CHAPTER 2

THEORETICAL FOUNDATION

2.1 System Analysis and Design

2.1.1 System Analysis

System analysis is an analysis about the system that already exists, with the purpose of designing a better system [2].

System analysis is the action of checking problems that will be solved by using information system. The System analysis covers several steps that must be done according to Laudon [4], the steps are:

(1) Determine the problems.

(2) Identify the cause of the problems.

(3) Find solution for the problems.

(4) Identify the data that is needed to find the solution

System analysis covers the evaluation of several solutions regarding of system problem. System analysis is emphasizing on the main goal of each system. The main foundation is the loss and profit analysis between each of the system's goals [5].

In conclusion, based from the theories above, it can be said that system analysis is an action of identifying, researching the existing systems, and find out the blunder of the systems and then, improve it or create a new systems that are better.

2.1.2 System Design

System Design is methods to make a system capable of fulfilling the needs of the information that has been needed by the system analysis [4].

System Design is the determination of process and data that is needed for the new system. If the system is computer-based system, then the design can include the specification of the tools that will be used [2].

In conclusion, based from the theories above, it can be said that system design is an action of determining on how the system that will be created, match with the requirement collected during the system analysis.

2.2 System Information

2.2.1 System

System is a group of components that are interrelated and collaborate to achieve the same goal by getting input and resulted in an output in an organized transformation process [3].

System is a group of resources that is linked to each other to achieve particular goal [5].

System is a group of elements that are integrated with the same purpose of achieving particular goal [2].

In conclusion, based from the theories above, it can be said that a system is a group of elements or components that are interrelated and have the same purpose.

2.2.2 Information

Information is a collection of raw data that has been processed into a valuable and useful data for user [3].

Information is collection of useful data and being processed so that it can be used as a base to make decisions [5].

Information is data that has been processed, and has a value [2].

In conclusion based from the theories above, it can be said that information is a collection of data that has been processed and has value for the user.

2.2.3 Information System

Information system can be organized with the combination of human, hardware, software, communication networking, and source data that collects, alters, and broadcasts information in an organization [3].

Information system is an interrelated group to collects, processes, saves, and distributes information to help the manager in decision making, controlling, coordinating, problem analysis, and visualize complex problem in an organization [4].

Information system recommends the computer technology user in an organization to provide information to the end-user. Information system is a group of hardware and software that is designed to convert data into valuable information [5].

In conclusion, based from the theories above, it can be said that information system is a unity of the connection between human and computer's components, such as hardware, software, and also the source that helps the company in making decision, controlling, distributing, and broadcasting the information.

2.3 Internet

2.3.1 Definition of Internet

Internet is an international connection that connects 109 million computers using internet protocol to communicate to each other. Literally, internet which is the abbreviation of inter-network is a combination of connected computer. Internet is a common computer system that is connected globally and using TCP/IP as the protocol for packet switching. The method to combine it is called Internet working [1]. The internet represents one of the most successful examples of the benefits of sustained investment and

commitment to research and development of information infrastructure [13].

2.3.2 World Wide Web

World Wide Web, which is usually called web, is an information space where the useful source is identified by the global identification which is called the Uniform Resource Identifier. Web is usually considered same as Internet, while the truth is; web is only a part of internet [1].

The World Wide Web is a huge set of interlinked documents, images and other resources, connected by hyperlinks and URLs. There hyperlinks and URLs allow the web servers and other machines that store originals, and cached copies of, these resources to deliver them as required using HTTP (Hypertext Transfer Protocol). HTTP is only one of the communication protocols used on the internet [14].

2.3.3 PHP

PHP is an "HTML-embedded scripting language" primarily used for dynamic web applications. The first part of this definition means that PHP

code can be interspersed with HTML, thus making it simple to generate dynamic pieces of web pages on the fly [15].

According to Luke Welling and Laura Thomson [9], PHP is server-side scripting language that is designed specifically for web. In HTML page, PHP code can be inputted in and will be executed every time the web is visited. PHP code is translated in web-server and converted into HTML or other output that will be seen by the web-browser.

PHP is a scripting language that is popular right now. PHP is commonly used to program a dynamic website, even though there is still a slight possibility that it is used for another usage. Example of PHP application is phpBB and MediaWiki. PHP can be seen as another option aside from ASP.net/C#/VB.NET Microsoft, ColdFusion Macromedia, JSP/Java Sun Microsystems, dan CGI/Perl. Another example of a more sophisticated application is CMS that is built by using PHP is Mambo, Joomla!, Postnuke, Xaraya, and etc.

2.4 Unified Modeling Language

Unified Modeling Language (UML) is a modeling visualization language used for explaining, create, and documenting part of a software system. It includes the decision and explanation about the system that will be created. UML mainly used to make a better understanding, designing, and controlling the information regarding to

the system. UML is meant to be used in all development method, lifecycle stage, application domains and media.

