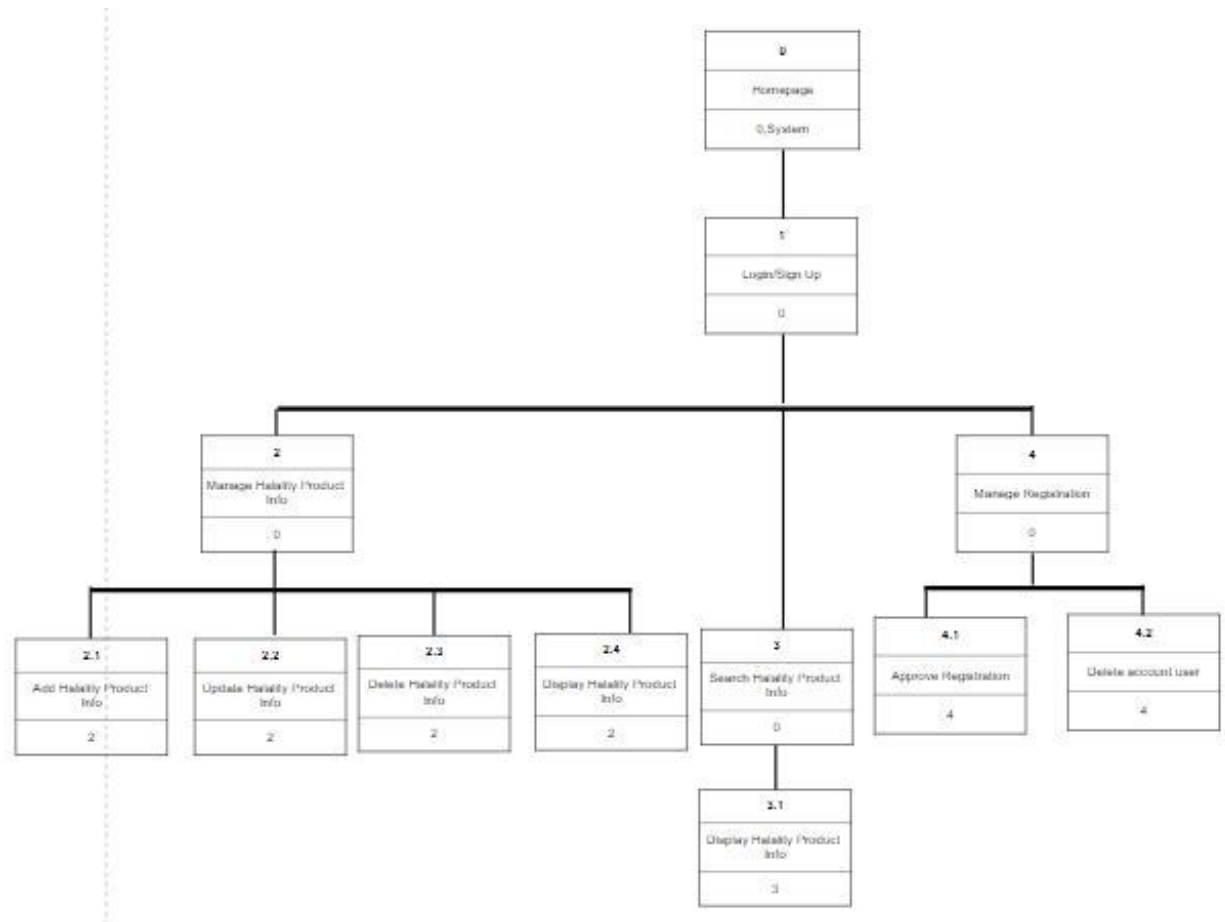
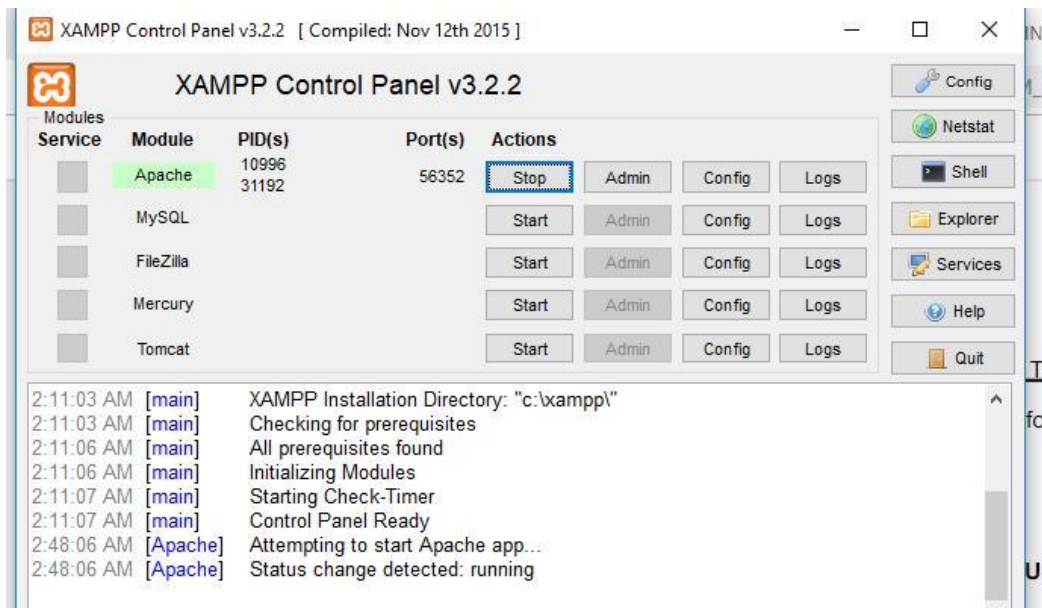


