Design of Management Information Systems Research, Publications and Community Service

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***Abstract* — Diponegoro University is one of the colleges that have a number of research activities, publications and community service were great. This activity is controlled by research institutions and community service (LPPM). The amount of activity that cause a lot of problems in the management, storage and delivery of information. Besides the need for information about the activities of research, publications and community service are indispensable in conditions of rapid and high degree of accuracy of the information.**

To overcome these problems will require a management information system used to manage, store and disseminate information. The method used in the creation and development of this application using the waterfall model. The use of the waterfall model of software development is intended to get maximum results. While testing is done using black-box testing.

Results of the black-box testing found that all the components used in the process of interaction can operate in accordance with a design that has been planned. So that the management information system of research, publications and community service can be used in managing the activity college.

Keywords—Information system; Research; Publication; Community Service

I. INTRODUCTION

Computer technology is one that is used by humans to help solve a problem. The development of very fast computer technology demands that humans can make the best possible. [1]. Research activities, publications and community service is an activity that requires a lot of natural resources, namely the use of paper. The paper used for documentation purposes such as proposals, progress reports and a final report. In addition the use of paper that is quite a lot of this will also cause problems in the storage and management.

Diponegoro University is one of the colleges that have a number of research activities, publications and community service were great. This activity is controlled by research institutions and community service (LPPM). The amount activity that would cause a lot of problems in the management, storage and delivery of information. Besides the need for information about the activities of research, publications and community service are indispensable in conditions of rapid and high degree of accuracy of the information. For example, delays in the presentation of information such as the recapitulation per study program may hamper the preparation of the accreditation report. Another issue that often arises in addition to the delay was the fault of information relating to the identity of the researcher, the amount of research that has been done, the grouping. This occurs because the data is still manual recording and stored in many files that result in the integrity and validity of the data is not guaranteed by either [2]

Information Systems Management (MIS) is the application of information technology to support the major functions and activities of either a private sector business or public sector institution. In the past, organizations recognized the importance of managing resources such as labor, capital, and raw materials. Today, it is widely accepted that managing the information resource is very often equally important. MSI supports the process of collection, manipulation, storage, distribution and utilization of an organization's information resources [3].

II. LITERATURE REVIEW

A. Information System

Information system (IS) as one that collects, processes, store, analyzes and disseminates data and information for a specific purpose. The composition of information systems is usually the same, each contain hardware, software, data, procedures and people. Information system are usually connected by means of electronic networks. The connecting network can be wireline or wireless. Information can connect an entire organization or even multiple organizations [4].

Computer base information system is an information system that uses computer technology to perform some or all of its intended task. Such a system can include as little as a personal computer and software. Information system are classified in this section by organizational levels and by the type of support provided. The organizational level that are support by information systems are shown in Fig 1.

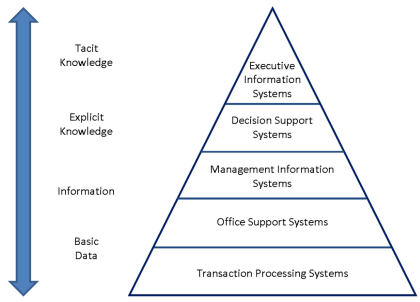

Fig 1. Level of Information Systems [5]

Information system infrastructure consists of the physical facilities, service and management that support all shared computing resource in an organization. There are five major component of infrastructure such as computer hardware, software, network communication, database, and information management personnel or human resource. Fig 2 shown about information system infrastructure.

Fig 2. Information System Infrastructure [6]

B. *Database*

A database is an organized logical grouping of related files. In a database, data are integrated an related so that one set of software programs provides access to all the data. The program that provides access to a database is known as a database management system (DBMS). Database Management Systems (DBMSs) are a ubiquitous and critical component of modern computing, and the result of decades of research and development in both academia and industry. Historically, DBMSs were among the earliest multi-user server systems to be developed, and thus pioneered many systems design techniques for scalability and reliability now in use in many other contexts [6]. The DBMS permits an organization to centralize data, manage them efficiently and provide access to the stored data by application programs. The DBMS acts as an interface between application programs and physical data files and provide users with tools to add, delete, maintain, display, print, search, select, sort, and update data. A DBMS Minimizes these problem by providing two views of the databases data, a physical view and logical view. The physical view deals with the actual physical arrangement and location of data in the direct access storage devices. The logical view of a database programs represents data in a format that is meaningful to a user and to the software programs that process those data.