UML catch the information about the static structure and dynamic behavior of a system. A system is a collection of discreet object that interacts with each other to create a task that benefits the user. Static structure is an object that is important for the system and the implementation, also the relation between the objects. Dynamic behavior is defined as a history of the object and the communication between the object to finish a particular task.

In an UML, there is also an organization construction to build a model into a packet that allow the software team to divide a bigger system into smaller part, thus make the task easier to be done.

UML is not a programming language. Tools can provide code generators from UML to several programming language, and also create reverse-engineered models from available programs. UML is meant to be a universal general-purpose modeling language for a discreet system like a system that is created from software, firmware or digital logic.

UML has emerged as the software industry's dominant modeling language. It is the de facto modeling language standard for specifying, visualizing, constructing, and documenting the components of software systems [16].

UML is consisted of different elements that merge into a diagram. Because UML is

a language, UML has rule in merging the elements.

2.4.1 Class Diagram

Class diagram shows a static structure in an object oriented mode: class

object, their internal structure and the relation in which they are

participating. In UML, class is represented with a shape of box that

consists of 3 parts divided horizontally. Class name is shown at the upper

part, attribute is shown at the middle, and operation is shown at the lower

part of the box [6]. Class diagram is an excellent aid to model the

attributes, operations, and associations of the classes in your applications

[17].

2.4.2 Use Case

Use case diagram is quite simple in nature and depict two types of

elements: one representing the business roles and the other representing

the business processes [18].

Use Case diagram is diagrams that show the behavior of a system from the

user's point of view. In order to create a Use Case Diagram, a very

valuable tool is needed. It is the technique to collect the system

requirement from user's point of view. This is very important if the goal is to create a system that can be used by all users [7].
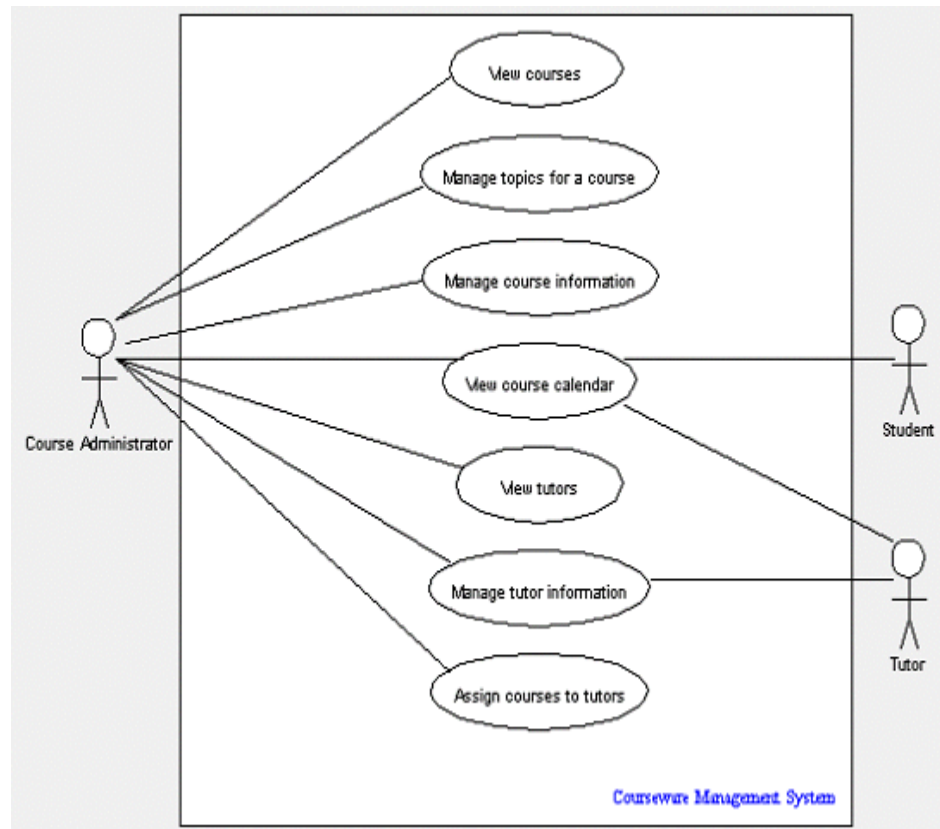

Figure 2.1: Example of the Use Case Diagram

Part of use case:

(a) Actor is the one who interact with the system to exchange information.

(b) Use Case is the processes that happened in an event. Use Case also draws what the actor is doing.

(c) Relation is explaining the relation between the actor and the use case.

2.4.3 Sequence Diagram

A sequence diagram is two-dimensional in nature. On the horizontal axis, it shows the life of the object that it represents, while on the vertical axis, it shows the sequence of the creation or invocation of these objects [19].