Figure 3.12: Dialogue Diagram for Halal Supply Chain System

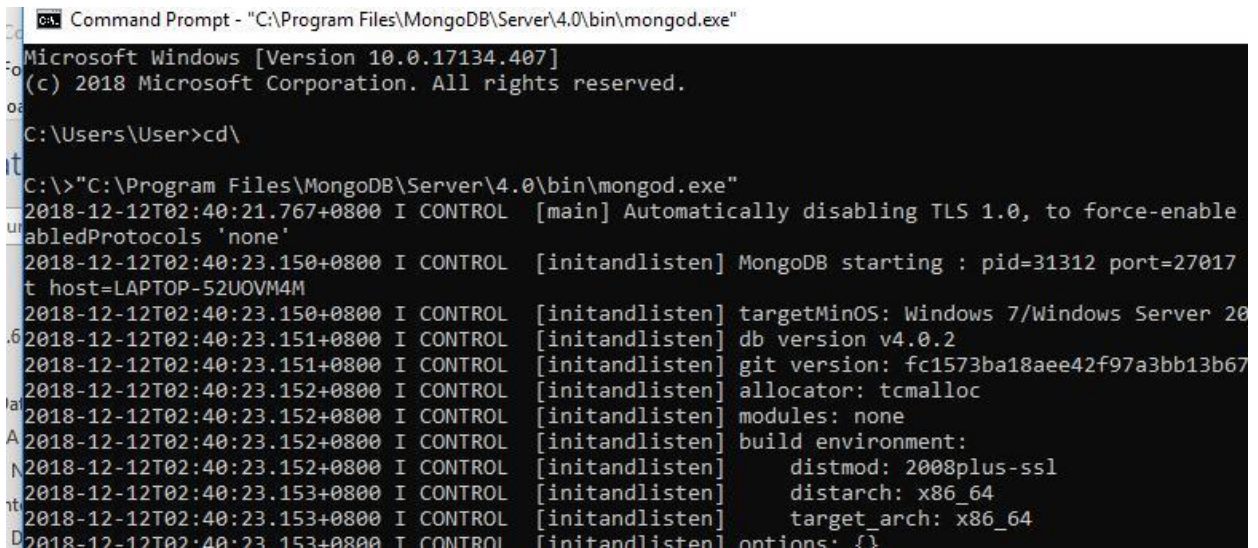
#### 3.7.2 User Interface

User interface design is the planning that lays the basis for the making of every object or system and also important for developing this system. It will show several the interface systems in Halal Poultry Supply Chain.

i. Start Xampp



ii. Open CMD and type "C:\Program Files\MongoDB\Server\4.0\bin\mongod.exe"





- iii. Open another CMD and type "C:\Program Files\MongoDB\Server\4.0\bin\mongo.exe" to open the database

```
Command Prompt - "C:\Program Files\mongoDB\Server\4.0\bin\mongo.exe"
Microsoft Windows [Version 10.0.17134.407]
(c) 2018 Microsoft Corporation. All rights reserved.

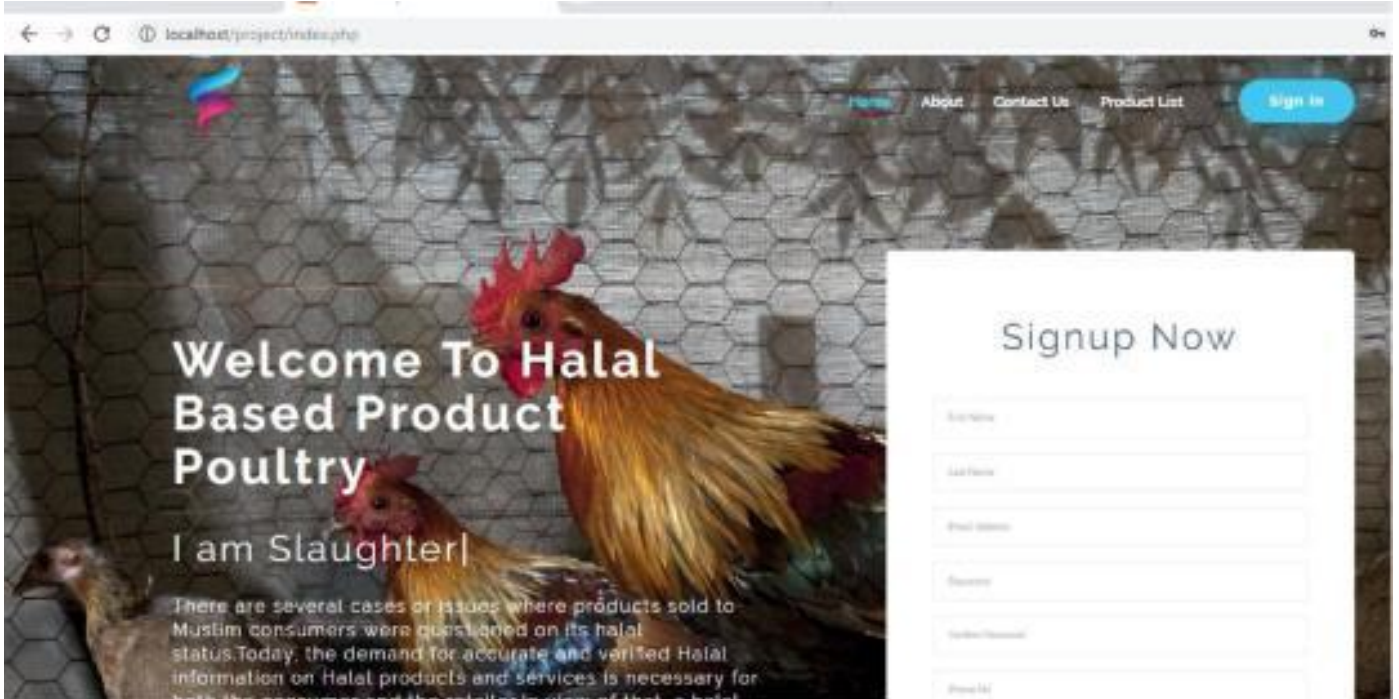
C:\Users\User>cd\

C:\>"C:\Program Files\mongoDB\Server\4.0\bin\mongo.exe"
MongoDB shell version v4.0.2
connecting to: mongodb://127.0.0.1:27017
MongoDB server version: 4.0.2
Server has startup warnings:
2018-12-12T02:40:25.049+0800 I CONTROL [initandlisten]
2018-12-12T02:40:25.050+0800 I CONTROL [initandlisten] ** WARNING: Access
2018-12-12T02:40:25.055+0800 I CONTROL [initandlisten] **          Read a
nrestricted.
```