A DBMS contains four major component, the data model, the data definition language, the data manipulation language, and the data dictionary. The data model defines the way data are conceptually structured. Data Definition Language (DDL) is the language used by programmers to specify the types of information and structure of the database. It is essentially the link between the logical and physical views of the database. The data manipulation language (DML) is used with a third or fourth generation language to manipulate the data in the database. This language contains commands that permit end user. Example command to manipulated data is Select, Insert, Update and Delete. The data dictionary stores definitions of data elements and data characteristic such as usage, physical representation, ownership, authorization, and security [7]. Fig 3 shown about DBMS structure with major component.

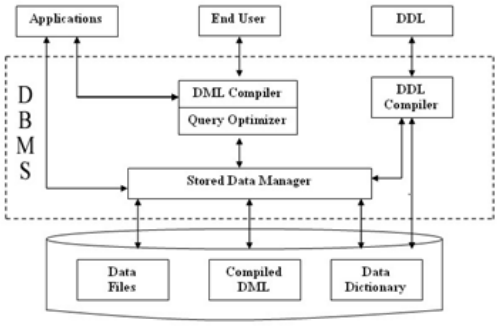

Fig 3. DBMS Structure [8]

Before building a database, programmers has to develo p the blueprints for data used in organization. A three stage model approach to building a database is also extremely effective, as shown in fig 4.

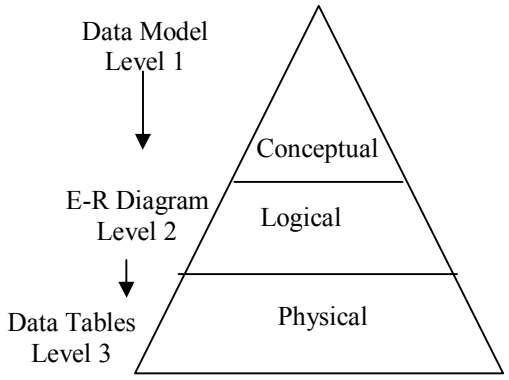

Fig 4 Data Model

1. Conceptual Level – this documents the basic entities of a proposed system and relationships between them.
2. Logical Level – this specifies entities and their relationships without implementation details.

3. Physical Level – this defines the database structure for a technology specific format (a DBMS) [9].

C. *Code Igniter*

Code Igniter is a web application framework that is open source used to build dynamic PHP applications . The main purpose is to assist the development of Code Igniter developers to work on apps faster than writing all the code from scratch. The aim of this framework development is to develop the acceleration of application development by providing a group of libraries frequently needed in doing certain function. Using the approach of Model-View-Controller (MVC), it is possible to separate between logical function and the display of the application. In its application, this approach makes possible for a web page to contain a script of web page as minimal as possible as it is separated from the PHP script [10]. The MVC architecture separates applications into three parts Model , View and Controller as shown in Fig 5 .

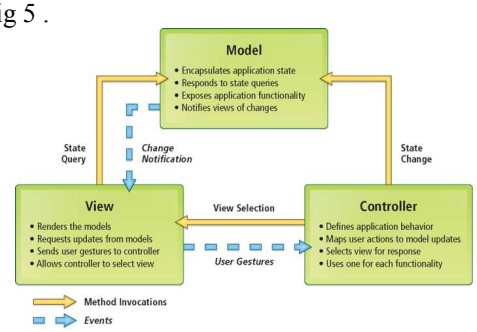

Fig 5. MVC Model

1. The Model represents your data structures. Typically your model classes will contain functions that help you retrieve, insert, and update information in your database.
2. The View is the information that is being presented to a user. A View will normally be a web page, but in Code Igniter, a view can also be a page fragment like a header or footer. It can also be an RSS page, or any other type of "page".
3. The Controller serves as an intermediary between the Model, the View, and any other resources needed to process the HTTP request and generate a web page.

To access a php file in the code Igniter framework shown in Fig 6.

