JIMMA UNIVERSITY
COLLEGE OF NATURAL SCIENCE
DEPARTEMENT OF INFORMATION SCIENCE

ASSESSMENT AND DEVELOPMENT OF PROTOTYPE ON MULTIMEDIA DIGITAL LIBRARY FOR THE ENHANCEMENT OF TEACHING AND LEARNING PROCESS IN ETHIOPIAN HIGHER EDUCATION INSTITUTIONS

BY:

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APPROVAL SHEET

This research study entitled *"*Assessment and development of prototype on multimedia digital library for the enhancement of teaching and learning process in Ethiopian higher education institutions*"* has been read, approved and submitted so as to meet the partial fulfillment of the research work as a preliminary requirement for the Degree of Master of Science in Electronic and Digital Resource Management in Jimma University, Ethiopia.

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DECLARATION

I hereby declare that the research work entitled "Assessment and development of prototype on multimedia digital library for the enhancement of teaching and learning process in Ethiopian higher education institutions" is a record of an original work conducted under the guidance of Getachew Bayissa and Worku Jimma, Jimma University, Department of Information Science.

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Date

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Signature

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DEDICATION

This research study is dedicated to my all brothers and sisters for their encouragement during the study.

ACKNOWLEDGMENT

Abstract

The main objective of this study is to assess and develop a prototype for multimedia digital library to enhance teaching and learning process in Ethiopian higher education. The study was conducted on four public universities in Ethiopia two each from formerly established and recently established. To conduct the assessment, the researcher used both qualitative and quantitative research method and cross sectional survey was used. The respondents were 385 students and staff sampled through random sampling method and 30 librarians and IT professional using purposive sampling method. The data were collected by pretested questionnaire, face-to-face interview and personal observation which were analyzed by frequency distribution and percentage. Lastly prototype was designed by using Omeka open source software. The study showed that there were multimedia content in the library, and there were high need of multimedia content. Most of the users (88.5%) visited multimedia content on the web. It was found that there are ICT facilities to handle multimedia content and to develop multimedia digital library, which can enhance teaching and learning process. Thus, it is high time to develop multimedia digital library in Ethiopian higher learning institutions

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LIST OF ACRONYM

ASTU- Adama Science and Technology University

CSS- Cascaded style sheet

DTD- Document Type Definition

GSDL- Greenstone digital library

HTML- Hypertext Markup Language

ICT- Information and communication Technology

IT-Information Technology

KM- Kilometer

LAN- Local Area Network

METS- Metadata encoding and Transmission

WAN- Wide Area Network

XSL- Extensible Stylesheet Language

CHAPTER 1

1.0.Introduction

ICT (Information and Communication Technology) revolution is changing the world rapidly, and creating a generation that is media-hungry and technologically savvy. This new generation is using digital media, among others for learning and communicating (Tapscott, 1998). In the context of education, educational technology is a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the tools, such as computers and related technologies (Roblyer and Edwards, 2010).

Multimedia is an integration of multiple media elements (audio, video, graphics, text, animation and image) into one synergetic and symbiotic, while that results in more benefit for the end user than any one of the media elements can provide individually and it is the use of various types of media to create a presentation or an application which can be used for the purpose of broadcasting, entertainment, education and many other (Sanjaya et. al. 2009).

The advent of multimedia and multimedia technologies has changed the way educators teach and students learn. Multimedia application design offers new insights into the learning process of the designer and forces to represent information and knowledge in a new and innovative way (Neo and Neo, 2010).

Multimedia "provides a means to supplement a presenter's efforts to garner attention, increase retention, improve comprehension, and to bring an audience into agreement", which consequently results in people remembering 20% of what they see, 40% of what they see and hear, but about 75% of what they see and hear and do simultaneously (Lindstrom 2011).

The traditional information service options are no longer acceptable to a large majority of the users or that there is a strong demand for newer forms of services which are not so familiar to the libraries. Libraries therefore are now forced to be friendly and familiarized themselves with all relevant and current popular multimedia formats (Sreekumar, 2010).The traditional meaning of library's collection range also undergo a great deal of change interactive and multimedia learning resource are now one of the most rapidly changing and exciting areas of education in the world today which offer students, teacher and researchers access to materials as never before. Multimedia can deliver large amounts of information in ways that make it manageable approachable and useful. The integration of multimedia programmes into libraries and classroom provisions not only to change the kinds of information that is available for learning, but in which that leaning take place (Sreekumar, 2010).

In USA, digital library development has gone through several significant stages but it lacks multimedia contents. That is why USA started to design multimedia digital library, because without multimedia content, the digital library by itself is poor when compared with its analogue counterparts (Chen, 2010).

In Africa, there are multicultural studies from the nature of Africa. Education at all levels primary, secondary and higher education has been challenged to develop digital resources for the enhancement of teaching and learning. But educational technologies tools provide enhancement and innovation for the delivery of course material in designing resource for the teaching issues of cultural diversity in multicultural societies (Deborah, 2010).

The study by Deborah (2010) on assessment of benefit of multimedia objects in the teaching of American history course revealed that, there is high degree of student interest, expand students understanding in using digital media and aided learning process. However, the study was limited

to only designing multimedia object, though what is needed is designing multimedia library to handle all those multimedia objects.

From formats of information sources, multimedia content are mostly visited on the web. This indicates that the need for multimedia content for education is high and to bring such collections to the learners and teachers, researchers designing and implementing multimedia digital library is important. To do this, designer started building multimedia digital library of audio/ video resources by using open source software (Sreekumar, 2010).

Others also started developing a prototype to multimedia digital library to enhance the satisfaction of the user on information material by using open source software which is practices used to test explored visualize an example of the role of the future system (JanSerrington & Ran Oliver, 2011).

However, to date there is no initiative on designing multimedia digital library in Ethiopian higher learning institutions to the knowledge of the researcher. Thus, this research was initiated with the main aim of having feature of interactivity, navigability, hyperlink, easy to understand and easy to use multimedia content and developing a prototype to manage and easily accessible by users to improve teaching and learning process in Ethiopian higher education.

1.1. Statement of the problem

Information communication technology is changing rapidly and its impacts on a library are also increasing rapidly and reach on the level to handle multimedia content. Its usage is become mobile, more social and more multimedia based experience (James & Aln, 2012).

Because of lack of interactive from traditional library material resources, the library is now forced to be friendly and familiarized themselves with all relevant and current popular multimedia format (Sreekumar, 2010).

In multimedia digital library, there is a possibility to retrieving documents in different media combining metadata and content analysis but there is lack of multimedia digital library in most countries (Claudio & Ulrich, 2009). Non-multimedia based education has barrier of time, space and lack of evidence to be accepted as anytime and anywhere and process of knowledge acquisition and event (Malik & Agarwal, 2012).