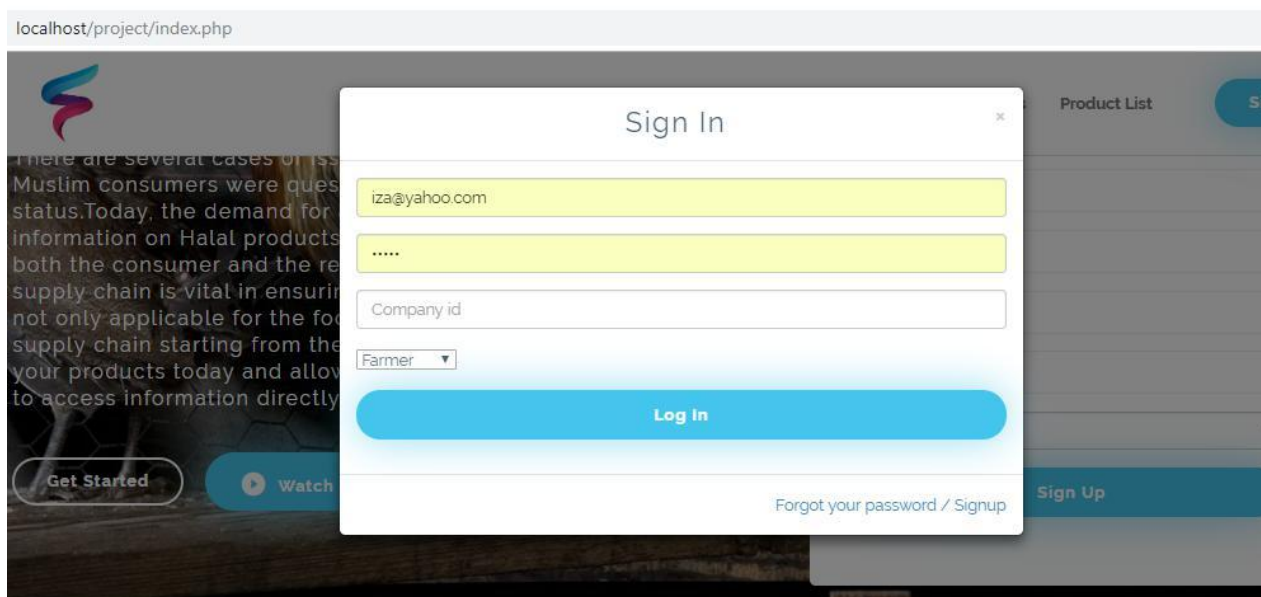
- iv. Type "show dbs", then it will ask to choose which selected dbs wants to used .then type "use project",After that,type "db.account.find().pretty()" to display data that available in mongoDB.

```
Command Prompt - "C:\Program Files\mongoDB\Server\4.0\bin\mongo.exe"
> show dbs
admin    0.000GB
config  0.000GB
local   0.000GB
project 0.000GB
> use project
switched to db project
> db.account.find().pretty()
{
  "_id" : ObjectId("5c03f2f534e9bf2c5c00236d"),
  "fname" : "ahmad basir",
  "lname" : "bin zakuan",
  "email" : "basir@yahoo.com",
  "pass" : "123456",
  "message" : "bin zakuan ahmad basir would like to request an account.",
  "phone" : "01137373693",
  "Cname" : "Ladang Ayam Kampung Temoh Stesen",
  "id_Company" : "F1000",
  "role" : "Farmer"
}
{
  "_id" : ObjectId("5c03f58534e9bf2c5c00236e"),
  "unigid" : "5c03f58505747"
```

- v. Opening the web browser by entering “localhost/project/index.php”
- vi. Access the system and register as Halal Supply Chain Participant, enters all the following details and click “Sign up” to create your account.