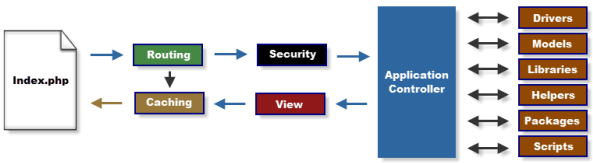

Fig 6. Data Flows Throughout the System [11]

Explanation of Figure 6 is as follows:

1. The index.php serves as the front controller, initializing the base resources needed to run Code Igniter.
2. The Router examines the HTTP request to determine what should be done with it.
3. If a cache file exists, it is sent directly to the browser, bypassing the normal system execution.
4. Security. Before the application controller is loaded, the HTTP request and any user submitted data is filtered for security.
5. The Controller loads the model, core libraries, helpers, and any other resources needed to process the specific request.
6. The finalized View is rendered then sent to the web browser to be seen. If caching is enabled, the view is cached first so that on subsequent requests it can be served [10].

III. DESIGN

Research conducted using the method of software development with the waterfall model. This development through five stages, namely, requirements analysis, design, Implementation, testing, and maintenance. The flow of the waterfall model is shown in Fig 7.

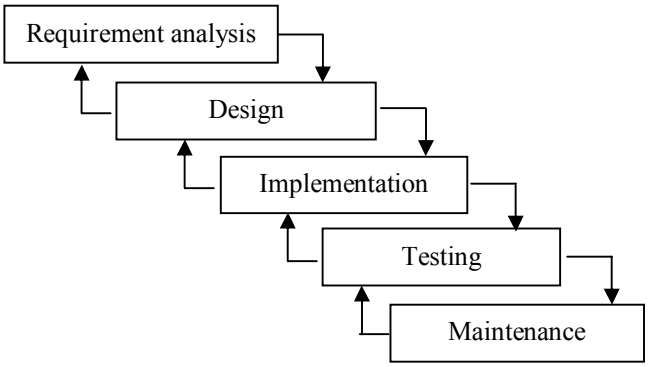

Fig 7. Model Waterfall

The necessary requirements in information systems research, publications and public service are as follows:

1. Actor lecturers can propose activities through an online application
2. Actor University leaders can obtain summary information activities
3. Actor operator can monitor and perform system settings.
4. Each actor is given the identification a username, password and access level

To create a workflow system in this study using a use case diagram. Figure 8 shows the use case diagram of the information system of research, publications and community service UNDIP.

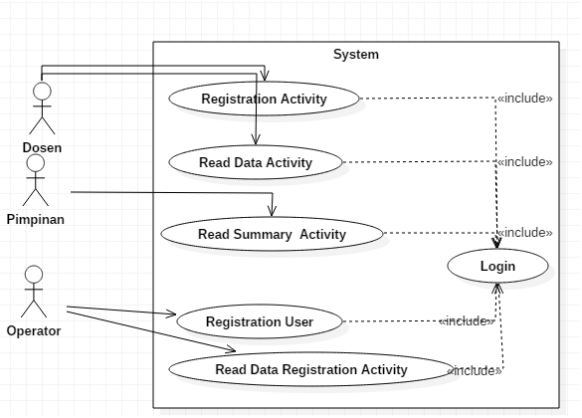

Fig 8. Use case System

To store the data generated by each user it is necessary to design the database. Fig 9 shows the logical database design to the model view.

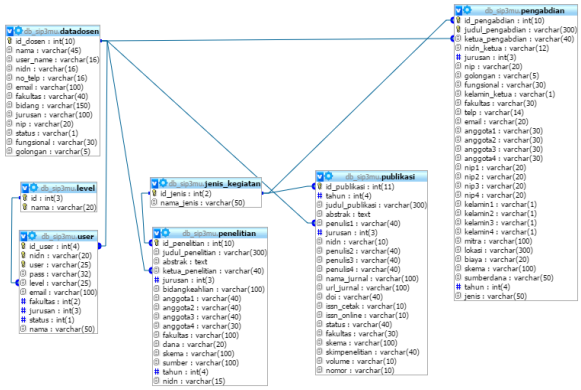

Fig 9. Design Logical model Database

Security design for the login process using MD5 modified and supplemented with salt. salt comprising random bits used as a key input for the derivative function. The design of the login process is shown in Fig 10.