Distance education involves providing a user with instructional materials for self or group learning for geographically dispersed students. These students feel lack of interactive material to understand the ideas. This can be done by multimedia content since face to face classroom learning has a limitation to foster and develop cognitive engagement through the ability to attract and hold students attention (Ahanger& Little, 2008).

As technology growth rapidly and content are multimedia based, library also need to include multimedia content management system; multimedia digital library is important to organize process and make accessible to the users. (Brekumar, 2010).

Moreover, multimedia content need a system that preserve them for future use without any damage. But multimedia content need high storage space, high bandwidth to transfer which are taken as a challenge. Thus, today education needs practical exercise or anything that is visualized

as theoretically achieved knowledge is required. This can be solved by simulation and multimedia content.

Generally, the research was conducted to answer the following research questions.

Research Questions

1. What is the status and use of a multimedia digital library system in Ethiopian higher learning institutions?
2. How available are multimedia content for teaching and learning in Ethiopian higher learning institutions?
3. What are the challenges and techniques to manage multimedia contents?
4. What is the level of ICT development to support multimedia content?

1.2. Objectives of the study

1.2.1. General objectives

The general objective of the research was to assess and develop a prototype on multimedia digital library to improve teaching and learning process in Ethiopian higher education

1.2.2. Specific objectives

- To investigate the current awareness of and usage of multimedia content in higher education.
- To investigate the challenges and techniques to manage multimedia content.
- To assess the status of multimedia digital library in Ethiopian higher education
- To assess the use of multimedia digital library in Ethiopian higher education

1.3. Significance of the study

The thought behind the study was to visually demonstrate scientific ideas and concepts, instill a sense of wonder end excitement in students about the world around them, present local relevant

case studies, generate students interest in science careers, promote 21st century skills, including critical thinking, problem solving and communication skills, and provide common experience shared by all students (Elizabeth & Tess, 2010).

Multimedia digital library designers will learn and understand user's questions, interest, problems and enhance the system or implement it for similar system of their own. When this system is implemented and used in the universities in Ethiopia, the university staff and students will participate on teaching and learning process in interactive manner. The teachers can create/ prepare teaching material originally or download from their sources and provide to the students in order to help them to understand what they learn theoretically. Since multimedia content substitute expensive practical materials, university would save resources. The students will learn practical lesson through multimedia digital library from university LAN or WAN architecture and can access the materials from anywhere. Students can see applications, procedures that they cannot get them locally in their University via multimedia digital library system. Once teachers prepare interactive materials and added to multimedia collection, no need to create again as it can be used until times will change it. Additionally, multimedia digital library help the students to practice difficult problem and practice risky exercise any time. By multimedia digital library, universities can preserve materials for a long period of time.

1.4. Scope of the study

This research was limited to investigating the current awareness of multimedia content, assess the challenges to manage multimedia content, assess the ICT development facility and investigate the role of multimedia content, multimedia digital library system in Ethiopian higher education. Lastly, the researcher developed a prototype for multimedia digital library.

Accordingly, the system covered at least item and archive management, collection classification and design, user management and setting configuration.

Generally the thesis include the statement of the problem of the study , objectives of the research, reviewed literature on the area, methods used to conduct the research, result obtained, discussion of the results, developed prototype. Lastly the thesis include conclusion of the research and recommendation.

1.5.Operational definition

Multimedia- computer information that can be represented through audio, video, and animation in addition to traditional media (i.e. text, graphics/ drawings, images).

Prototype- is a practices used to test explored visualize an example of the role of the future system.

Open source software- a software that is not perfect solution but gives developers and users the opportunity to modify functionality and create interface for integration with other software and applied for different areas.

Multimedia digital library- it is a digital library through which a user can access multimedia content.

Digital library- it is the electronic provision of digital documents in connection with online services, building on the tasks of a traditional library, which enables world wide access to its collection via the Internet (Arms, 2010).

Education- the process of teaching and learning usually at school, college or university.

Enhanced education: education with practical support, attractive

Omeka- it is free, flexible, and open source web publishing platform for the display of library collections and exhibitions of any collection format and fall at the crossroads of web content management system.

Higher education- is education at university or similar educational establishments, especially to degree level.

ICT Facility- include both hardware and software technologies

CHAPTER TWO

2. Literature review

2.1. Multimedia and its contents

Multimedia is an integration of multiple media elements (audio, video, graphics, text, animation and image) into one synergetic and symbiotic, while that results in more benefit for the end user than any one of the media elements can provide individually and it is the use of various types of media to create a presentation or an application which can be used for the purpose of broadcasting, entertainment, education and many other (Sanjaya et. al. 2009).

Educational institutions, Business, industry and military have recognized this potential and used computers as instructional tools. However, in the context of education, technology also refers to the process of applying the tools for educational purposes. In other words, "educational technology is a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and their related technologies" (Roblyer and Edwards, 2000).

2.2. Reason to use multimedia and multimedia content in education

According to Ellizabeth and Jess (2010), in the content of "computer age", the history of multimedia dates back to the year 1972, when the first video game ATARI was launched. Computers with multimedia features were introduced in the 1990's before that there was no technology capable of providing informative multimedia at an affordable cost. In its early days, multimedia technology was not very well received by the means of especially among skeptical number of the academia.

Educational institutions have recognized the potential and used computers as instructional tools. In the context of education, technology also refers to the process of applying the tools for

educational purposes (Robbyer and Edwards, 2000). With multimedia, the communication of the information can be done in effective manner and can be an effective instructional medium for delivering information (Neo and Neo, 2000).

Listron (2011) stated that with multimedia, the communication of information can be done in a more effective manner and it can be an effective instructional medium for delivering educational information. This is because it enables the teacher to represent the information in various media, i.e. via text, sound, animation, video and images. Barbara (2010) stated that, by incorporating multimedia in teaching and learning process, teachers can capture attention, engage learners, explain difficulty concepts, inspire creativity and have fun. According Barbara (2010), the main reason of using multimedia in a teaching and learning situation because of multimedia facilitate and develop a community of learner through online ice-breaker activity which offer fun and easy ways to get know each other while also proving outlet for student's activity. Multimedia help scaffold learning through activities enhanced by videos and online interactive and help students visualize difficult concept or procedure more easily by static or dynamic multimedia. For this Barabara (2010) used a software called screen steps, which allows the students to quickly create visual handout for learners and students also using software like Ting to record screen shot or video.