- vii. To login ,enter your email , password, company id and role at the box provided and then click “Log in”



viii. In this section it will display, list menu for Farmer.

ix. In this section, Farmer needs to insert the following information regarding best practice that they do it in Farm

- x. Farmer insert production details to who Slaughterhouse they sold the animals.

Hi kamal@yahoo.com.  
Please fill information delivery chicken productions farm to slaughterhouse:

**PRODUCTION FARM DETAIL-->**

Staff Id Incharge:

**DELIVERY DETAIL TO SLAUGHTERHOUSE-->**

Slaughterhouse Name:

Date Delivery:

Quantity:

Type of Chicken Breed:

List of Delivery Chicken Production to Slaughterhouse

[View Supply Chain Farm Information](#)

Record saved successfully.

No	Staff Id Incharge	Date Delivery	Quantity	Chicken Breed
1	A101	2019-01-01	35	Cobb
2	A101	2019-01-21	36	Cobb

- xi. Then user login as role Slaughter with Company ID “S1001” now can track information history where does the chicken comes from.

HALAL SUPPLY CHAIN FOR POULTRY BASED PRODUCT

SLAUGHTER DASHBOARD>>Hi, zakir@yahoo.com

<< You are login as Slaughter-->

Here some idea to begin with Halal Supply Chain, please explore more!

- 1) Fill up your company info, including information halal practices of premise
- 2) Fill up your transaction production information for Halal participant to review
- 3) Review Halal Supply Chain Information
- 4) Answer some questionnaire to see your awareness regarding Halal practise

My Account   SlaughterHouse Information   Questionnaire   Supply Chain Info

Halal Poultry Based Product

localhost/project/listfarm1.php?id=5c361c17a04eb

HALAL SUPPLY CHAIN FOR POULTRY BASED PRODUCT

Slaughterhouse can view information regarding Halality of chicken from Farm

SlaughterHouse Information >> Supply Chain Details

Hi zakir@yahoo.com,farm that delivery your poultry are:

Poultry Farm Information:

- 1) Farm Name : Ladang Ayam Kampung Temoh Stesen
- 2) Owner Name : Ahmad Basir bin zakuan
- 3) Phone No : 0125674894
- 4) Farm Address : ds
- 5) Type of Farm : Open
- 6)Website/Facebook/Instagram : @basirZakuan72
- 7)Type of Food : Own Mix
- 8)Total no of Chicken : 122
- 9)If your mix your own food,state the source: no
- 10)Water sources in the farm : Water Pipes
- 11)Vaccine Name : bronchitis
- 12)Date : 2.12.2018
- 13)Are the animal has received any treatment or is in the course of any treatment (drug, antibiotic):Yes
- 14)If yes, please specify the name of the product used and the date of the prescription:(etc:Sulfonamida,Diaminoprimidin)
- 15)Vaccine Name : vaccine
- 16)Date Of Prescription:29.11.2018
- 17)Please specify steps cleanliness of pen and cage : perak
- 18)State the duration to empty the pen and cages:as

## **CHAPTER 4**

### **RESULT AND DISCUSSION**

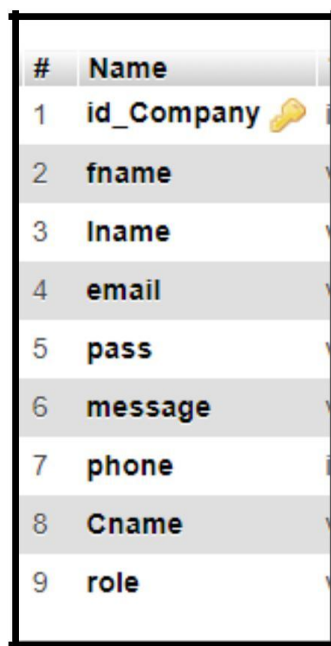
#### **4.1 Introduction**


In this chapter, the query were analysed with two different type of databases MongoDB and MySQL by measured each query processing time. The main purpose of these research is to know which databases given the best time when process the query. To strengthen the results of query processing ,the query analysis will be focus on query optimization which is by controlling and limiting space and time of executing query.The important accessed tables that will be involved are UserAccount, InformationDetails and TransactionItem. In addition, to ensure the experiment conducted in the same environment queries insert and selected has been chosen to conduct this research ,so there is no different between two databases.All the databases will be using same table . Futhermore there are different comparisons resulted from the analysis that conducted in this research.

