

## **CHAPTER II LITERATURE AND THEORY REVIEW**

### **2.1 Literature Review**

Research by Sivabalan, Yazdanifard, & Ismail(2014) explained about how to transform the normal procedure of recruitment into online system. They proposed online job recruitment on their research. It is said that by using online recruitment, it could save time and cost for perspective employer. It provides job seekers with a comprehensive database of categorized jobs, and the ability to submit resumes and apply for jobs online.

Research of Walia & Gill (2014) explained about a web based student record management using PHP. They created a website for students to get their desired information on their research. Their research proved that by having a website, students can get the information much easier and there is no need to arrange the student records manually.

Research of Das & Saikia (2016) explained about the comparison of procedural PHP with Codeigniter and Laravel framework. They did a comparison test between Laravel and Codeigniter using plain PHP. This research proved that Laravel does more efficient work than Codeigniter because of the evolving of the system, Laravel performance will get better because of the execution time measurement is better Codeigniter.

Research of Suprpty, Malani, & Nurhayati(2016) explained about the selection of prospective employees online using SAW method. On their research, they developed a system that helps in selection of employees and they used some sample data to measure the ranking of each candidate data. The result from their

research concludes that this system can help and make recommendation for the company in choosing candidates.

Research of Salah, Alves, Guerreiro, & Gustavsson (2016) talked about using UML models to describe their system. They are using use case diagram and activity diagram to provide a clear idea and to aid understand of the system workflow. They proved that UML has succeeded to bring the benefits of a standardized modeling syntax and ease of understanding offered by a good modeling language.

The table below shown which is Table 2.1 is for the research comparison against the project that is going to be developed.

Table 2.1

*Literature Review*

<i>No</i>	<i>Authors</i>	<i>Title</i>	<i>Conclusion</i>
1	Sivabalan, Yazdanifard and Ismail	How to Transform the Traditional Way of Recruitment into Online System	It save time and cost and it provides job seekers with a comprehensive database of jobs and the ability to submit resume and apply jobs online
2	Walia and Gill	A Framework for Web Based Student Record Management System using PHP	Information is much easier to get by using website
3	Das and Saikia	Comparison of Procedural PHP with Codeigniter and Laravel Framework	Laravel has an efficient performance
4	Suprpty, Malani and Nurhayati	Design of Information System for Acceptance Selection of Prospective Employees Online Using Tahani Fuzzy Logic Method and Simple Additive Weighting (SAW)	SAW information system can help and make a recommendation for the company to select candidates
5	Mohmed Salah, Alves, Guerreiro and Gustavsson	Using UML Models to Describe the VISIR System	UML bring the benefits of a standardized modeling syntax and ease of understanding offered by a good modeling language

On this research, we will develop a website form like what has been done by Walia and Gill (2014). The development will be using Laravel web framework like what Das and Saikia (2016). Suprpty, Malani, and Nurhayati (2016) did in their research about employees selection using SAW method. Website that we will going to develop is a website for online job seeking like Sivabalan, Yazdanifard and Ismail(2014) did, and use UML for the website modeling like Salah, Alves, Guerreiro and Gustavsson (2016) did.

## **2.2 Theory Review**

### **2.2.1 Simple Additive Weighting (SAW)**

Simple Additive Weighting (SAW) is a simple and most applicable method in multi-attribute decision. This method is based on the weighted average and an evaluation score is measured by multiplying the normalized value of each criteria for the objectives with the importance of the criteria (Jaberidoost et al., 2015). SAW method is used to select candidates by analyzing the criteria based on the needs of each company and applicant data to produce a final ranking to see which candidates are worth hiring (Suprpty, Malani, & Nurhayati, 2016). SAW method requires a process of normalizing the decision matrix (X) to a scale which can be computed with all the rating alternatives. See Eq. 2.1 to see the formula of benefit and Eq. 2.2 for the cost attribute normalization and Eq. 2.3 to see the formula of preference value for each alternate applicant.