2.3. Multimedia and content in higher education

Multimedia means the use of various types of media to create a presentation or an application which can be used for the purpose of broadcasting, entertainment, education and many others by using various types of media, a presentation of information that uses multimedia technology is livelier, more dynamic and able to attract the attention of many users. And which most commonly defines as the use of at least two of media elements: sound (audio), and text, still

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graphics and motion graphics (visual) (Tannenbaum, 1998). According to Neo (2010), multimedia technology is vastly used in many fields and characterized by interactivity which is simple to use navigation which enable the users to control the sequence of concepts that they wishes to present and also multimedia has a feature of easy to understand and easy to use. Neo (2010) also stated five common media in multimedia system, namely text, graphics, animation, audio and video which all brought about tremendous change in the method of information disseminations, which are able to present real life situations and capable of attracting the attention and emotions of users. As Drave's (2000) suggested, the quality of interactivity is more important than content for the success in learning.

According to Malikand and Agarwal (2010), multimedia facilitates mastering basic skills of student by means of drill and practice. It helps in problem solving by means of learning, by doing , understanding, abstract, concepts, provide enhanced access for teachers, and students in remote locations, facilitate individualized and cooperative learning, helps in management and administration of classroom activities and learning content and simulate real life problem handling environments.

According to El Saddik et. al. (2010), the primary motivation for using multimedia technologies in education is the belief that they will support superior forms of learning.

2.4. Multimedia digital library

Multimedia digital library is a digital library through which a user can access multimedia content. According to Claudio and Ulrich (2010), recent advances in multimedia technology have radically changed information systems. One of such information systems is multimedia digital libraries. As they opined, multimedia digital library copes with the storage and retrieval of resources of different media such as video, audio, maps, images and text documents.

Multimedia digital library require metadata standards such as Dublin core, Metadata Object description schema (MODS) or metadata encoding and transmission (METS). They also need strength of extensible Markup language (XML) encoding schemas, related Document Type Definitions (DTD) and extensible stylesheet language (XSL) transformation between the non-traditional data streams and hypertext markup language (HTML) front-end (Sreekumar, 2010).

To build digital library, Sreekumar (2010) follow a philosophy of using open sources software, in order to avoid expensive license fees, and open source software allow developers and users to modify and tailor it to their own particular needs. As commercial software, open source software will not be perfect solution, but open software at least gives developers and user the opportunity to modify functionality and create interfaces for integration with other software (Nural and Pragya, 2009).
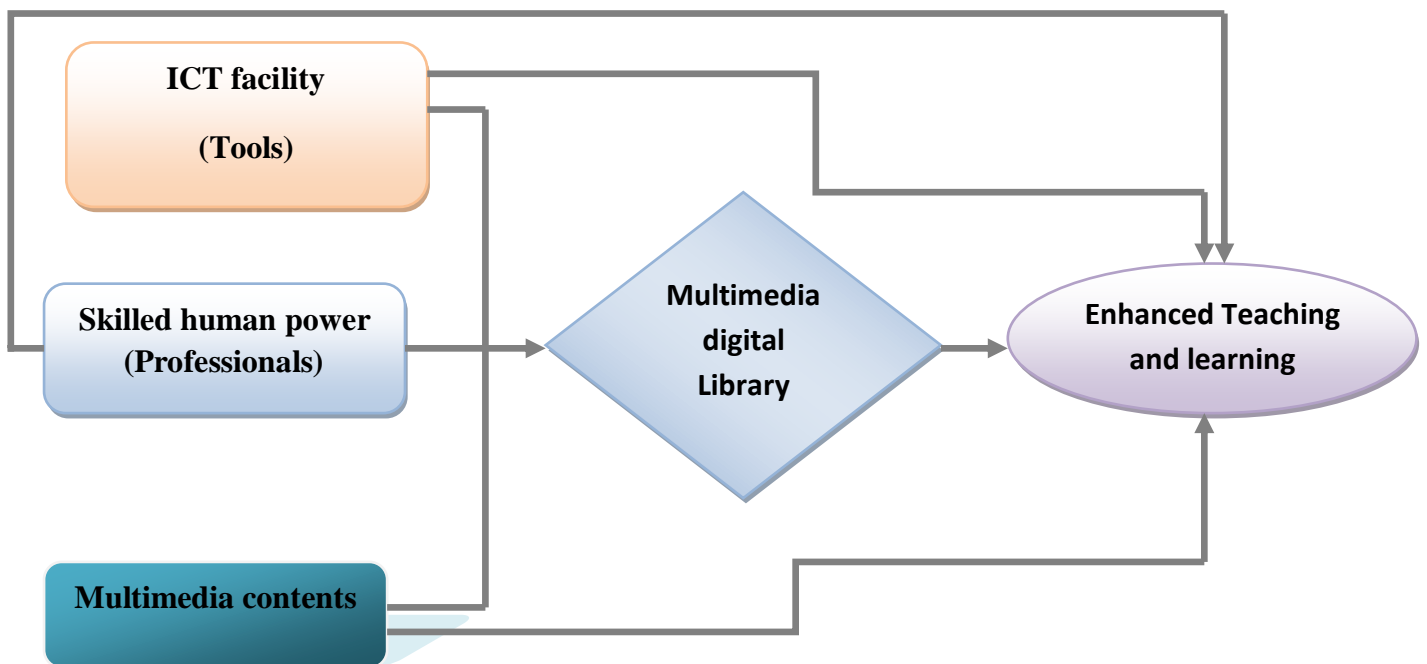
Figure 2.1. Conceptual framework of multimedia prototype adapted from literatures.

CHAPTER THREE

3.0. METHODOLOGY

3.1. Description of the study area

In Ethiopia there are 33 public universities from which 21 were formerly established and 12 were established recently. Twenty one of them are more experienced on developing and using ERMS and relatively advanced on the use based on their year of experience and practice. By using lottery method researcher selected two from both categories; from formerly established and currently established universities. Accordingly, the study was conducted on Metu University and Wolkite University from recently established universities and on Adama Science and Technology University and Jimma University from formerly established universities. By geographical location, Metu University is located in South West of Ethiopia, in Oromia regional state, Illubabor zone which is 500km from the capital city, Addis Ababa. Wolkite University is located in South West of Ethiopia in Southern Nation and Nationality regional state, Gurage zone about 200km from Addis Ababa. Adma Science and Technology University is located in Oromia regional state, East Shoa zone which is 90 Km from Addis Ababa and Jimma University is located in South West of Ethiopia in Oromia regional state, Jimma zone in Jimma town, at about 352KM from Addis Ababa.

3.2. Study design

The study adopted multiple data collection techniques include both qualitative and quantitative research and cross sectional survey research method was used. To develop a prototype, the researcher used Omeka web publishing open source software after qualitative and quantitative data was analyzed. To do that Linux operating system, Apache web server, MySQL database, PHP5 programming language, HTML, which all are embedded in Omeka. Omeka was used

because it can support a web content management system, library and archival repository and digital collections system, museum collection management and online exhibition system independently while others support separately. The study included investigating the current awareness and usage of multimedia content, assessing ICT facilities, assessing the education quality, investigating the major factor affecting the implementation of multimedia system, and investigating the extent of contribution of multimedia contents and multimedia digital library system and lastly to develop a prototype in higher education. The prototype covered creating archive, collections; identify users participating in system testing, setting of themes and management of plugins.