## 4.2 Query Processing Time Between SQL and NoSQL Databases

Application development using PHP language was built. The application was built because there is no specific Integrated Development Environment (IDE) to perform response time experiment on DBMS, MongoDB and MySQL. In addition, this application ensure the experiment conducted in the same environment, so there is no different behavior in the experiment. The Application has two database connections, with MySQL and MongoDB. The Application becomes an intermediary between user and data in DBMS. The queries already defined in the application, so user only need to entry the query criteria through application. After the query executed and running in DBMS, query response time displayed in application. Overall, there are some comparisons resulted from the analysis that conducted in this research. The structure of database as shown in figure below.

- i. Example table schema for RDMS :
  - a) UserAccount



#	Name
1	id_Company 
2	fname
3	lname
4	email
5	pass
6	message
7	phone
8	Cname
9	role

**Figure 4.1 :Example RDMS Attribute for UserAccount**

b) ItemDetails

	#	Name
<input type="checkbox"/>	1	id_Company
<input type="checkbox"/>	2	uniqid
<input type="checkbox"/>	3	Role
<input type="checkbox"/>	4	cName
<input type="checkbox"/>	5	ownerName
<input type="checkbox"/>	6	Muslim
<input type="checkbox"/>	7	cAdd
<input type="checkbox"/>	8	w_hour
<input type="checkbox"/>	9	phone
<input type="checkbox"/>	10	social
<input type="checkbox"/>	11	MuslimType
<input type="checkbox"/>	12	w_Slaughter
<input type="checkbox"/>	13	w_meat
<input type="checkbox"/>	14	eduSlau
<input type="checkbox"/>	15	eduMeat
<input type="checkbox"/>	16	q1
<input type="checkbox"/>	17	stunning
<input type="checkbox"/>	18	pSlaughter
<input type="checkbox"/>	19	q2
<input type="checkbox"/>	20	q3
<input type="checkbox"/>	21	q4
<input type="checkbox"/>	22	q5
<input type="checkbox"/>	23	q6

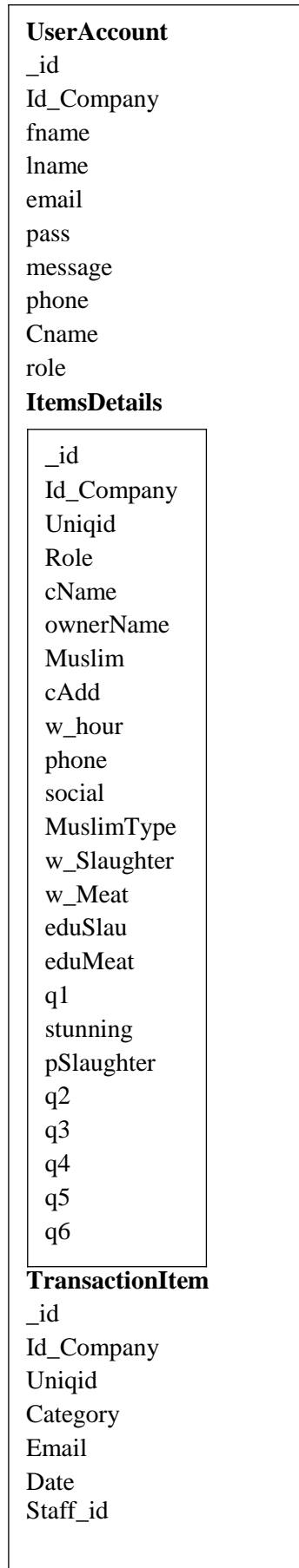
Figure 4.2 :Example RDMS attribute for ItemDetails



c) TransactionItem

#	Name
1	uniqid
2	category
3	email
4	date
5	staff_id
6	id_Company

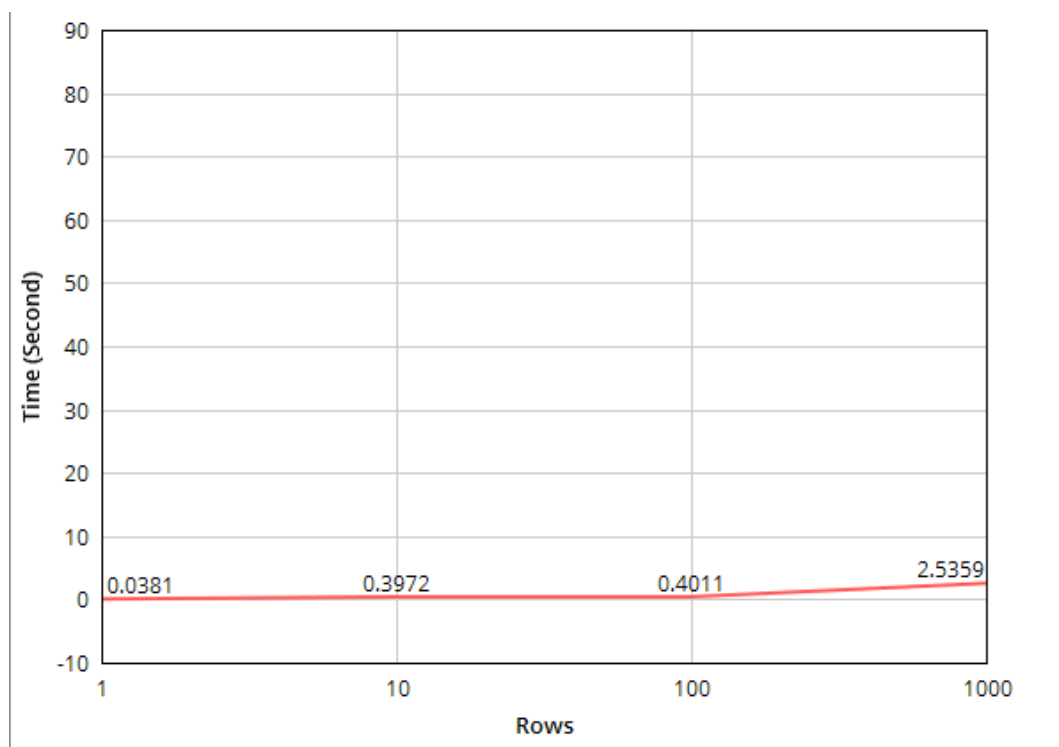
**Figure 4.3 :Example RDMS attribute for TransactionItem**