Sequence diagram draws an interaction between objects in a particular time period. Because of the pattern from the interaction vary from one use case to the other, every sequence diagram shows only the interaction to particular use case. This shows the object with their lifeline, and the interaction between those objects – that is built in a time sequence – with a message that they exchange one with the other [6].

2.4.4 Activity Diagram

Activity diagram shows steps and decisions that appear from the behavior of an object. Every step resulted from the activity diagram shown as a box, and every decision point is shown as diamond. Unified modeling language activity diagrams are used as design specifications. By setting up several tests adequacy criteria with respect to activity diagrams, an automatic approach is presented to generate test cases for java programs [20].

2.5 Database

2.5.1 Database Management System (DBMS)

According to Thomas Conolly [11], Database Management System is a system or software that is designed to run a database and to run operation to data that is requested by the user. DBMS is the one that organize the organization, storage, management, and usage of data in the databases.

DBMS includes:

- Modeling language to explain the scheme from every database that is in the DBMS, and match with the DBMS data model.
- Data structure (Fields, record, file, and object) is optimized to be used within a big scale storage data.
- Database query language
- Transaction mechanism

2.5.2 Entity Relationship Diagram (ERD)

According to Jeffery L. Whitten, Lonnie D. Bentley, Kevin C. Dittman [12] Entity Relationship Diagram is data model that use several notation to

draw a data in the entity and relationship context that is described by that data.

ERD is a conceptual model that is used to describe the relationship between the savers. ERD is used to model the data structure and the relationship between data. With ERD, the model can be tested by ignoring the process that is done.

ERD data model has several basic concepts, they are:

1. Entity

   Entity is a group of objects or a concept of what we need to capture and save the data. If entity is something that we need to save the data, so we have to identify the specific part of data that we want to save from every example of certain entity. This part of data is called attribute. Attribute is a characteristic of an entity.

2. Attribute

   Attribute is an entity characteristic.

   a) Domain

      Value from each attribute is defined into three properties, they are:

      - Data Type   : Property from the attribute that identify the data type that can be saved into attribute.

      - Domain   : Property from attribute that defined what value that can be taken by an attribute.

- ▪ Default Value   : a value that will be saved if the value is not specified by the user.

b) Identification

With so many instanced that an entity has, unique key is needed to identify each instance based on the data from the attribute. Key is an attribute or group of attributes that has a unique value from every part of the entity, and it is usually called identifier. Candidate key is one of the key that has the possibility to become a primary key. Primary key is a candidate key that is unique and identifies a part of entity. Alternate key is a candidate key that are not made as a primary key.

3. Relationship

Conceptually, entity and attribute is impartially. The things that are classified by relationship are interacting with each other and influence to support business goal. Relationship is business relationships that exist between one or more entities. That relationship can state the event that is connecting the entity or only the logics similarity between entities. Cardinality is a minimum and maximum amount of the existence of an entity that can be related with another entity. Degree is amount of entities that participate in a relationship. Foreign key is a primary key that is used by another entity to identify instance from a relationship.

2.5.3 MYSQL

According to Luke Welling and Laura Thomson [9], MYSQL is a fast and reliable relational database management system.

MYSQL is a SQL software database management system or DBMS that is multithread, multiuser, with 6 millions installations in all over the world. MYSQL is owned and sponsored by a commercial company, Swedia MYSQL AB, which has the copyright to almost all of the source code. The founders of MYSQL AB are: David Axmark, Allan Larsson, and Michael "Monty" Widenius. Available as free software under the license of GNU General Public License (GPL), but they are also selling it under the commercial license in case the user is not compatible with the use of GPL.

2.6 User and Computer Interaction

Nowadays, most of created programs have an interface that is become a part of the application that enables the user to interact with the program. Human and Computer interaction arise around the middle age of 1980. The main concept of the human and computer interaction is how to make a system that is easy to be learned and used. The definition of human and computer interaction according to Shneiderman [8] is an ability that connects with the design, evaluation and the implementation of

interactive computer system to be used by humans also the study of phenomenon that has a connection with it.

2.6.1 Interactive systems

With the development of the computer technology, an interactive system is becoming important. An interactive and user-friendly System will make the user feels ease, and comfort to operate the system. In the opposite, if the system is less interactive, the system will be hard to be operated and annoy the user.

Shneiderman [8] states five criteria that have to be fulfilled in order to create a user-friendly system, they are:

1. **Learning time**

How much time will be needed for a beginner user to learn how to operate the system?

2. Processing speed

How long the system takes time to finish a task.

3. Level of Mistake

How many mistake and what kind of mistake that the user makes in operating the system?

4. Memorizing

How good is the ability of the users to keep their memory in a certain period of time?

5. Objective Satisfaction

How satisfied the user from using the system.