3.3. Population of the study

The study population was university staff and students. Staffs included librarian, IT professionals, whereas students included undergraduate, postgraduates (MSc and PhD students) in the selected four universities with a total population of 42545.

Table 3.1. Total population of the study in the selected four universities

No	University	Under graduates	Postgraduates	PhD	Staff profile	Total
1.	ASTU	15236	930	23	919	17108
2.	JU	18830	1290	30	1341	21491
5.	MU	1814	0	0	508	2322
7	WU	1462	0	0	167	1624
8	Total	37342	2220	53	2935	**42545**

Source: Ministry of education statistics annual abstract. November, 2013/2014 E.C

3.4. Sampling technique

There are a number of methods used to determine sample size of a study. The researcher used purposive sampling technique to select a sample size of 30 respondents from different professionals or experts who have knowledge about multimedia and multimedia content applications. Those respondents were IT professionals and librarians. And random sampling techniques was used to select 385 samples from others academic staff and students.

3.5. Sample size determination

The total populations identified for this study form selected universities were 42545. From this total number of populations, 37342 were undergraduate students, 2220 were postgraduate and 2935 were staffs. The sample size was thirty (30) respondents from different professionals or experts and 385 respondents from academic staff and students based on the following formula.

The sample size was determined using the statistical formula given below:

$$n = \frac{n_0}{1 + \frac{n_0}{N}} \qquad \text{Where } n_0 = \frac{Z_{\alpha/2}^2 pq}{d^2} \qquad \text{(Kothari, 2004)}$$

Where n = sample size

d= margin of error

N = total number of students

p= proportion of population

α= level of significance

q = 1-p

Where: d = 0.05

p = 0.5

α=0.05

$$n_0 = \frac{(1.96)^2 \times 0.5 \times 0.5}{0.05^2} = 385$$

By considering the population correction factor into account the sample size for each university look like the following

A. Adama Science and Technology University

$$n = \frac{17108 x 385}{42545} = 155$$

Sample size allocation (proportional allocation for undergraduate, postgraduate, PhD and staff)

$$n_1 = \frac{n * N1}{N}, \quad n_1 = \frac{155 \times 15236}{17108} = 138 \qquad \text{for under graduate students}$$

$$n_2 = \frac{n * N2}{N} \quad n_2 = \frac{155 \times 930}{17108} = 8 \qquad \text{for postgraduates (MSc)}$$

$$n_3 = \frac{n * N3}{N} \quad n_3 = \frac{155 \times 919}{17108} = 8 \quad \text{for staff}$$

$$n_4 = \frac{n * N4}{N} \quad n_3 = \frac{155 \times 23}{17108} = 1 \qquad \text{for PhD}$$

B. Jimma University

$$n = \frac{21491 X 385}{42545} = 195$$

Sample size allocation (proportional allocation for undergraduate, postgraduate, PHD and staff)

$$n_1 = \frac{n * N1}{N}, \quad n_1 = \frac{195 \times 18,830}{21491} = 171 \qquad \text{for under graduate students}$$

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$$n_2 = \frac{n * N2}{N} \quad n_2 = \frac{195 \times 1290}{21491} = 12 \qquad \text{for postgraduates (MSc)}$$

$$n_3 = \frac{n * N3}{N} \quad n_3 = \frac{195 \times 1341}{21491} = 12 \quad \text{for staff}$$

C. Wolkite University

$$n = \frac{1624 X 385}{42545} = 15$$

Sample size allocation (proportional allocation for undergraduate, postgraduate, PhD and staff)

$$n_1 = \frac{n * N1}{N}, \quad n_1 = \frac{15 \times 1462}{1624} = 14 \qquad \text{for under graduate students}$$

$$n_2 = \frac{n * N2}{N} \quad n_3 = \frac{15 \times 167}{1624} = 1 \quad \text{for staff}$$

D. Metu University

$$n = \frac{2322 X 385}{42545} = 21$$

Sample size allocation (proportional allocation for undergraduate, postgraduate, PhD and staff)

$$n_1 = \frac{n * N1}{N}, \quad n_1 = \frac{21 \times 1814}{2322} = 16 \quad \text{for under graduate students}$$

$$n_2 = \frac{n * N2}{N} \quad n_3 = \frac{21 \times 508}{2322} = 5 \quad \text{for staff}$$

3.6. Study variable

The study has both dependent and independent variable.

Dependent variable

- Improved teaching and learning process

Independent variable

- Usage of multimedia content

- Multimedia digital library

3.7. Data collection instrument and procedures

In order to carry out qualitative study, the researcher distributed closed and open ended questionnaire and to conduct qualitative study the researcher used personal observation and interview to allow the participants to discuss their opinions, views and experiences fully in detail. Interview was conducted with 8 purposively selected librarians and IT professionals. Participants were reminded of their right to withdraw from the study or terminate the interview at any time before commencing the session. The questionnaire was prepared in English.

The researcher conducted pilot study which consists 5 questionnaires for each academic staff and librarian and IT professionals 15 questionnaires for students for validity and reliability and made adjustment for the feedback before distributing the main questionnaire.

The researcher went to universities and collected participants data from students union and staffs profiles from human resource management to get the list of academic staff and professionals and went to registrar to get list of students which include undergraduate students, postgraduate and PhD students and the sample of size of each category was randomly selected based by using the order on which individual located to distribute a questionnaire. For the interview the library director and IT director was selected. For personal observation, the researcher used check list which has a list of services in the universities measured by availability and functionalities.

3.8. Data processing and analysis

After data collection, each questionnaire was checked visually for completeness and coding at the right margin of the questionnaire and the response to the question were also coded and

labeled by using Epidata software, version 3.1 for reliability and error free and exported to SPSS version 20. The final result was displayed using frequency tables and statements.

3.9. Prototype system testing and evaluation

Developed prototype has administrator and user end interface. Administrator interface and activities of administrator was evaluated and tested by 10 librarians to test usability. And 50 end users were used to evaluate and test user side of the prototype. The prototype tested and evaluated by using two types of testing method, system centered evaluation and user centered evaluation. System centered evaluation was used to evaluate the administrator part of the system to manage activities of collection developers whereas user centered evaluation used to evaluate user side of the system to manage the activities of users to access the items which include usability of the system.

3.10. Ethical statement

The proposed study findings should benefit and cause no harm to the participants and society. Privacy and confidentiality was maintained at all times, all findings were handled in a confidential manner and no personal or identifiable information was recorded or printed in the study. No names recorded during interviewing process and no audio recording and video capturing device was used.