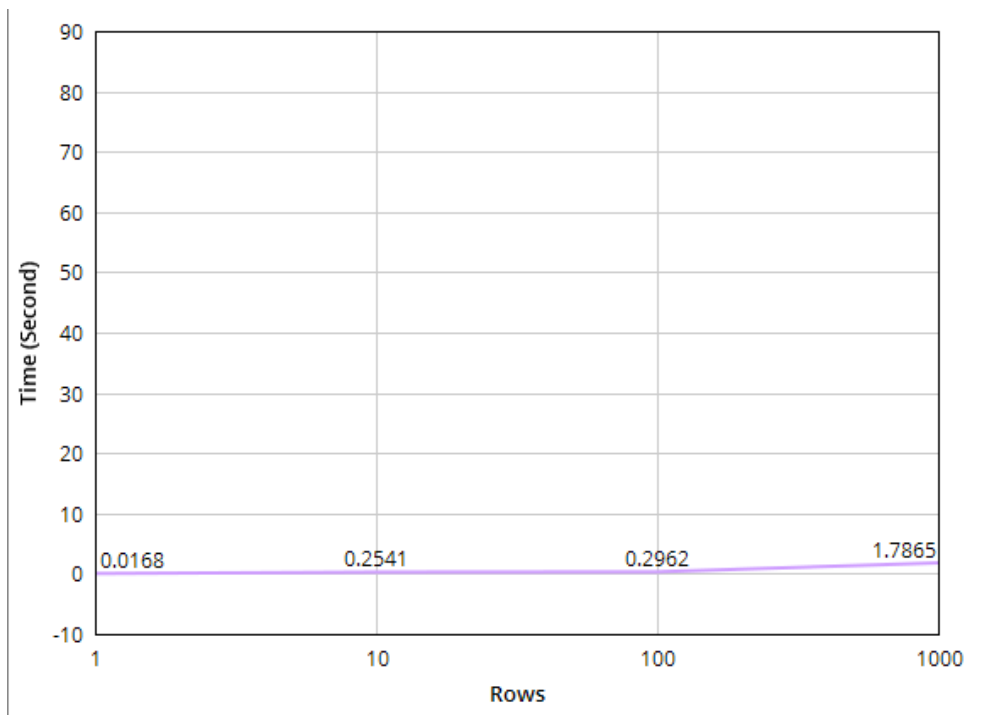
**Figure 4.4 :Example Schema in MongoDB Database**

### 4.2.1 Response Time Query

The experiment, MongoDB and MySQL installed on a machine running an Intel Core CPU i3-6006U CPU @2.00 GHz, RAM 4GB. Experiment was carried out in this scientific research has 2 scenarios according to the query operation that executed, such as insert and select. Each scenario was performed by executing a query with different rows are 1, 10, 100 and 1000 rows. Query executed 10 times and taking average to get the final result. For each scenario, query response time result show in a graph. Formula used to calculate value of y (query response time) from value of x (number of rows) and R2 is used to determine significance level of the experimental results. The comparison of experimental result can be seen in the following graph query response time on table or collection with relationship.