$$r_{ij} = \left\{ \frac{x_{ij}}{\text{Max}_i x_{ij}} \right\} \text{ with } j \text{ is benefit attribute}$$

**Equation 2.1** Benefit Attribute Normalization Formula

$$r_{ij} = \left\{ \frac{x_{ij}}{\text{Min}_i x_{ij}} \right\} \text{ with } j \text{ is cost attribute}$$

**Equation 2.2** Cost Attribute Normalization Formula

Where:

$r_{ij}$  : Normalization data

$X_{ij}$  : Data from sample data

$i$  : Attribute from sample data

$j$  : Criteria from sample data

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

**Equation 2.3** Preference Value for Each Alternate Applicant Formula

Where:

$V_i$  : Preference value for each alternate applicant

$n$  : Number of alternate applicants

$i$  : Alternative criteria (1 to  $n$ )

$j$  : Attribute (1 to  $m$ )

$w$  : Weight Preferences

$r_{ij}$  : Matrix of sample data that has been normalized

The larger the  $V_i$  value indicates the candidate ( $A_i$ ) alternative is selected as the best alternative.

Here is a sample case that will determine the best candidate in a company:

“A company is going to do a recruitment towards 5 candidates for the position of machine operator. That position currently only has 2 left.”. We will use SAW to determine the best candidates.

The benefit attributes and cost attributes are determined in Table 2.2, candidate weighting data will be determined in Table 2.3 and criteria weighting data will be determined in Table 2.4.

Table 2.2

*Benefit and Cost Attributes*

<i>Attributes</i>	<i>Benefit / Cost</i>
Job Experience (C1)	Benefit
Education (C2)	Benefit
Age (C3)	Benefit
Marital Status (C4)	Cost
Address (C5)	Cost

Table 2.3

*Candidate Weighting Data*

<i>Candidate</i>	<i>Criteria</i>				
	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>
<i>A1</i>	0.5	1	0.7	0.7	0.8
<i>A2</i>	0.8	0.7	1	0.5	1
<i>A3</i>	1	0.3	0.4	0.7	1
<i>A4</i>	0.2	1	0.5	0.9	0.7
<i>A5</i>	1	0.7	0.4	0.7	1

Table 2.4

*Criteria Weighting Data*

<i>Criteria</i>	<i>Weighting</i>
C1	0.3
C2	0.2
C3	0.2
C4	0.15
C5	0.15
Total	1

After we have determined which is the benefit criteria, cost criteria, candidate weighting data and criteria weighting data, we will convert the candidate weighting data to a matrix which is shown in Table 2.5 and we will normalize the benefit criteria data by using the formula as shown in Eq. 2.1 and cost criteria data by using the formula as shown in Eq. 2.2 and the result after normalize is shown in Table 2.6

Table 2.5

*Candidate Matrix*

0.5	1	0.7	0.7	0.8
0.8	0.7	1	0.5	1
1	0.3	0.4	0.7	1
0.2	1	0.5	0.9	0.7
1	0.7	0.4	0.7	1

Table 2.6

*Normalize Result*

0.5	1	0.7	0.714	0.875
0.8	0.7	1	1	0.7
1	0.3	0.4	0.714	0.7
0.2	1	0.5	0.556	1
1	0.7	0.4	0.714	0.7

Lastly, we will use the normalize data to find the preference value for each candidate using the formula shown in Eq. 2.3 and we will get the result as shown in Table 2.7.

Table 2.7

*Preference Value for Each Candidate*

<i>Candidate</i>	<i>Preference Value</i>
A1	0.72835
A2	0.835
A3	0.6521
A4	0.5934
A5	0.7321

So according to the preference values result, the recommended candidates for the company are candidate A2 and A5 who has the top 2 highest preference values.

**2.2.2 Information System**

The system on its procedure definition is a system is a network of procedures that are interconnected, gathered together to perform a certain of

activity or purpose, while the system on components of elements can be interpreted as elements that interact and interconnect to achieve unity (Astuti, 2013).