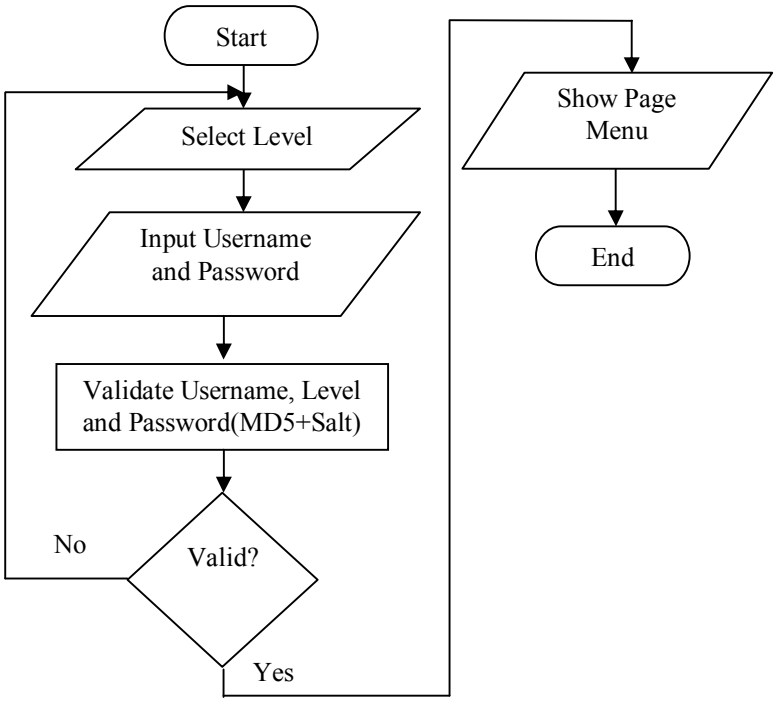

Fig 10. The design of the login process

IV. RESULT

Interface design resulting from implemtasi process is shown in Figure 11.

Figure 11. Display start page

To access the system, the actor must do proes log in accordance with the level that will be used. To secure the login information, the application data to be entered are encrypted beforehand. Encryption is done by modifying the MD5 encryption algorithm. Fig 12 shows the view page one of the actors who have done the login process.

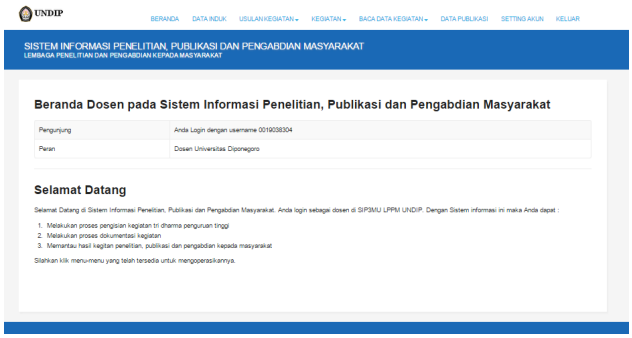

Fig 12. Page views actor

Making the database using MySQL DBMS. To create a database name that will be used in the application, the command used is CREATE DATABASE `db_sip3mu`;. To produce a reliable database on management information systems research, publications and community service then carried out a process of normalization of data. Data normalization phase that is done is as much as three stages, namely stage has not normalized, the first normalization phase (1NF), the second stage of normalization (2NF). Results-making table in the database that have been normalized to 2NF stage is shown in Fig 11. The resulting table in the management information system is the user table, study table, table publications and community service tables. These tables will store any data generated by the actors involved in the application.