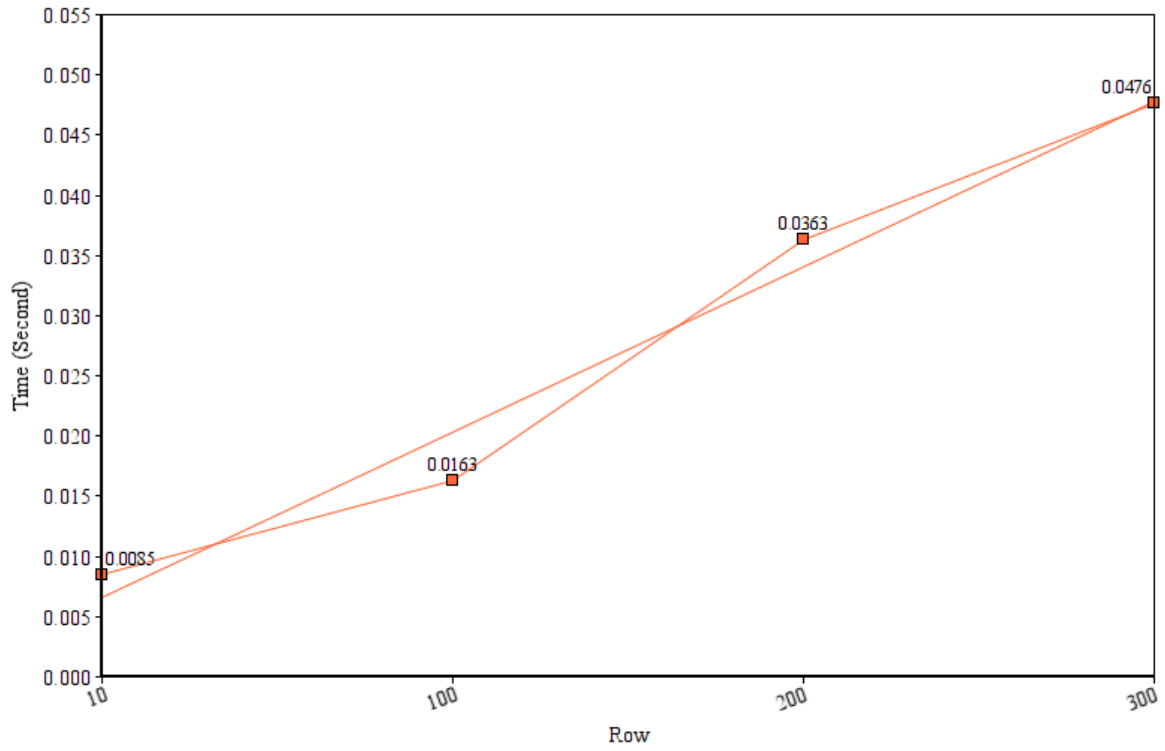


**Figure 4.5: Insert response time on table or document with relation in MySQL**

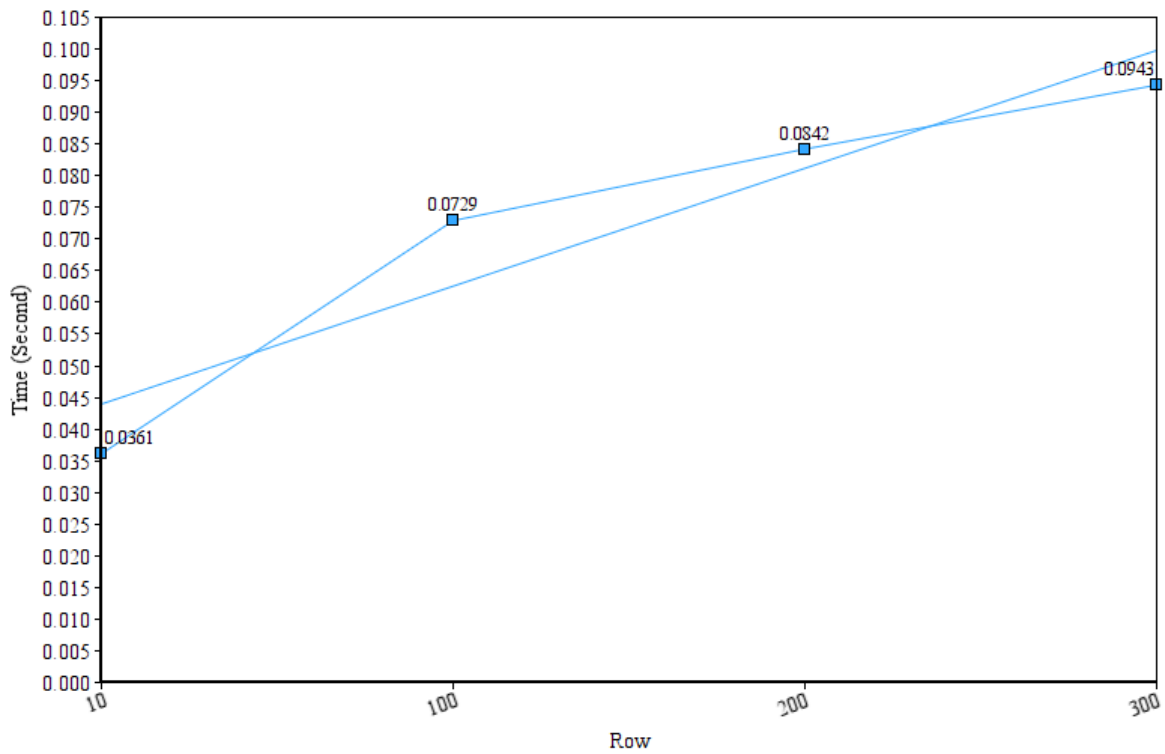


**Figure 4.6: Insert response time on table or document with relation in MongoDB**

Figure 4.5 and 4.6 shows the comparison inserting time between the two database systems. We can see MongoDB is constantly faster than MySQL, even though the number of rows in the database and the number of rows that are inserted is increasing. Especially in MySQL, the response time for a query slows down when the number of data records in the table and the document increases. Insert operations on MongoDB are faster than MySQL. Insert operations on MySQL involve several stages (execution plan). MySQL must confirm the valid data type (domain integrity) with values that will be inserted, primary keys must be unique, not null (integrity entities), and relationships between tables where the foreign key must match the referenced primary key in another table. While insertions in MongoDB are flexible, which means insertions are done directly without regard to constraints because MongoDB uses a dynamic schema. It means there is no limitation to the schema or document structure in MongoDB before doing an insert process. In addition, insert operations in MongoDB can be done directly without defining the collection. That's why inserting data in MongoDB is faster than inserting data in MySQL.