Information is the result of data processing so it becomes an important form for the recipient and has a usefulness as a basis in making decisions that can be felt directly or indirectly in the future (Astuti, 2013).

Information System is a collection or related elements to manage the data so that it becomes meaningful to the recipient and useful for current or future decision making (Nugroho, 2015).

There are many types of information systems that are used in business organizations. Such as transaction processing systems which is designed to records daily transactions, office automation systems which is designed to monitor and control industrial of physical processes, management information system (MIS) which is designed to convert data from internal sources into information, decision support system which is designed to help manager in decision making, executive information which is designed to provides senior managers with a system to assist in taking strategic and tactical decisions, and expert system which is designed to emulate human reasoning (Al-mamary, Shamsuddin, & Aziati, 2014).

On the research of A. Nugroho (2015) he developed a management information system for the processing of assets where the system consists of an admin as a manager in the system and user as a user in the system so that the company detection of damage assets in the company can be done systematically into a computer-based application system which previously is done manually.

### 2.2.3 Website

Website is an internet source where it creates possibilities to distribute information through hyperlink. Hyperlink is a distribution of information through web page that moves from one web to another web (Khair, Astuti, & Khairina, 2016). On the research of Khair et al. (2016), a website is developed to store data and information so that it can be used by company and also it ease company in data collection. On the research of Habibie et al. (2014) an online web based software that does registration and reception of work candidates is developed, so that it will ease job seeker to get a job.

There are various ways to develop a website, one of them is using PHP. PHP is used as a server-side script in building web that is inserted into HTML and also the uses of PHP allows web to be develop dynamically so that the maintenance of the website become easier and more efficient (Habibie et al., 2014).

A database is also needed in building a website. In the research of Suhartanto (2012), he created a website using PHP and MySQL as its database.

Database is a collection of structure information Gunawan (2016). A database consists of a collection of files in the computer system. Usually database is used by an organization to store information that is related to the business process of the organization such as payroll, customer management and inventory. Like what is written in the research of Astuti (2013) about the information system of pharmacy sales, database is used to store the pharmacy data, such as medicine name, medicine type, sales invoice and sales details.

For a database to have a structured data, it needs database normalization.

Database normalization is needed to manage a structured database. Normalization

is used to reduce the redundancy of excessive data, data dependency, and all data that are related is stored in one table. Storing a related data in one table is important to prevent data anomaly like insert, update and delete. By applying normalization in database, data will be stored more efficiently for insert, update and delete (Mendjoge, Joshi, & Narvekar, 2016).

#### **2.2.4 Structured Query Language (SQL)**

Structured Query Language (SQL) is a standard computer language for relational database and data manipulation such as to add, update, edit and delete data (Walia & Gill, 2014). SQL statements that are commonly used can be categorized as Data Definition Language (DDL) and Data Manipulation Language (DML) (Prabhjot & Sharma, 2017).

DDL is a language that allows the user to define data and their relationship to other types of data. It is mainly used to create files, databases, data dictionary and tables within databases. And it is also used to specify the structure of each table, attribute, constraints, security and authorization. DML is a language that provides a set of operations to support the basic data manipulation operations on the data held in databases. It allows user to insert, update, delete and get data from the database (Prabhjot & Sharma, 2017).

#### **2.2.5 Laravel**

Laravel is one of the web development framework with expressive syntax (Alfat, Triwiyatno, & Isnanto, 2015). There are 7 components in Laravel that interacts with one another. Model View Controller (MVC) interacts with Query, Routing, and Apache component is used to build database, while View manage

the user interface with the help from `<style>.css.` `<script>.js` and `<view>.blade.php.`

On the research of Alfat, Triwiyatno, and Isnanto (2015), they created a website using Laravel framework and the website has been tested in resolution, various web browser, and platform and they conclude that the web has achieved 88% accuracy. And by using Laravel framework, it simplifies steps to developing application.

The research result from Rahayuda (2017) regarding the development of e-government using Laravel, can be concluded that website that is developed by Laravel works well on different browser like Mozilla, Chrome, Safari and Opera, and work well also on device with different layer size like desktop, laptop, tab and smartphone.

### **2.2.6 Unified Modeling Language (UML)**

UML is a standard language that is used by many industry to define requirement, analysis and design making, and describes the architecture in object programming (Siregar & Sundari, 2016). This language force the modeler to think and model clearly about the behaviors being modeled, and to identify and express the essential, leaving out the incidental (Murray & Clark, 2015). There are also types of UML diagrams:

#### **2.2.1 Use Case Diagram**

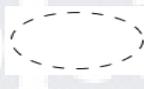
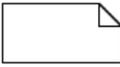
Subekti, Indrawan, & Putra(2014)describe Use Case Diagram as a diagram to draw actor, use case and other relation as a sequence of actions that provide measurable value to the actor. An Use Case

Diagram is described as a horizontal ellipse in an UML use case diagram (See Table 2.8).

Table 2.8

*Use Case Diagram Symbol*

<i>No</i>	<i>Image</i>	<i>Name</i>	<i>Description</i>
1		Actor	Specifies sets of role that the user uses when interacting with use case.
2		Dependency	Relationships where changes occur in an element independent that will effects the elements that depend on it.
3		Generalization	The relationship where the child object (descendant) shares the behavior and data structure of the parent object (ancestor).
4		Include	Specifies that source use cases are explicit.
5		Extend	Specifies that the use case target extends the behavior of the source use case at a given point.
6		Association	What links between objects one with other objects.
7		System	Specifies packages that feature system on a limited basis.
8		Use Case	A description of the sequence of actions that the system performs that produces a measurable result of an actor.

9		Collaboration	The interaction of rules and other elements that work together to provide greater behavior of numbers and elements (synergies).
10		Note	The physical element that exist when the application is run and reflect a computing resource.

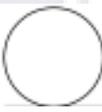
### 2.2.2 Sequence Diagram

Subekti et al.(2014) describe Sequence Diagram as a diagram that explains object interaction that is organized according to the sequence of time. Sequence Diagram is a step-by-step description, including a logically changing chronology that should be done to produce something according to the use case diagram. (See Table 2.9).

Table 2.9

*Sequence Diagram Symbol*

No	Image	Name	Description
1		LifeLine	Entity objects, interfaces that interact.
2		Actor	Used to describe user.
3		Message	Specifications of communication between objects containing information about the activity that occurred.
4		Boundary	Used to describe a form.

5		Control Class	Used to connect boundaries with tables.
6		Entity Class	Used to describes the relationship of activities performed.

### 2.2.7 Entity Relation Diagram (ERD)

Entity Relation Diagram (ERD) is a graphical way to explain about the database in a system. By using ERD diagram the person who design the database can convert this information to build the tables of the database. Information that are received about the database helps to reach the relational database schema (Al-Masree, 2015).

ERD helps us understand all the important data that must be stored in a database. It can also be the blueprint of data which will help us understand the complexities of functional system and it also give interaction between system analyst, application programmers, designers and end users (Dedhia, Jain, & Deulkar, 2015).

ER model consists of several components which are entity, relations, attributes and cardinality. Entities that contain more than one property is called an entity set. Examples of entities are “Company”, “Job”. A rectangular box is used to represent entity in the ER diagram. Characteristic or property of an entity is describes by an attribute. Such as: name, email, description can be attributes of the entity company. Ellipse is used to represent attributes in the ER diagram.

Diamond is used to represent relation between entities in ER diagram. For example a company has many jobs. Here “has” implies a relation between the entity of company and job. Entities can have relation of one-to-one or one-to-many relation, which is also known as cardinality. For example, a single company can has many jobs, so the cardinality here is one-to-many (Dedhia et al., 2015)