Field	Type	Null
id_user	int(4)	No
nidn	varchar(20)	No
user	varchar(25)	No
pass	varchar(32)	No
level	varchar(25)	No
email	varchar(100)	No
fakultas	int(2)	Yes
jurusan	int(3)	Yes
status	int(1)	No
nama	varchar(50)	No

Field	Type	Null
id_penelitian	int(10)	No
judul_penelitian	varchar(300)	Yes
abstrak	text	No
ketua_penelitian	varchar(40)	Yes
jurusan	int(3)	No
bidangkeahlian	varchar(100)	No
anggota1	varchar(40)	Yes
anggota2	varchar(40)	Yes
anggota3	varchar(40)	Yes
anggota4	varchar(30)	Yes
fakultas	varchar(100)	Yes
dana	varchar(20)	Yes
skema	varchar(100)	Yes
sumber	varchar(100)	Yes
tahun	int(4)	Yes
nidn	varchar(15)	No

Field	Type	Null
id_publikasi	int(11)	No
tahun	int(4)	No
judul_publikasi	varchar(300)	No
abstrak	text	No
penulis1	varchar(40)	Yes
jurusan	int(3)	No
nidn	varchar(10)	No
penulis2	varchar(40)	Yes
penulis3	varchar(40)	Yes
penulis4	varchar(40)	Yes
nama_jurnal	varchar(100)	No
url_jurnal	varchar(100)	No
doi	varchar(40)	No
issn_cetak	varchar(10)	No
issn_online	varchar(10)	No
status	varchar(40)	No
fakultas	varchar(30)	No
skema	varchar(100)	No
skimpenelitian	varchar(40)	No
volume	varchar(10)	No
nomor	varchar(10)	No

Field	Type	Null
id_pengabdian	int(10)	No
judul_pengabdian	varchar(300)	No
ketua_pengabdian	varchar(40)	No
nidn_ketua	varchar(12)	Yes
jurusan	int(3)	No
nip	varchar(20)	Yes
golongan	varchar(5)	Yes
fungsional	varchar(30)	Yes
kelamin_ketua	varchar(1)	Yes
fakultas	varchar(30)	Yes
telp	varchar(14)	Yes
email	varchar(20)	Yes
anggota1	varchar(30)	Yes
anggota2	varchar(30)	Yes
anggota3	varchar(30)	Yes
anggota4	varchar(30)	Yes
nip1	varchar(20)	Yes
nip2	varchar(20)	Yes
nip3	varchar(20)	Yes
nip4	varchar(20)	Yes
kelamin1	varchar(1)	Yes
kelamin2	varchar(1)	Yes
kelamin3	varchar(1)	Yes
kelamin4	varchar(1)	Yes
mitra	varchar(100)	Yes
lokasi	varchar(300)	Yes
biaya	varchar(20)	Yes
skema	varchar(100)	No
sumberdana	varchar(50)	No
tahun	int(4)	No
jenis	varchar(50)	No

Fig 11. Logical View Model Database

Results of functional testing of the interface design on management information system applications research, publications and community service undip for login function shown in Table 1.

Table 1. Black-box test result login function

Component testing	Expected results	The test results
Login function testing	May login with user access	Successful

Next is the black-box testing for the actor lecture where component testing performed on three main components. Black-box test results to the actor lecture can be seen in Table 2.

Table 2. Black-box test results to the actor lecture

Component testing	Expected results	The test results
Registration testing activities	Can register activities	Successful
Testing identity filling activities	Data can be stored in the database	Successful
Testing upload pdf file	Pdf file types can be saved and the other type can not be	Successful

	saved	
Testing reading data	Data can be displayed activity	Successful

Next is the black-box testing for the actor Operator where component testing performed on three main components. Black-box test results to the actor Operator can be seen in Table 3.

Table 3. Black-box test results to the actor operator

Component testing	Expected results	The test results
Testing user registration lecturer	User lecture can register	Successful
Testing data upload recapitulation of activities	Data recapitulation of activities can be stored in the database	Successful
Testing reading data	Data activity can be displayed	Successful

Next is the black-box testing for the actor leadership where component testing performed on three main components. Black-box test results to the actor leadership can be seen in Table 4.

Table 4. Black-box test results to the actor faculty leadership

Component testing	Expected results	The test results
Testing reading data	Data activity can be displayed	Successful
Testing data search activity	Data activity can be	Successful
	displayed	

V. CONCLUSION

Based on the results of the tests performed in this study can be concluded:

1. The process of designing a database take a very important role in a management information system
2. The process of database design requires the stages that must be passed is without normalization, normalization phase 1, and the normalization phase 2
3. The test results using all the available black-box user interface components that relate actors can operate according to the initial scenario.

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