2.6.2 Eight Golden Rules of designing the interface

These 8 golden rules are basic principles to design the interface. This rule is created based on the experience in creating the design. These are the 8 golden rules [8]:

1. Try to be consistent

The meaning of the consistency is consistent in particular actions and situations such as the consistency in menu, color, layout, font, and etc.

2. Enabling Shortcut

For users that have become expert in running the system, they need some shorter interactions. These short interactions can be obtained with a shortcut.

3. Informative feedback

For every action that has been done by the user to the system, the system has to have a feedback. The system's response (feedback) must be polite and clear.

4. Create a dialog to show the final result

Sequence of actions is set in groups with first part, middle part, and the last part. Feedback in the last part should be able to give satisfaction to the users.

5. Prepare error prevention and simple error handling

A system should be created in order for the user to not make a mistake. If the users make a mistake, the system should be able to detect it and giving a simple instruction and build a recovery.

6. Allow redo action

Redo action will make the user less worry because the users know that they can redo the action when they made a mistake.

7. Locus of control

Expert users want a sensation that they have dominated the system, and the system should respond to whatever they feel like to do.

8. Reduce the burden of short-term memory

Limited ability of humans for short-term memory needs attention. The solution to that limitation is by reducing windows movement frequency and enough training.

2.7 System Development Life Cycle (SDLC)

According to Turban, Rainer, and Potter [10], SDLC is a structured framework that is used for big information technology project, which is consisted of several sequential processes that is needed to build an information system.

Waterfall approach is used to draw SDLC in this thesis. According to Turban, Rainer, and Potter [10], this waterfall approach is a SDLC approach which is done stage by stage, means that one task must be finished before doing the next task.

Stages of the SDLC are as follow:

1. **System investigation**

   Feasibility study is the most important part in the system investigation. With the correct feasibility study, a company can avoid a mistake that can cause the

increase of outcome of the company. Feasibility study determines the possibilities of benefit from system development that is proposed and estimates the project in term of technique, and cost.

2. **System Analysis**

   System analysis is an analysis towards the business problem that will be solved with information system by the company. This stage defines business problem, identify the causal, specify the solution, and also identify the information that are needed. Main purpose of this stage is to combine the information regarding to the existing system, and decide the necessity of the new system. Several things resulted from analysis stage are:

   - The Strengths and Weaknesses of the existing system
   - Functions that the new system needs to overcome the problems
   - Information necessity regarding of the user for the new system

3. **System Design**

   This stage is explaining on how a system will work. This stage will result in:

   - Output, Input, and User interface of the system
   - Hardware, Software, Database, Telecommunication, Personnel, Procedure.
   - Explanation on how the component integrated

4. **Programming**

   This stage includes the translation of design specifications into computer language.

5. **Testing**

This stage is used to check whether the computer programming has met the

requirement. Testing is designed to detect mistake in the coding.

6. **Implementation**

Implementation is a conversion process from the using of old system to the

using of new system. There are four strategies that can be used by a company to

deal with changes, they are:

a) Parallel conversion   : Company will apply both of the new and old

system simultaneously in a certain period of time.

b) Direct conversion   : New system will applied directly and the old one

will be terminated.

c) Pilot conversion   : The new system will be used in one part of the

organization. If the new system success, it will be used in another part of

the organization.

d) Phased conversion   : The system will be used stage by stage. The

modules will be tried and evaluated one by one. If one module succeeds

then the other module will be used until the whole system succeeds.

7. **Operation and Maintenance**

After the conversion stage succeeds then a new system will be operated in a

certain period of time. There are several stage in maintenance, they are:

- Debugging the program：This process is going on as long as the system runs.

- Keep improving the system in order to accommodate changes in business situation

- Adding new function and feature into the system

2.8 SMS Gateway

In the last few years, SMS (Short Message Service) has made a big impact on the way we communicate. Instead of communicating over the phone using voice, more and more people are turning to using SMS for messaging. One of the popular uses of SMS is for voting. For example, you can vote for your favorite contestant on the television program "Indonesian Idol" by simply sending SMS message to a particular phone number. This is then automatically tabulated into a final vote count for each participant. Traditionally, to implement such a system, you needed to buy an expensive SMS gateway, which is overkill for a small project with limited budget [21].

2.9.1 Mobile Phone

A mobile phone or mobile (also called cellphone and handphone, as well as cell phone, wireless phone, cellular phone, cell, cellular telephone, mobile

telephone or cell telephone) is a long-range, electornic device used for

mobile voice or data communication over a network of specialized base

stations known as cell sites. In addition to the standard voice function of a

mobile phone, telephone, current mobile phones may support many

additional services, and accessories, such as SMS for text messaging,

email, packet switching for access to the internet, gaming, bluetooth,

infrared, camera with video recorder and MMS for sending and receiving

photos and video, MP3 player, radio and GPS.