**Figure 4.7:Select response time on table or document with relation in MongoDB**



**Figure 4.8 :Select response time on table or document with relation in MySQL**

Figure 4.7 and 4.8 shows the comparison selection time between the two database systems. Query that used in this experiment is a complex query that used join operation for MySQL. On select operation using clause between and (select 1 or 100 rows on table/collection with/without relation), MongoDB is faster than MySQL. Experiment shows select operation on MongoDB is faster 47.6% than MySQL. Number of rows in MySQL database causes performance decrease significantly, while number of rows selected did not affect to the performance.

There are some steps (execution plan) in select operations on MySQL. Firstly, select statement will be executed. If select based on certain criteria (where clause), MySQL access a table that will be selected with full access table. Execution plan performed on the select statement is to filter based on the criteria. Select operations on tables that have relationship to other table executed by accessing table based on index then scan the unique index (primary key). Filter also executed against foreign key (primary key from other tables) that has not null value and to the specific criteria. Select operation in MongoDB is more flexible due to using of dynamic schema and documents using JSON format that consist of key and value. Select operation in MongoDB with conditions related documents (embedded document) is much faster because MongoDB retrieve data directly from documents in one collection (full collection scan) without having pay attention to the relationships with other documents. Data stored in document that has sub-document. In addition, MongoDB uses index for selection process that facilitate text searching. By using index, searching results that already obtained will be stored in a view (temporary storage) of the collection in an efficient structure.

Example query that executed for figure 4.5 and 4.6 are:

**MySQL:**

```
INSERT INTO `UserAccount`(`Role`, `fName`, `oName`, `Muslim`, `phone`, `fAdd`,  
`type_farm`, `w_live`, `soMedia`, `water_farm`, `v`, `date`, `q10`, `n_p`, `d_p`, `cp`,  
`duration`) VALUES ([value-1],[value-2],[value-3],[value-4],[value-5],[value-6],[value-  
7],[value-8],[value-9],[value-10],[value-11],[value-12],[value-13],[value-14],[value-  
15],[value-16],[value-17])
```

**MongoDB:**

```
db.UserAccount.insert(  {"Role"      : 'value1', "oName":      'value2', "Muslim":  
'value3', "phone" : 'value4', "fAdd" : 'value5', "type_farm" : 'value6', "w_live" :  
'value7', "soMedia" : 'value8', "water_farm" : 'value9', "v" : 'value10',  
"q10" : 'value11', "n_p" : 'value12',, "d_p" : 'value13',, "cp" : 'value14',,  
"duration" : 'value15',})
```

Example query that executed for figure 4.7 and 4.8 are:

**MySQL:**

```
Select *  
From UserAccount u, InformationDetails i, TransactionItem t  
Where (UA.ID = ID.ID)  
      AND (ID.ID = TI.ID)  
      AND (ID.uniqid = uniqid)  
and (ID.Role = Slaughter)
```

**MongoDB:**

```
db.UserAccounts.find(  
{ "Role.RoleID" : { 'value1' , 'value2' },  
"Transaction.TransactionID" : { 'value1' , 'value2' } });
```

In conclusion, Based on the results of select query execution, query response time in MySQL is affected by number of rows data stored in the database. More number rows in the database, query response time query swill be slower. Based on the result of experiment, data model design on MongoDB (reference or embedded document) affect the performance of database. In complex query that use join, the relational database should query more than one table, but MongoDB only need to query one document if using embedded data model. User must choose the right data model for better performance. The data model also affect the capacity of data storage.

## **CHAPTER 5**

### **CONCLUSION**

#### **5.1 Introduction**

This chapter summarizes the overall study paper by collecting the important information to give a better understanding about the research. In this chapter, achievement of objectives of the research is concluded. Then literature review, methodology that has been selected, data analysis and interview and observation also summarized briefly. Other than that, the contributions of the research has been listed in detailed as well as the future works for this research title. From this research, the results will give a better decision how to choose database in the future.

#### **5.2 Research Result**

The purpose of this research is to study the comparison between Non tabular database over Tabular database by using MongoDB, the experiment was conducted by developing a system for halal supply chain based for poultry product using NoSQL MongoDB. This aim of the research was successfully achieved by studying and analysing the query processing between both of this database.

Results of the study shows that NoSQL MongoDB does have a better efficiency than SQL, because in terms of optimize query. In futures it become more challenging if query optimization done in relational database because there are many replications and fragments spread over different server and platform.



### **5.3 Research Constraints**

Time was one of the limitation factors. The time taken for conduct an interview was limited and not many references in internet regarding mongoDB and PHP coding.

### **5.4 Future Works**

This research was done by allocating mongoDB to Halal Poultry Supply Chain system to calculate query processing for optimize query. In future if there is Supply Chain system been develop mongoDB is the suitable to used because the ability it handle big data. Furthermore, we recommend for future research on identifying how to upgrade mongoDB in terms of characteristic.

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## APPENDIX A

Below are some image that has been capture during observation at Batu Gajah ,Perak Farm:

