ANALYSIS AND DESIGN OF INTEGRATING DOMAIN CONTROLLER ACTIVE DIRECTORY BY LYNC AND EXCHANGE SERVER TECHNOLOGIES TO SUPPORT *HYBRID LEARNING* AND *VIRTUAL CLASSROOM ACTIVITY*

Ahmad Sa'di[1], Eko Arianto[2], Oki Wicaksono[3]
Gadjah Mada University,
Jl. Grafika No.2 Yogyakarta 55281 Phone/Fax. (0274)
547506,510983,
Email: ahmadsa.mti13*@ugm.gmail.ac.id*[1]*,*
ekoarianto.mti13*@ugm.gmail.ac.id*[2]*,*
oki_ti03@mail.ugm.ac.id[3]

Abstract - The emergence of various kinds of e-learning technology is an advancement of technology and the role of technology in meeting human needs, especially in the field of distance education. Lync videoconferencing is used as a medium for distance learning in a virtual classroom. This system is part of a directory service, can be integrated with directory services such as mail from the exchange server. Ative directory where the domain controller is the basis of a system formation. Active directory will make the implementation of policies that are attached to each student or group account class, and perform authentication when it joins the students in the virtual classroom. Users that have been made in the active directory domain controller is utilized as well as markers of presence in virtual

classrooms and digital learning. So it is not required back-making system from scratch such as domain, user and so on and integrated with the system that has been running at this time.

Key Word:: *Virtual classroom, Domain controller, Active Directory, Intergrasi System*

I. Introduction

Advances in technology and mobile human activity, led to various types of e-learning [1]. Distance learning education both with a hybrid model learning, blended learning and online learning full, has the goal of providing ease of learning for students and teachers as an alternative way of teaching students [2] [3].

when using e-learning, the learning material can be accessed anytime and from anywhere, in addition to the material that can be enriched with a variety of learning resources including multimedia can quickly updated by teachers [4]. Of course, it can benefit educators, both in the area of educational institutions and companies that require their employees to increase skills [5]. on the Educational Activities if followed many people would need a space large enough to accommodate the participants. Or can be implemented in a scheduled rotation but it would require more time and it will affect the amount of charge

Conventional education can only be done in a classroom, but e-learning in a virtual classroom can be done with the concept of one to many good local conferencing and mobile conferencing. It means the teachers can teach more than one class at the same time. conferencing systems can also be done a head to head between teachers and students without hampered by distance and time. This certainly increases the effectiveness and flexibility of learning [6].

STMIK AMIKOM Yogyakarta is an educational institution, which has a research institute animated film. educational institution that is named PT. Mataram Surya Vision Pictures with the placement of employees who are divided in six buildings, Building 1, Building 2, Building 3, Building 4, Building 5 and 6 buildings Employees here are as learners and some employees as a teacher in STMIK AMIKOM Yogyakarta. FastTrack education held each month and there are a lecturer who performs the daily teaching activities.

In this case, lync technology used for real time communications which allows users (educators and learners) can perform audio / video conferencing, meetings, presentations, to the presence in the virtual classroom. Technology lync is part of an integrated system with active directory domain controller and exchange server, where the active directory domain controller as the initial formation of a foundation conference system [7].

The purpose of this research is to utilize list of employee user that was created in active directory users and computers, the initial function of the user is a user authentication against an existing resource in the network storage server computer. Users can function as a sign of the presence of a user login when learners join in virtual classrooms with technology synergize lync and exchange server.

Domain Controller

A domain controller (DC) is a server that responds to security authentication requests within a Windows Server domain. It is a server that is responsible for allowing host access to Windows domain resources. [8].

Active Directory

Active Directory is the directory service on a windows server. Active Directory includes the directory, which stores information about network resources, as well as all the services that make information available and useful [8].

Active Directory domain controllers in this study functioned as [9]:

- As learners Presence
- Authenticate students using computers in office
- Saving account information learners
- Implement the security policy as follows:
  - Managing rules (policy)
  - Permissions (priviledges) on research data,
  - Other matters Relating to the security of other users or computer.

II. Problem Analysis

In order to get the right solution, there should be analysis of the problem of the system running the current and the expected system desires. Some of these problems are:

1. Utilizing a list of users that have been formed in the user and the computer active directory domain controller into an integrated system that supports virtual classroom
2. on the use of the high mobility activity, there is no system support virtual classrooms and video conferencing to facilitate instructors teach or to facilitate face-to-face conference between departments.

III. Recomendation

A. Design of the Network for the virtual classroom

Designing networks that integrate active directory domain controller, Lync Video Conference and Exchange Mail Server implemented in the network with the IP address of each as follows:

Table 1. IP address

SERVICE	IP ADDRESS	NETMASK	GATEWAY
Domain Controller AD	10.1.1.253	255.255.255.0	10.1.1.254
Lync Video Conference	10.1.1.252	255.255.255.0	10.1.1.254
Exchange Mail Server	10.1.1.251	255.255.255.0	10.1.1.254
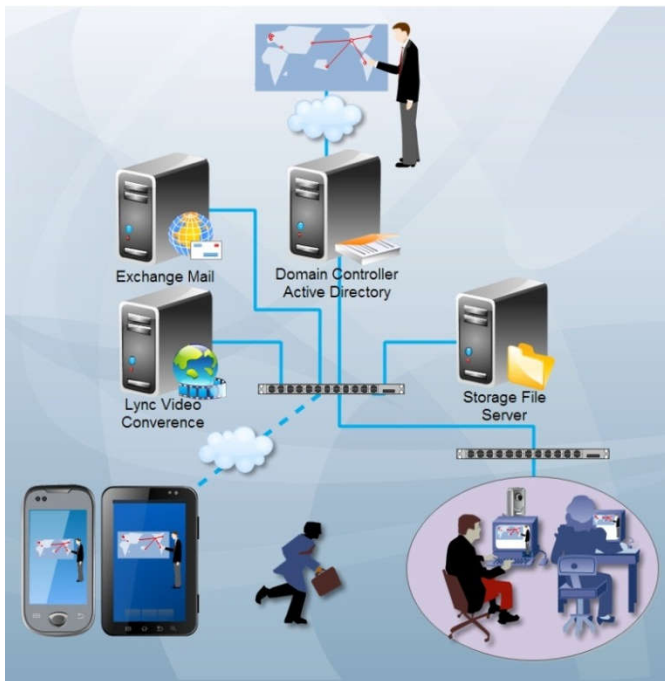
Figure 1. Network for virtual classroom

Description:

Designed an integrated system with each other. The system consists of a system of active directory domain controller, file server, lync Technology, and exchange mail server. When a user that has been created in the active directory domain control is in active directory users and computers will be able to use the user's identity when a user joins the virtual class room. Accessing the join link can also be shared via email in accordance with their

own class or group. The files of research or research data stored in the storage server can be accessed in accordance with the policy in the group, and attached at each user. This means that users access the data maintained authority and a track record that has been done by the user can be known.

The system is built in a network that can be used on a local area network or mobile network when video conferencing, presentation and demonstration of research results. Instructors with a flurry of work hours can make the learning process and can remotely monitor developments in research that has been done by each group.

IV. Implementation

A. Mechanism of Active directory Integration System Integration with Lync

Computer network that has been formed and inter-connected with each other ie Active Directory domain controller, video conferencing lync and exchange mail server. after forming the interconnected computer network system integration and synchronization process can be carried out information, with mechanisms and explanations are shown in Figure 2.
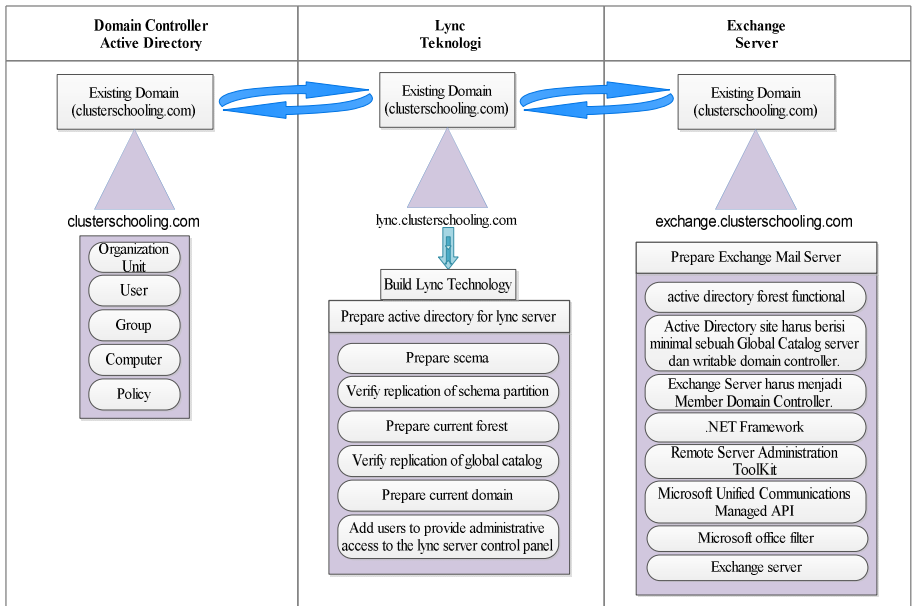
Domain Controller Active Directory	Lync Teknologi	Exchange Server
Existing Domain (clusterschooling.com)	Existing Domain (clusterschooling.com)	Existing Domain (clusterschooling.com)
clusterschooling.com	lync.clusterschooling.com	exchange.clusterschooling.com

Domain Controller / Active Directory:
- Organization Unit
- User
- Group
- Computer
- Policy

Lync Teknologi:

Build Lync Technology

Prepare active directory for lync server
- Prepare scema
- Verify replication of schema partition
- Prepare current forest
- Verify replication of global catalog
- Prepare current domain
- Add users to provide administrative access to the lync server control panel

Exchange Server:

Prepare Exchange Mail Server
- active directory forest functional
- Active Directory site harus berisi minimal sebuah Global Catalog server dan writable domain controller.
- Exchange Server harus menjadi Member Domain Controller.
- .NET Framework
- Remote Server Administration ToolKit
- Microsoft Unified Communications Managed API
- Microsoft office filter
- Exchange server

Figure 2. System Integration Mechanism

Description:

Active directory domain controller is used as an initial basis in integrating technology and exchange conferencing server. This has the benefit that becomes high availability servers. it is because the system is still available when the primary server is going down. when the server is going down the job can be executed by the server domain resulting from the replication of the primary server.

before applying conferencing technology lync, Lync must first become a member of a domain controller (clusterschooling.com) and immediately make the process of replication on a domain controller so that all the information that has been formed in the primary domain controller can be stored on the Lync server. After all the information stored on the server lync, lync then the installation process can be done.

same as mail exchange server, so that all the information stored on the primary domain can be saved, then that should be done is to become a member of the main domain server domain clusterschooling.com. after becoming a member of a domain, it can continue the installation process as well as application-independent exchange server.

All three servers can be integrated, so any information that is in the active directory domain controller will be announced a major update to the server and in the replication domain (domain for lync and exchange servers), the user-user, organization units, policy and so on. Anything that has been updated in both the main domain, lync server and exchange server will be updated in each domain server, this is the result of the integration system each domain.

Results Integration and Auto Update Information System

Administrators create user, group, policy conducted in the active directory domain controller (active directory users and computers), the information will be updated by lync and exchange, this is also happens if admintrator create a user in lync then the information will be updated on the domain controller active directory and exchange mail server.
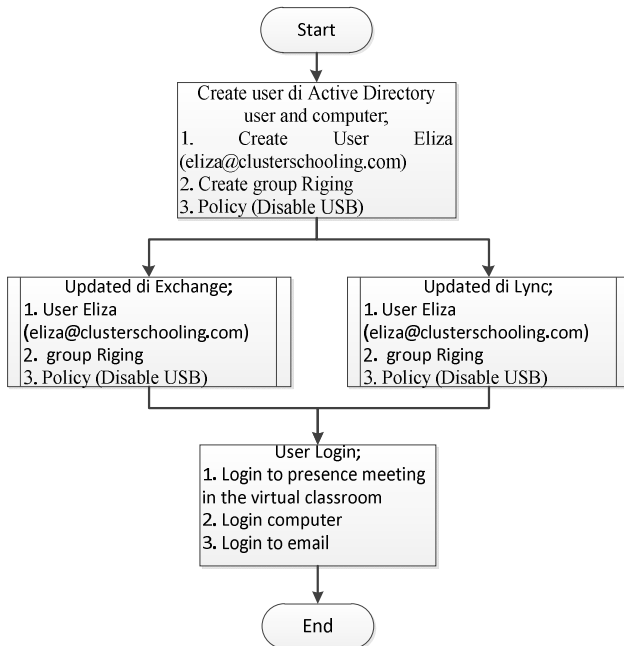
```
                    ┌─────────┐
                    │  Start  │
                    └─────────┘
                         │
                         ▼
        ┌──────────────────────────────────┐
        │   Create user di Active Directory │
        │        user and computer;         │
        │ 1.      Create      User     Eliza│
        │ (eliza@clusterschooling.com)      │
        │ 2. Create group Riging            │
        │ 3. Policy (Disable USB)           │
        └──────────────────────────────────┘
              │                    │
              ▼                    ▼
  ┌────────────────────┐  ┌────────────────────┐
  │ Updated di Exchange;│  │ Updated di Lync;   │
  │ 1. User Eliza       │  │ 1. User Eliza      │
  │ (eliza@clusterschooling.com) │ (eliza@clusterschooling.com) │
  │ 2.  group Riging    │  │ 2.  group Riging   │
  │ 3. Policy (Disable USB)│  │ 3. Policy (Disable USB)│
  └────────────────────┘  └────────────────────┘
              │                    │
              └────────┬───────────┘
                       ▼
        ┌──────────────────────────────┐
        │ User Login;                   │
        │ 1. Login to presence meeting  │
        │ in the virtual classroom      │
        │ 2. Login computer             │
        │ 3. Login to email             │
        └──────────────────────────────┘
                       │
                       ▼
                  ┌─────────┐
                  │   End   │
                  └─────────┘
```

Figure 3. Results of system integration

B. Creating the Virtual Classroom and Virtual Classroom Join

The first thing done before the start of classes a teacher is making the class schedule. The class schedule will be communicated to students. Delivery notification may be done in accordance group and each class can be done by one person by one person. Students can join in virtual classrooms by checking each email and click the link that is created by the instructor.
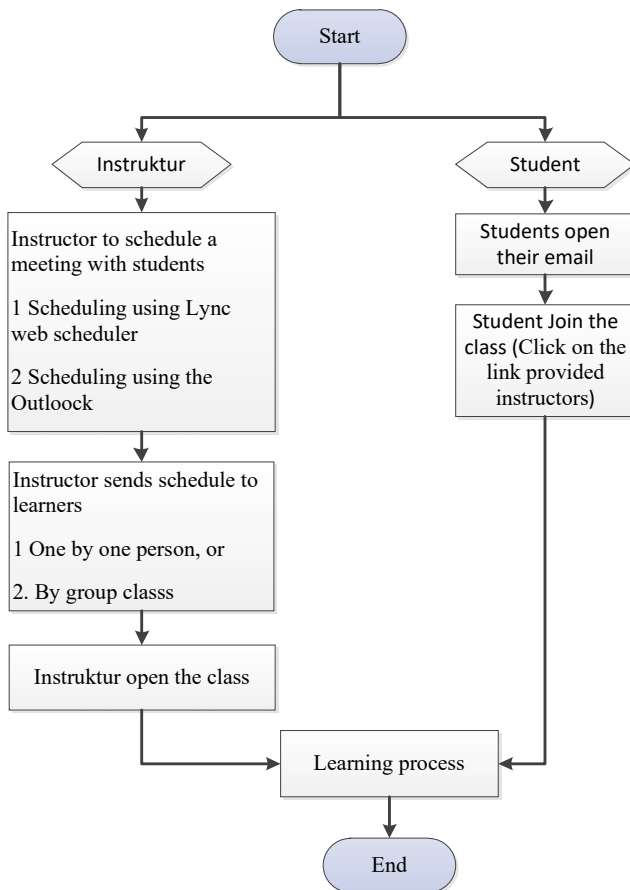
```
                          ┌──────────┐
                          │   Start  │
                          └──────────┘
                               │
            ┌──────────────────┴──────────────────┐
            │                                      │
      ⬡ Instruktur ⬡                         ⬡ Student ⬡
            │                                      │
┌───────────────────────┐            ┌───────────────────────┐
│ Instructor to schedule a │          │   Students open       │
│ meeting with students    │          │   their email         │
│                          │          └───────────────────────┘
│ 1 Scheduling using Lync  │                      │
│ web scheduler            │          ┌───────────────────────┐
│                          │          │ Student Join the      │
│ 2 Scheduling using the   │          │ class (Click on the   │
│ Outloock                 │          │ link provided         │
└───────────────────────┘            │ instructors)          │
            │                         └───────────────────────┘
┌───────────────────────┐                        │
│ Instructor sends schedule to │                 │
│ learners               │                        │
│                        │                        │
│ 1 One by one person, or│                        │
│                        │                        │
│ 2. By group classs     │                        │
└───────────────────────┘                        │
            │                                     │
┌───────────────────────┐                        │
│ Instruktur open the class │                     │
└───────────────────────┘                        │
            │                                     │
            └──────────┐     ┌────────────────────┘
                  ┌──────────────────┐
                  │ Learning process │
                  └──────────────────┘
                          │
                     ┌──────────┐
                     │   End    │
                     └──────────┘
```

Figure 4. Starting a Virtual Classroom Rule

V. Conclusions

Integration of Active Directory domain controller with lync server and exchange server can occur if the lync server and exchange server to be a member of a domain controller and do active directory domain replication process.

The information has been updated on each server in both the domain controller server or lync server or exchange server will be updated also on other servers.

Teaching and learning activities by the virtual classrooms design can be run well by utilizing a system that has been integrated. Active directory domain controller as the user makes the learners, group classes and policies on user and group classes. Lync server as a medium for meeting scheduling of virtual classrooms, videoconferencing, presentation files, demo programs, virtual whiteboards, polls, and chat. Exchange server as a media link to join the class email delivery virtualroom.

Reference

[1] M. Simonson, S. Smaldino, M. Albright, and S. Zvacek, "Teaching and learning at a distance," *Columb. Pearson Educ.*, 2003.

[2] A. Littlejohn and C. Pegler, *Preparing for blended e-learning*. Routledge, 2014.

[3] P.-S. D. Chen, A. D. Lambert, and K. R. Guidry, "Engaging online learners: The impact of Web-based learning technology on college student engagement," *Comput. Educ.*, vol. 54, no. 4, pp. 1222–1232, 2010.

[4] M. Wang and J. W. Ng, "Intelligent Mobile Cloud Education: Smart Anytime-Anywhere Learning for the Next Generation Campus Environment," in *Intelligent Environments (IE), 2012 8th International Conference on*, 2012, pp. 149–156.

[5] E. Brynjolfsson and A. McAfee, "Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy," 2011.

[6] G. Salmon, *E-moderating: The key to online teaching and learning*. Routledge, 2012.

[7] K. Milanovic, M. Milosavljevic, D. Vuckovic, and D. Jankovic, "Videoconferencing in the Complex E-learning Scenario," in

Telecommunications Forum (TᴇʟFOR), 2011 19th, 2011, pp. 1482–1485.

[8] W. Stanek, *Active Directory Administration: The Personal Trainer for Windows Server 2008 and Windows Server 2008 R2*. RP Books & Audio, 2014.

[9] J. Kadlec, D. Jaros, and R. Kuchta, "Implementation of an Advanced Authentication Method within Microsoft Active Directory Network Services," 2010, pp. 453–456.

Author:

[1] Ahmad Sa'di is a Postgraduate Student at Electrical Engineering and Information Technology Department Gadjah Mada University that focusing on information technology and Staff at PT. MSV Pictures of Yogyakarta as a Computer Network Administrator.

[2] Eko Arianto is a Postgraduate Student at Electrical Engineering and Information Technology Department Gadjah Mada University that focusing on information technology.

[3] Oki Wicaksono is a Postgraduate Student at Electrical Engineering and Information Technology Department Gadjah Mada University that focusing on information technology and Mobile Application Programmer at Qi

DEVELOPING A DIGITAL LIBRARY AS AN ONLINE LEARNING SOURCE FOR THE OPEN AND LONG-DISTANCE EDUCATION OF JAKARTA STATE UNIVERSITY'S STUDENTS

Cecep Kustandi, M.Pd.

Universitas Negeri Jakarta

ABSTRACT

In the era of ICT (Information and Communication Technology) each institution including libraries is in race to integrate technologies for developing and empowering the ICT-based application in the form of libraries comprising of digital learning sources.

The focus of the current study was hence how to develop a Digital Library as an online learning source for the open and long-distance education in the Curriculum and Educational Technology Department (CETD), Faculty of Pedagogy (FP), State University of Jakarta (SUJ), as one of sources for students and lecturers in search of digital-form information.

The product of the database design of the digital library application is the further innovation of the opensource that has adopted International Standard, that is, the AACR

standard. The Software is called SLiMS (Senayan Library Management System). It is a web-based Open Source Software (OSS) designed specifically for meeting the needs for library automation from a limited scale to a large scale.

Digital Library as an online learning source for the open and long-distance education in the CETD, FP, SUJ yielded benefits to the lectures and students in searching references as well as course materials.

INTRODUCTION

Information and Communication Technology or ICT has become a necessity as well as an integral part of the global life. Thus, each institution, including libraries is in race to integrate ICT for empowering knowledge-based HR (Human Resources) in order to compete in this global era through the provision of a collection of books as much as possible.

Simultaneous with the ICT development, there have been a number of libraries that seek to implement the Digital Library for its management. However, it is not as easy as it is thought. A lot of hindrances emerge such as limited funding and less-qualified human resources. These problems are considered as the dominant hindering factors for realizing a Digital Library.

Apart from all that, the emergence of the Digital Library in Indonesia is responded well by the information managers or librarians. Most librarians are open to changes in technology, yet they still keep their traditional roles to assist visitors in search for information either in a digital or printed form. The socialization of Digital Library program for the network members as well as the users is salient. In

this case, there lies a need to increase their awareness of their primary function, that is, to offer easy access to information. To offer easy access, librarians need to push the Digital Library users to be information literate. These types of library users are those who understand when they need information and can find it, evaluate it, as well as use the needed information effectively and ethically.

A Digital Library is frugally more advantageous than a traditional library. Chapman and Kenney (in Sismanto 2008) suggested four reasons, namely : institutions can share a digital collection; digital collections can reduce the need for printed materials at the local level; its use will improve electronic access; and long-term value of digital collections will reduce the costs for maintenance and delivery.

The focus of the present study was how to develop a Digital Library as one of online learning sources for the open and long-distance education in searching for digital-form information? While the purpose of the study was to develop the Digital Library media as online learning sources for the open and long-distance education students in the CETD, FP, SUJ.

Digital Library is a system comprising of a wide range of services and information object that supports the access to the information itself through digital devices (Sismanto, 2008). This service is expected to fast, precisely, and accurately facilitate the search for information on the collections of information objects such as digital-form documents, images and databases. A Digital Library does not stand alone, but rather is linked to other sources of information services and is open to users worldwide. The collections of Digital Library do not merely support the replacement of printed document, the scope of its collections even caters for to the digital artefacts that is absent in their printed forms. Its collections primarily consist of information content from old documents and searching results. This library serves the machine, information managers as well as information users. This helps in supporting the management of collections, storing, and aid services for information searching.

Association of Research Libraries (ARL), 1995, defined a Digital Library as follows:

1) A Digital Library is not a single entity.
2) A Digital Library relies on technology to link to various sources.

3) The connection between a Digital Library and its information services is transparent to the users.
4) Universal access to a Digital Library and information services is a goal.
5) The collections of a Digital Library do not merely comprise of documents; they encompass digital artefacts that cannot be represented or distributed in a printed form.

The primary devices required in the Digital Library is a personal computer (PC), Internet (inter - networking), and the World Wide Web (WWW). These components realize the Digital Library.

A Digital Library also requires information systems. Sucahyo and Ruldeviyani (2007) pointed out that there are three essential elements required for developing information systems, that is, hardware, software, and human (brain ware) .

The hardware in this case encompasses the following.

1) Web server, the server that will respond to the service requests of web page coming from internet users;

2) Database server, the heart of a Digital Library since it functions as the space where all collections are kept;

3) FTP server, plays a role in sending / receiving files across computer networks;

4) Mail server, the server which serves everything in the form of electronic mail (e – mail) ;

5) The printer server, in charge of receiving requests printing , setting its queue, and processing;

6) Proxy server, for the security settings of internet usage especially to be sterile from unauthorized users and for restricting access to unexpected sites.

The most widely used software is Apache, an open source (free open - gratis). For the Microsoft users, there is a software for a web server, that is, IIS (Internet Information Services) .

The required Human resources for this information system is

1) Database Administrator, responsible for the smooth running of data base,

2) Network Administrator, responsible for the smooth operation of computer networks,
3) System Administrator, in charge of selecting authorized users,
4) Web masters, in charge of keeping the website along with its all pages to remain operated so that it can be accessed by the users, and
5) Web Designer, in charge of designing the display of the website simultaneously organizing its content.

METHODOLOGY
The Design Strategy

This research of development aimed to provide a comprehensive and detailed depiction of how the process of developing a Digital Library, which finally yielded a product of Digital Library for the open and long-distance education of educational technology study program, faculty of pedagogy, State University of Jakarta.

The design model adopted in developing this medium is the ADDIE model design comprising of five

basic procedures namely Analysis, Design, Development, Implementation, and Evaluation. The steps started from analyzing the learners' needs, making the draft of the product, making the product, implementing the product and evaluating the product.

This design involved some respondents as follows:

a) Media Expert

The Media expert was a professional who mastered the theory and concept of the Digital Library. The role of a media expert in this study was to provide assessment and feedback for the yielded media. The involved media expert was a Lecturer in the CETD.

b) Library Expert

The material or content expert in this study was a professional who mastered library and was competent to evaluate the accuracy of various aspects in the Digital Library.

c) Students

The students in this study were the ones majoring in the Study Program of Educational Technology, FP, SUJ.

1. Instrument

The instrument for this development study is based on the work of Purnomo (2008) . The coverage of Library Automation is

a) Procurement of collections

b) Cataloging

c) Circulation, reserve, inter -library loan

d) Management of periodicals

e) Provision of the catalog (OPAC)

f) Members Management

g) Statistics (Report)

While according to Arif, Ikhwan (2003) :

a) Database

b) Users

c) Automation Devices .

Development procedures

```
        ┌──────────────────┐
   ┌───▶│        A         │
   │    └──────────────────┘
   │       │        ↕
   │    ┌──────────────────┐
   │───▶│        D         │
   │    └──────────────────┘
   │       │        ↕
   │    ┌──────────────────┐
   │───▶│        D         │
   │    └──────────────────┘
   │       │        ↕
   │    ┌──────────────────┐
   │───▶│        I         │
   │    └──────────────────┘
   │       │        ↕
   │    ┌──────────────────┐
   └───▶│        E         │
        └──────────────────┘
```
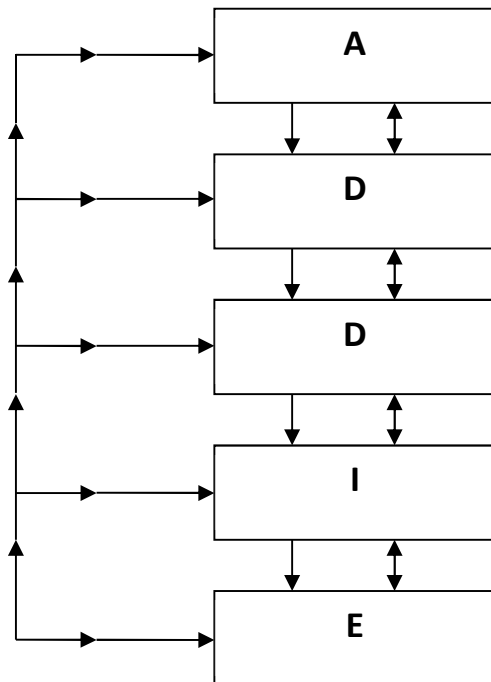
Proceduress of developing ADDIE

In developing the Digital Library, the researcher used ADDIE development procedures consisting of five stages, which in general starting from analyzing, designing, developing, piloting up to the evaluation phase. The following are the stages of ADDIE development model in developing the Digital Library.

1. The first step : analysis

In this phase, a needs analysis was conducted to determine the specifications of the Digital Library to be designed. The needs analysis was done by using an instrument on the current condition of the course. Results from the conducted needs analysis of the target were used as a reference to determine the things needed for the Digital Library.

Initially the first thing conducted in the analysis stage was to analyze the characteristics of students attending the lecture program of educational psychology. In this study the potential users of this Digital Library were students of 3rd to 5th semester.

The second step performed in the analysis stage was to analyze the supportive environment of ICT lectures. It was obtained that the Department of Curriculum and Educational Technology has had the

facilities and infrastructure that can support ICT, such as e -learning , wi-fi , and a computer lab connected to the internet and intranet .

The third step in the analysis of the selected course making use of Digital Library was selecting the educational psychology course. .

2. The Second Step: Design

Design is the second phase of ADDIE model. At this stage clarification on the designed product specifications was needed so that the product can reach the expected goals.

The design phase was closely associated with designing the draft for assessment instrument, the draft of observational sheet, and with the process of making the Digital Library media that would be used.

After that, the organization of assessment instruments as well as their assessment procedures were made. In the process of developing media, the conducted common evaluation was formative evaluation . The evaluation process was in the form of library expert review and media expert review where each of which consisted of one assessor. Then the pilot phase was implemented to the media users in one-to - one and small groups.

The instrument used for experts and students had a rating scale consisting of four options with different values from one another as given follows.

Description of Scoring Scale:

1 = Poor

2 = Quite good

3 = Good

4 = Excellent

Subsequently, the obtained data of test results were calculated to gain the assessment of the quality of the media being developed with the following assessment descriptions:

Criteria Results:

4 = Excellent

3 to 3.9 = Good

2 to 2.9 = Quite Good

1 to 1.9 = Poor

3. **The third step: development**

Development is the third stage of the ADDIE model. The procedures undertaken in this phase were to create the Digital Library starting from the pre-production stage, the production stage, and post-production stage. Then the products being developed were piloted to determine the conformity of the products with the expected goal. The Digital Library was subsequently reviewed and revised in reference to the obtained feedback. The procedures in the creation of the Digital Library of this stage are:

- **Pre-Production Phase**

The pre-production stage was the stage that took a long process and determined the success of the next stage. This stage was the planning for future activities and the results to be achieved .

At this stage the forms, menus, as well as the database in the Digital Library were identified.

- **Production Stage**

The production activities in this study was the process of developing the database of digital library application created in open source, which had a very good quality and has adopted the International Standard by using the standard of AACR 2. The software is named SLiMS (Senayan Library Management System). SLiMS (Senayan Library Management System) is a web-based Open Source Software (OSS) designed

specifically to meet the needs of library automation from a small scale to a large scale . With its comprehensive features, SLiMS is suitable for the library that has a lot of collections, members, and staff in the network environment, both in a local network (intranet) and the internet .

Another strength of SLiMS is a multi-platform , which means that it can run virtually in all operating systems that can run PHP and MySQL RDBMS . The Slims itself was developed on the platform GNU / Linux and it runs well in other platforms such as FreeBSD and Windows.

At the present time, SliMS is currently used by hundreds of large libraries in various regions of Indonesia, even to other countries such as Germany, Spain , the Middle East, etc.

SLIMS features include:

1) Online Public Access Catalog (OPAC) with the creation of thumbnails generated *on-the-fly*. Thumbnails are useful for portraying book covers. Search modes were available for simple search and advanced search.
2) Detailed records are also available in the XML format (Extensible Markup Language) for the requirement for the web service.

3) The management of bibliographic data which efficiently minimize the data redundancy.
4) The management of masterfile for referential data such as GMD (General Material Designation), Collection Types, Publisher, Author, Location, Supplier, and others.
5) Circulation with features:
   a. The transaction of borrow and return
   b. Reservations of collection
   c. Flexible lending rules
6) The Management of membership
7) The Inventory of collections (stocktaking)
8) Reports and Statistics
9) Senayan that supports a variety of language formats
10) The module system with the features:
11) Union Catalog Server
    This new facility enables the combination of online catalog with one server.
12) And many other complete SLiMS features that all of which have been already suited with the needs of internationally standardized digital library management

Apart from the display facility mentioned above, SLiMS also has other various displays that can be selected based on our own choices and even if we

master the language programming, we can modify the display and various features with our own choice.

4. The Fourth Step: Implementation

Furthermore, concerning on the design of this product simultaneously to obtain feedback from the stakeholders, piloting was done to librarians, media specialists, and students as users A product has a better quality after it has undergone a process of testing or evaluation

This stage is the implementation of the Digital Library which has been developed by the researcher. This Digital Library application was used as supportive media of online learning sources in facilitating the students of CETD, FP, SUJ.

Implementation of the product was conducted to determine whether the Digital Library deserved to be used as learning sources or not, as well as to determine whether there lied limitation in the Digital Library.

5. The Fifth Step: Evaluation

The last or fifth step of ADDIE design model is evaluation. The evaluation of Digital Library is the process of providing information as the basis of decision

making in order to improve the quality the Digital Library product.

a. The product quality (*Digital Library*)

This evaluation was intended to measure the quality of the Digital Library that has been developed previously. This evaluation underwent the quality aspects of the Digital Library along with its learning and media aspects.

Of a product , the ideal formative evaluation activities encompass four phases:

a. expert review

b . one-to -one evaluation

c . small group evaluation

d . on-field tests , but in this study this phase was not conducted.

The data analysis technique employed in this study was qualitative descriptive statistics.

1. Expert review

The data analysis technique used for the evaluation of the expert review was by calculating the score of a questionnaire based on pre-defined grading scale .

2. One-to-one evaluation

The subsequent data analysis technique was one-to -one evaluation.

3. Small group evaluation

The data analysis technique used for the evaluation of small groups was basically the same with the one used for the evaluation of expert review as well as the evaluation of one -on-one.

RESULTS AND DISCUSSION

The Product

The product of this development study is 'the Digital Library of CETD, FP, SUJ'. The final result of this media design is the Digital Library Application as learning sources in particular for the Educational Psychology course while in general to facilitate other courses in the CETD, FP, SUJ.

Product Characteritics

1. **The System Requirements**

The Digital Library should have the software requirements like:

Engine skripting PHP 5 (at least version 5.1. SLiMS developed with PHP version 5.2.4) with a few notes:

   a) The support of GD is enabled. GD is enabled with the support of PNG , JPG , GIF , and FreeType format (for UNIX systems, to install from the source code, this can be performed with a compile option --with- gd --with- png - dir = / usr

/ lib - --with- jpeg - dir = / usr / lib --with-freetype - dir = / usr / lib and make sure that the library and header development of PNG , JPEG and freetype are installed.

b) The support of XML (usually automatically enabled in PHP5)

c) The support of extension mysql
Web server (Apache 2.2 is recommended)

d) MySQL database server (recommended > = 5.0)
Mysqldump utility for the database backup
GNU Operating system / Linux , FreeBSD , Solaris or Windows
Browser with the capacity of JavaScript 1.5 , AJAX and CSS 2 such as : Mozilla Firefox 2 , Opera 9 , Conqueror 3.5, or Microsoft Internet Explorer > = 6.0
PDF document reader such as Adobe Reader, Evince or Foxit PDF Reader for viewing PDF documents generated by the Senayan .
Hardware requirements :

a) Processor with Pentium class III

b) RAM 256 MB

c) Standard VGA with 16- bit color support

d) Optional : Barcodes reader to scan a barcode in circulation

2. Advantages of the program

Some advantages of the Digital Library program of CETD, FP, SUJ among others are easy to use in this case students who have a username can access this Digital Library very easily. They can download various types of digital materials in the form of digital books (e -books), digital scientific journals (e - journals) and other library materials .

Usage Procedures

The Digital Library was used to support the Educational Psychology course, where students taking this course were given a username and password to access the Digital Library and download the references underpinning the Educational Psychology Course.

The Pilot Results

1. Expert Review

a) Media Expert

The pilot result from the media expert for the Digital Library program of CETD, FP, SUJ yielded recapitulated data as follows:

Table of Average Scores of *Expert Review*
(Evaluation of Media Expert)

No	Aspects	Average

1	Web-based media	3.15
Overall average		**3.15**

From the aspect of web-based media, the Digital Library of CET, FP, SUJ obtained the value of 3.15 interpreted good of 1-4 rating scale. This result was obtained by summing over the average value of each aspect then it was divided by the overall numbers of aspects. Below are the inputs recommended by media experts, regarding the initial product of Digital Library.

1. Can the Digital Library be accessed through a department web (not independent)?
2. The main header should be re-edited
3. The background is better suited with the theme of library
4. The font type on the menu is too small
5. Colors are suggested to be more harmonious

b) Library Expert

The pilot result conducted by the library expert for Digital Library program of CETD, FP, SUJ yielded recapitulated data as follows:

Table of Average Scores of Expert Review
(Evaluation of Library Expert)

No	Aspects	Average
1	Quality	3.00
Overall average		**3.00**

For its quality, the Digital Library of CETD, FP, SUJ obtained the value of 3.00 meaning that the quality is good of 1-4 rating scale. This result was obtained by summing over the average value of each aspect then it was divided by the overall numbers of aspects.

Below are the inputs recommended by the library expert, regarding the initial product of Digital Library.

1. Pay attention to the copyright of e - books, whether paid or free.
2. Note how to index a book.
3. Is the Digital Library free for everyone or it needs a log-in process?

2. **Pilot Result of One-to-One Users**

In this pilot result of one-to -one users, responses from students of CETD, FP, SUJ were as follows :

Table of Average Scores of One-to-One Users

(Evaluation of Students)

No	Students	Average
1	Participant I	3.15
2	Participant II	3.61
3	Participant III	3.30
Overall average		**3.35**

From the first participant, an average value of 3.15 was obtained, which meant that the Digital Library was interpreted good. Then from the second student of CETD, FP, SUJ, the gained score was 3.61 meaning that the Digital Library can be judged good as well. Furtermore, from the third participant, the obtained value was 3.30 representing good quality. The overall average value obtained from the three participants was 3.35 clarifying that the Digital Library of CETD, FP, SUJ can be claimed to have a **good** quality of 1-4 rating scale. This result was obtained by summing the average value of all participants then it was divided by the numbers of participants.

3. Pilot Result of Small Group Users

After the pilot test of one to one users, then the next step was to test the small group users. The pilot

test conducted to 5 students yielded the summary as follows :

Table of Average Scores of Small Group Users (Evaluation of Students)

No	Participants	Average
1	Participant I	3.30
2	Participant II	3.69
3	Participant III	3.07
4	Participant IV	3.61
5	Participant V	3.30
Overall average		**3.39**

From the first student an average score of 3.30 was gained, which meant that the Digital Library was considered good. Then from the second student, the obtained score was 3.69 representing the good quality of Digital Library. Besides, from the third participant the obtained score was 3.07 which also meant that the Digital Library of CETD, FP, SUJ was good. From the fourth student the obtained score was 3.61 meaning that the Digital Library was judge good as well. From the fifth or last participant the obtained score was 3.30 which also represented good Digital Library. The overall obtained average score from the five participants was 3.39 leading to

the conclusion that the Digital Library of CETD, FP, SUJ had a good quality of 1-4 rating scale. This result was obtained by summing the average value of all participants then it was divided by the total numbers of participants

.

Below the print-screen display of the Digital Library as the online learning sources for the open and long-distance education of CETD, FP, SUJ, is portrayed.

The Front Display of *Digital Library* of CETD, FP, SUJ

The Administrator Menu Display of *Digital Library* of CETD, FP, SUJ

CONCLUSION AND IMPLICATION
Conclusion

The conclusion derived from this development study of the Digital Library descriptions above is that "developing Digital Library in the CETD, FP, SUJ "has undergone various stages in the scheme of ADDIE instructional model. This model comprises of five basic procedures, firstly, analysis stage where students' learning needs, students' characteristics and learning environment in this case the supporting ICT systems were analysed. The subsequent stage was design, namely the creation of the product

specifications. The step was followed by the development stage consisting of pre-production, production and post-production steps. The next stage was the implementation of the developed product. The final stage was the evaluation phase where the product along with its advantages and impacts was assessed.

This research of development concerned on every detail of each phase of ADDIE model since it was believed that a good process would generate a good instructional media as well. Although only as a source of learning in the lecture, later it is expected that the Digital Library contributes to a positive impact for the lecture in the DEPT, FP, SUJ.

From the pilot test results, the overall obtained average score from the formative evaluation of media expert was 3.30 fulfilling a good criterion while from the library expert the overall average score was 3.74 which also fulfils a good criterion. In the pilot phase of one-to-one, the overall average score was 3.35 fulfilling a good criterion. For the small group pilot test phase, the overall average was 3.39 which also met a good criterion. Based on the overall average score of the formative evaluation test above, it can be concluded that the Digital Library in the CETD, FP, SUJ, has a good criterion to be used as a learning source. The Digital Library of CETD, FP, SUJ is expected to assist lecturers and students in the lecturing process by making use of ICT

as well as to boost students' motivation and interest in figuring out learning materials and sources.

Implication

The implications associated with this development study of Digital Library of CETD, FP, SUJ are that the products have been tested and have a good quality for the lecture. The development process has been conducted as good as possible so that the course objectives set in advance could be achieved well while in its development process the product was also made as attractive as possible to assist students in accessing the up-to-date learning sources and references.

The Digital Library of CETD, FP, SUJ also offers benefits to lecturers and students. It can facilitate them in obtaining references and learning materials related with the Curriculum and Educational Technology Department.

This design study of Digital Library of CETD, FP, SUJ, offers inputs to the students of this department, who want to develop a medium, especially the Digital Library then it is expected that it can be used as consideration in generating other instructional media.

For further development, the availability of the following are recommended to be further considered.

1) *Web server*, a server that will respond to students' requests to the Digital Library service;
2) *Database server*, the heart of a Digital Library where the entire collection is stored;
3) *FTP server*, having a role to send / receive files across computer networks ;
4) *Mail server*, a server that serves everything related to electronic mail (e – mail) ;
5) *Printer server*, having roles to receive printing requests, to set queue, as well as to process it;
6) *Proxy server*, having roles to secure the internet use from those who are not eligible and to restrict access to any forbidden sites.

Apart from the availability of the system, the following required human resources for the information system of Digital Library also need to be taken into account.

1) *Database Administrator,* in charge of the smooth running of data base,
2) *Network Administrator,* in charge of the smooth operation of computer network,
3) *System Administrator,* responsible for setting those who are eligible to get access to the system,