The researcher respected the respondents' right and ensured informed consent completed before carrying out any interviews and distributing questionnaires. The researcher ensured a regular review of what the participants have given consent was carried out.

Before starting the data collection, consent was obtained from head of Jimma University department of information science. By submitting official letter from Jimma University,

informed verbal consent was secured for each study subjects. Each respondent was informed about the objective of the study and assurance of confidentiality.

CHAPTER 4

4.0 Results and Discussion

4.1. Results

Socio-Demographic Characteristics of the respondents

Table 4.1 Socio-Demographic characteristics of staff respondents

Characteristics	Frequency	%
University		
ASTU	9	39.1
JU	8	34.8
MU	4	17.4
WU	2	8.7
Gender		
Female	8	34.8
Male	15	65.2
Academic Status		
BSc/BA_degree	13	56.5
MSc_Degree	10	43.5
Year of Experience		
1-5 years	13	56.5
6-10 years	10	43.5

The above table, table 4.1 shows that the number of academic staff participated on the research. Accordingly, 39.1% (9) were from ASTU, 8 (34.8%) were from Jimma University, 17.4% (4) from Mettu University and 2 (8.7%) from Wolkite University from which 8 (34.8%) of respondents were females and 15 (65.2%) were males. Out of this participants 13 (56.5%) of respondents have BSc/BA degree and 10 (43.5%) have MSc degree. Again 13 (56.5%) of respondents have experience of 1-5 years and the rest 10 (43.5%) have 6-10 years of experience.

Table 4.2 Socio-Demographic characteristics of student respondents

Characteristics	Frequency	%
University		
ASTU	146	42.0
JU	176	50.6
MU	14	4.0
WU	12	3.4
Gender		
Female	68	19.5
Male	280	80.5
Academic Status		
BSc/BA_degree	288	82.8
MSc_Degree	59	17.0
PhD	1	0.3

As presented in table 4.2 out of 348 students, 146 (42.0%) were from ASTU, 176 (50.0%) were from Jimma university, 14 (4.0%) were from Mettu University and 12 (3.4%) were from Wolkite University according to proportion from sample of 358 (with response rate 97.20%). Out of this, 68 (19.5%) were females and 280 (80.5%) were males and 288 (82.8%) of the student respondents were BSc/BA students, 59 (17.0%) were MSc students and 1 (0.3%) PhD student.

Table 4.3 Socio-Demographic characteristic of librarian and IT professional respondents

Characteristics	Frequency	%
University		
ASTU	11	36.7
JU	12	40.0
MU	3	10.0
WU	4	13.3
Gender		
Female	4	13.3
Male	26	86.7
Academic Status		
BSc/BA_degree	21	70.0
MSc_Degree	9	30.0
Year of Experience		

1-5_years	20	66.7
6-10_years	7	23.3
11-15_years	1	3.3
16-20_years	2	6.7

The above table, table 4.3 shows the number of librarian and IT professional participated on the study. Accordingly, 11 (36.7%) of them were from ASTU, 12 (40.0%) were from Jimma University, 3 (10.0%) were from Mettu University and 4 (13.3%) were from Wolkite University from this, 4 (13.3%) of professionals were females and 26 (86.7%) were males. According to their education level, 21 (70.0%) have BSc/BA degree and 9 (30.0%) have MSc degree. As to year of experience, 20 (66.7%) of them have experience of 1-5 years, 7 (23.3%) have 6-10 year of experience, 1 (3.3%) have 11-15 year of experience and 2 (6.7%) have 16-20 year of experience.

4.1.2. ICT development and multimedia content

4.1.2.1. Academic staff response on ICT development and multimedia content

Table 4.4 Staffs response on status of ICT, multimedia content and multimedia digital library

Variable	*f*	*%*
Chance to access audio visual material		
No	23	100
Yes	0	0
Availability of digital librarian		
Yes	9	39.1
No	14	60.9
Took IT course or training		
Yes	22	95.7
NO	1	4.3
ICT facility		
Yes	22	95.7
No	1	4.3
Purpose of ICT		
Research	17	73.9
Project	7	30.4

Teaching	21	91.3
Communication	17	73.9
Entertainment	12	52.2
Frequency of Internet		
Everyday	16	69.6
1-3 days a week	5	21.7
Once a week	2	8.7
Internet Service		
ICT Lab	6	26.1
Office	18	78.3
Mobile	18	78.3
Home	3	13.0
Internet cafe	9	39.1
Difficulty of Internet Access		
Yes	3	13.0
No	20	87.0
Information sources		
Internet	23	100
CD-ROM	1	4.3
Databases	2	8.7
Library	14	60.9
E-library		
Favorite teaching materials		
Audio	4	17.4
Video	19	82.6
Text	15	65.2
Graphics	7	30.4
Animation	15	65.2
Image	14	60.9
Importance of Audio/visual materials		
Yes	22	95.7
No	1	4.3
Audio visual supoort		
Support lecture class	22	95.7
Support laboratory session	18	78.3
For advanced learning and teaching	22	95.7
Availability of Audio visual center		
Yes	2	8.7
No	21	91.3
Hearing new about world		
Through Internet	19	82.6
Through Radio	15	65.2
Through TV	19	82.6
From Research	6	26.1

From Articles	4	17.4
From Journals	4	17.4
Challenges to put practical learning		
Skilled human power	21	91.3
Infrastructure	8	34.8
Awareness about multimedia integration into curriculum	17	73.9
Resistance to new system	1	4.3

In table 4.4., results on the status of ICT development, multimedia content and multimedia digital library as responded by universities academic staffs is presented. Accordingly, all staffs (100%) didn't get a chance to access audio visual material in the library. And 14 (60.9%) believe that the library has no digital librarian and 9 (39.1%) of them believe the library has digital librarian. In respondents academic background 22(95.7%) of them took IT course or training whilst 1 (4.3%) didn't take. Of the respondents, 22 (95.7%) responded that their university has ICT facility from which 21 (91.3%) used for teaching whilst 7(30.4%) used to do a project. And 16 (69.9%) of the respondents use Internet every day whilst 2 (8.7%) use once a week and 18 (78.3%) of them get Internet service from office and mobile whilst 3 (13.0%) access Internet in home. Out of the respondents 20 (87.0%) feel no difficult whilst 3(13.0%) feel difficult to use Internet. Accordingly, 23 (100%) of respondents use Internet as information source. About 19 (82.6%) of the respondents access video whilst 4 (17.4%) access audio from Internet. And 22(95.7%) of staffs believe that audio visual materials are important for teaching and learning whilst 1 (4.3%) not, from which 22 (95.7%) of respondents believe that audio visual material support lecture class and help for advanced learning and teaching whilst 18 (78.3%) support laboratory session. From the respondents 21 (91.3%) said there is no audio visual center in their university. To know new about the world, 19 (82.6%) of staffs use Internet and TV whilst 4 (17.4%) use research and journals. Form this, it can be said that almost all respondents believed

in the importance of multimedia digital library and multimedia content and also the entire study participants confirmed that they did not get the chance to access audio-visual services in their respective universities.

4.1.2.2. Students response on ICT development and multimedia content

Table 4.5 student's response on status of ICT, multimedia content and multimedia digital library

Variable	*ƒ*	*%*
Chance to access audio visual material		
No	317	91.1
Yes	31	8.9
Source of learning materials		
E-library	148	42.5
Internet	301	86.5
Database	67	19.3
CD-ROM/DVD	83	23.9
Web document format		
Video	308	88.5
Animation	289	83.0
Graphics	97	27.9
Text	102	29.3
Audio	96	27.6
ICT facility		
Yes	343	98.6
No	5	1.4
ICT services		
Internet	336	96.6
Maintenance	138	39.7
E-learning	106	30.5
Digital library	50	14.4
Video conference	40	11.5
Purpose of Internet		
Education	325	93.4
Learning	261	75.0
Research	172	49.4
Project	226	64.9
Communication	231	66.4
Entertainment	176	50.6
Frequency of Internet		
every_day	178	51.1

1 -3 ays aweek	144	41.1
once_a week	26	7.5
Internet Service		
ICT Lab	274	78.7
Mobile	211	60.6
Home	27	7.8
Internet cafe	109	31.3
Internet connection speed		
Fast	29	8.3
Slow	47	13.5
Medium	259	74.4
Fair	13	3.7
Access time rate		
Excess	33	9.5
Enough	253	72.7
Little	60	17.2
too_little	2	.6
Excess	33	9.5
Information sources		
Internet	325	93.4
CD-ROM/DVD	44	12.6
Databases	49	14.1
Library	192	55.2
E-library	58	16.7
Access early program		
Yes	121	34.8
No	227	65.2
Enough library material		
Yes	56	16.1
No	292	83.9

The above table, table 4.5 shows, the status of ICT development, multimedia content and multimedia digital library as responded by the students. Accordingly, 317(91.1%) of the students didn't get a chance to access audio visual material in the library whilst 31 (8.9%) got a chance to access. As to the sources of materials 301 (86.5%) of the students said they use Internet whilst 67 (19.3%) use databases for learning materials. From Internet, 308 (88.5%) of the students accessed video, 289 (83.0%) visit animation, whilst 96 (27.6%) and accessed audio files. On ICT

facility 343 (98.6%) believed that their university has ICT services from which 336 (96.6%) said Internet service, whilst only 40 (11.5%) mentioned services for video conferencing.

As to the purpose of Internet use, 325 (93.4%) of the students use Internet for Education purpose whilst 176(50.6%) use Internet for entertainment. Out of the total student respondents 178 (51.1%) use Internet every day whilst 26 (7.5%) use once a week. With respect where they access Internet, the majority 274 (78.7%) access from ICT lab, 211(60.6%) from Mobile whilst 27 (7.8%) access in home. Accordingly, 259 (74.4%) of students believed that there is medium speed of Internet connection whilst 13 (3.7%) believed fair speed from which 253 (72.7%) said enough access rate whilst only 2 (0.6%) too little access time rate. About 325 (93.4%) said they use Internet whilst 44 (12.6%) use CD-ROM/ DVD as source of learning materials. About 227 (65.2%) of students could access materials of early program while the rest can access them. The majority 292 (83.9%) believed that their library has no enough materials. From this, it can be said that almost all respondents believed in the there was ICT facility which applied for Internet service and most of the students use Internet for education purpose that most students accessed multimedia content from the Internet. And they did not get the chance to access audio-visual services in their respective universities.

4.1.3. Role of multimedia content and multimedia digital library

4.1.3.1. Staff response on the role of multimedia content and multimedia digital library

Table 4.6 Staffs response on the role of multimedia content and multimedia digital library

Variables	Strongly disagree		Disagree		Undecided		Agree		Strongly agree	
	f	%	f	%	f	%	F	%	f	%
Multimedia content can facilitate and support teaching and learning activities	--	--	11	47.8	--	--	12	52.2	--	--
Audio/Visual materials provide better knowledge	--	--	10	43.5	--	--	13	56.5	--	--
Multimedia digital library can substitute theoretical teaching and learning	1	4.3	--	--	8	34.8	12	52.2	2	8.7
Multimedia digital library is compulsory for teaching and learning process.	8	34.8	--	--	1	4.3	14	60.9	--	--
Multimedia digital library support a teacher in a class and on practical session	9	39.1	--	--	3	13.0	11	47.8	--	--
Interactive material increase student's attention and success.	--	--	--	--	1	4.3	15	65.2	14	60.9
Multimedia digital library should be considered as central resource management	8	34.8	--	--	--	--	15	65.2	--	--
Multimedia Digital library help for resource preservation	8	34.8	15	65.2	--	--	--	---	---	--
Multimedia digital library reduce resource expense	3	13.0	--	--	4	17.4	16	69.6	--	--
Multimedia digital library support teaching and learning in class and outside the class	10	43.5	--	--	1	4.3	12	52.2	--	--
Multimedia digital library can fully support distance education	--	--	--	--	--	--	10	43.5	13	56.5

Numbers of questions were posed to the respondents on the role of multimedia content and multimedia digital library. As presented in table 4.6., 12 (52.2%) of the staff agreed that multimedia content can facilitate and support teaching and learning activities while 11 (47.8%)

disagreed. Majority 13 (56.5%) of respondents agree that audio visual materials provide better knowledge whereas 10 (43.5%) disagreed. Also 12 (52.2%) of staffs agreed that multimedia digital library can enhance theoretical teaching and learning whilst 1 (4.3%) strongly disagreed. Majority, 14 (60.9%) of the staffs agreed that multimedia digital library is compulsory for teaching and learning whilst And 11 (47.8%) of staffs agreed that multimedia digital library support teacher in a class and on practical session. On multimedia content, 14 (60.9%) of the staffs strongly agreed that interactive material increase students attention and success whilst 1 (4.3%) couldn't decided. Moreover, 15 (65.2%) agreed that multimedia digital library help for resource preservation whilst 1 (4.3%) could not decide. And also 13 (56.5%) and 43.5% (10) of the staffs strongly agreed and agreed that multimedia digital library can fully support distance education respectively. From this it can be said that most of the staffs agreed that multimedia content can support teaching and learning activities and increase students attention and success. Accordingly, it is possible to say that the way forward for distance education is multimedia digital library.

4.1.3.2. Students response on the role of multimedia content and multimedia digital library

Table 4.7 students' response on the role of multimedia content and multimedia digital library

Variables	Strongly disaagree		Disagree		Undecided		agree		Strongly agree	
	f	%	f	%	f	%	f	%	f	%
Multimedia content can facilitate and support teaching and learning activities	4	1.1	2	0.6	--	--	199	57.2	143	41.1
Audi/Visual material provide better knowledge	4	1.1	2	0.6	6	1.7	197	56.6	139	39.9
Multimedia digital library can enhance theoretical teaching and	4	1.1	6	1.7	33	9.5	182	52.3	123	35.3

learning									
Multimedia digital library support learning in class and practical session	6	1.7	5	1.4	29	8.3	171	49.1	137	39.4
Interactive material increase student's attention and success.	3	0.9	1	0.3	23	6.6	134	38.5	187	53.7
Multimedia digital library should be considered as central resource management	4	1.1	3	0.9	32	9.2	191	54.9	118	33.9
Multimedia Digital library help for resource preservation	3	0.9	3	0.9	23	6.6	195	56.0	124	35.6
Multimedia digital library reduce resource expense	2	0.6	3	0.9	57	16.4	147	42.2	139	39.9
Multimedia content help distance students to learn practical session	3	0.9	3	0.9	13	3.7	166	47.7	163	46.8
Multimedia digital library enables users to access resource through LAN and mobile phone	3	0.9	2	0.6	9	2.6	145	41.7	189	54.3

--: indicates no response

The above table, table 4.7 shows that, majority 199 (57.2%) of students agreed and 143 (41.1%) students strongly agreed that multimedia content can facilitate and support teaching and learning activities whilst only 2 (0.6%) disagree. And 197 (56.6%) of respondents agreed that audio visual materials provide better knowledge while 2 (0.6%) disagreed. Also 182(52.3%) of students agreed that multimedia digital library can enhance theoretical teaching and learning whilst 4 (1.1%) strongly disagreed. Accordingly, about half, 171(49.1%) of the students agreed that multimedia digital library support learning in class and practical session. On multimedia content, 187 (53.7) of the students strongly agree that interactive material increase students attention and success whilst 1 (0.3%) disagreed. Of the total respondents, 191 (54.9%) of the students agreed that multimedia digital library should be considered as central resource management whilst 3 (0.9) disagreed. Moreover, 147 (42.2%) of the students agreed and 139 (39.9%) of the students strongly agreed that multimedia digital library reduce resource expense

whilst 2 (0.9%) disagreed. And 166 (47.7%) of students agreed and 163 (46.8%) of the students strongly agreed that multimedia content help distance students to learn practical session. Again 189 (54.3%) of the students strongly agreed that multimedia digital library enables users to access resource through LAN and mobile phone. From the results obtained, it can be said that majority of the students were in favor of multimedia digital library as it plays positive roles in the teaching learning processes.

4.1.3.3. Professionals' response on the role of multimedia content and multimedia digital library

Table 4.8 Professional's response on the role of multimedia content and multimedia digital library

Variables	Strongly disaagree		Disagree		Undecided		agree		Strongly agree	
	f	%	f	%	f	%	f	%	f	%
Multimedia content can facilitate and support teaching and learning activities	1	3.3	--	--	--	--	15	50.0	14	46.7
Audio/Visual materials provide better knowledge	1	3.3	--	--	--	--	19	63.3	10	33.3
Multimedia digital library can enhance teaching and learning	1	3.3	--	--	1	3.3	16	53.3	12	40.0
Multimedia digital library is compulsory for teaching and learning processes.	1	3.3	--	--	1	3.3	21	70.0	7	23.3
Multimedia digital library support a teacher in a class and on practical session	1	3.3	--	--	1	3.3	19	63.3	9	30.0
Interactive material increase student's attention and success.	1	3.3	--	--	--	--	13	43.3	16	53.3
Multimedia digital library can serve as resource management	1	3.3	--	--	1	3.3	24	80.0	4	13.3
Multimedia Digital library enhance resource preservation	1	3.3	1	3.3	--	--	20	66.7	8	26.7
Multimedia digital library reduces resource expense	1	3.3	--	--	4	13.3	18	60.0	7	23.3
Multimedia contents are easy to	1	3.3	--	--	6	20.0	13	43.3	10	33.3

manage and use									
Multimedia digital library can fully support distance education	1	3.3	--	--	1	3.3	19	63.3	9	30.0
Multimedia digital library enable the users to access resource through LAN and mobile phone	1	3.3	--	--	2	6.7	20	66.7	7	23.3
Multimedia contents support practical/laboratory session	--	--	--	--	2	6.7	16	53.3	12	40.0
Multimedia digital library support teaching and learning in class and outside the class	--	--	--	--	1	3.3	13	43.3	16	53.3

The above table, table 4.8 indicates the response of library and IT professionals on the role of multimedia content and multimedia digital library. Accordingly, half, 15 (50.0%) of respondents agreed that multimedia contents can facilitate and support teaching and learning whilst 1 (3.3%) disagreed. Majority 19 (63.3%) of the respondents agreed that audio/visual materials provide better knowledge whilst 1 (3.3%) disagreed. Also 16 (53.3%) of the respondents agreed that multimedia digital library can enhance teaching and learning whilst 1(3.3%) disagreed. And 19 (63.3%) of the respondents agreed that multimedia digital library support a teacher in a class and on practical session whilst 1 (3.3) disagreed. Moreover, 16 (53.3%) of the respondents strongly agreed that interactive materials increase student's attention and success whilst 1 (3.3%) strongly disagreed. Majority 24 (80.0%) of the respondents agreed that multimedia digital library can serve as resource management whilst 1 (3.3%) strongly disagreed. About two-third, 20 (66.7%) of the professional respondents agreed that multimedia digital library enhance resource preservation. And 18 (60.0%) of respondents agree that multimedia digital library reduces resource expense whilst 2 (6.7%) strongly disagreed. Also 13 (43.3%), 10 (33.3%) of respondents agreed and strongly agree respectively that multimedia content are easy to manage and use whilst 1 (3.3%) strongly disagreed. Also 19 (63.3%) of respondents agreed that multimedia digital library can fully support distance education whilst 1 (3.3%) strongly

disagreed. Majority, 20 (66.7%) of respondents agreed that multimedia digital library enable the users to access resource through LAN and mobile devices. Also 16 (53.3%) of respondents strongly agreed that multimedia digital library support teaching and learning in class and outside the class. The result obtained from the librarians and ICT professionals on the role of multimedia content and multimedia digital library for teaching learning process is in line with that of the academic staff and students.

4.1.4. Challenges and techniques to implement multimedia digital library

Table 4.9 Challenges and Techniques to implement multimedia digital library

Challenges	Students		Staff		IT&Libraria	
	F	*%*	*F*	*%*	*F*	*%*
Lack of skilled human power	303	87.1	21	91.3	26	86.7
lack of proper infrastructure	91	26.1	8	34.8	16	53.3
Insufficient instructor's awareness to integrate multimedia content in the curriculum	209	60.1	17	73.9	20	66.7
Resistance to new system	109	31.3	1	4.3	8	26.7
Insufficient ICT facility in University	--	--	--	--	6	20.0
Techniques to manage multimedia content						
Provide training to professionals	--	--	--	--	30	100.0
Develop multimedia content management system	--	--	--	--	27	90.0
Use multimedia content compression techniques	--	--	--	--	26	86.7
Implement multimedia content development policy	--	--	--	--	25	83.3
Create awareness for users on multimedia contents	--	--	--		19	63.3

--: indicates no response

The above table, table 4.9 shows that the response of the respondents on the challenge and techniques to develop multimedia digital library and to manage multimedia content. Accordingly, vast majority 303 (87.1%) of the students, 21 (91.3%) of academic staff and 26 (86.7%) of librarians and IT professionals believe that lack of skilled human power is the number one challenge and insufficient instructor's awareness to integrate multimedia content in the

curriculum is the second challenge whilst others responded to insufficient ICT facility in University. For techniques to be used all librarian believed that training should be provided to professionals, 27 (90.0%) of librarians supported the idea of developing multimedia content management system, the rest inclined to the idea of using multimedia content compression techniques, implementing multimedia content development policy and creating awareness for users on multimedia content. Thus, it was found that skilled manpower is a bottle neck for the implementation and management of multimedia digital library.

4.1.5. Qualitative results

4.1.5.1. Interview results

Interview with the librarians

For the question on the availability of audio-visual, image and graphics materials, most of the respondents believed that they have audio visual materials which are embedded in the book. And sometimes, there were a time when multimedia content acquired through purchase and donation. However, they were limited to circulate the book only because they have not created system to handle multimedia contents. The reason mentioned for not doing so is lack of skilled human power and lack of attention to the library.

As to how they manage audio-visual materials, most respondent's idea is that audio visual materials in the library have no such designed management system but as separated from book, the content of the book came with CD was identified and labeled with the same classification number of book and other bibliographic description of the book. And the book is transported to shelf or stack whereas audio/visual part taken to temporary place where students and academic staff cannot access because the materials are not open to users. It may exist only in a single copy

or librarians also fear for the deterioration of the content, because audio visual materials contain the basic part of the book, like practical session, along procedures.

When the interviewees were posed with the question: what is the main subject of multimedia materials, the common response from respondents of four universities was that there were multimedia content for all subject even though there were difference in quantity. There were much multimedia content that came with books for medical subjects. Specifically, contains video, image, animation which support surgical procedure and physiological structure to teach students easily. For other subjects/ fields such as technology there were animation, graphics, image, video depend on the content of the books.

When asked about the future plan to enhance the services of multimedia content and if there are some initiatives already or not, all universities libraries have a plan to enhance the service of multimedia. They are thinking for both text digital library and multimedia digital library. Especially formerly established universities have planned as short term strategy to have multimedia digital library separately. There are initiatives to develop both text digital library and multimedia digital library. For text digital library the project has been started and for multimedia digital library there were a plan but waiting to overcome challenges.

On the role of ICT in their respective library, the respondents idea was, even though the development level of ICT is different, the status is good and has continuity to use. In recently established university libraries, there is Internet service in the library and users can access Internet besides other library services. For the future ICT service in the library, the respondents of the newly established University libraries said that in addition to Internet service, they are planning to start automation system and text digital library and also planned to enable multimedia content to be accessible by users via Internet. Formerly established universities

respondents said that Internet service in the library is a long time history, what they are doing now is to have central server on which multimedia content digital content can be loaded and accessed via already distributed line in the library.

With respect to the challenges to be faced if multimedia digital library is implemented, most respondents raised the challenge of skilled human power to implement multimedia digital library. The reason is that there was no frequent advanced training for librarians and no advanced learning on the area. Others raised the idea of academic curriculum in the country i.e., there was no program in this area to bring advanced library services. This is in line with the result obtained by quantitative study whereby the majority said there is lack of skilled manpower to implement multimedia digital library.

The interviewees were posed with the question on the ways they acquire multimedia content and most respondents said they acquired multimedia content with books, sometimes through donation and making a purchase depending on the subject of the materials. Some organization like WHO distribute their product via CD in the form of audio, video, animation, image and text.

On the techniques to manage/handle multimedia materials, most of the interviewees agreed that multimedia content management and service need special skills. To have such skill they believe frequent and advanced training and even to have advanced learning on the area is very important. Again they raised the idea of having a system to handle the content in order to provide services for the users.

Interview with IT professionals working in libraries

When asked on the importance of multimedia digital library in teaching and learning, most of the IT professionals agreed its importance and compare the system with the international. They opined that users can easily learn and practice from multimedia content at the absence of

teachers. They also believe the idea of using multimedia digital library to follow practical session of any subject and watch long procedure which cannot be given in the laboratory.

As to the role of ICT in teaching and learning in their respective university, most respondents raised the idea of Internet service in the library, developing library system such as automation system and digital library. Moreover, they raised the role of ICT in the class room such as smart class by using digital materials, multimedia contents in the class which simplify the work of teachers, enable the students to understand easily and they also raised ICT role as resource sharing.

With respect to the vision of ICT development in the university where they work for the purpose of teaching and learning, all respondents of each university have good vision of ICT development in their university. They viewed an opinion that university is woring on ICT to have ICT service in all sectors/departments. To have high speed Internet service and to have locally reserved central resource management that include learning and teaching resources by developing system in order to solve the problem of frequent interruption of Internet connection in the campus. According to the ICT professional's ideas, the users will access local resources any time in the campus. Both recently established and formerly established universities began to have local file server from where users can access teaching and learning materials within the campus. When the researcher raised the idea of having multimedia content, professionals responded that they have planned to have multimedia contents since today's users inclined to watch multimedia contents rather than text documents.

When asked to explain the current status of ICT to support multimedia, the respondents of formerly established universities agreed that their university has good level of development to support multimedia contents. And the future vision of the universities is to strengthen the ICT

status. Currently, formerly established universities have established ICT facilities with enough infrastructures and have a capacity to fulfill the needed one. According to the respondents, the university has high speed servers to handle multimedia content and they are working to have important infrastructure.

When it comes to the question about the challenges of to implement multimedia digital library, like the librarian all the respondents agreed on the existence of challenges such as lack of skilled human power, and lack of professionals who specialize in the area. As their ideas, lack of attention to the project may be a challenge since such kind of project need due attention. For such a challenge the respondents suggested that providing training to current professional and including the program in curriculum.

4.1.5.2. Personal observation

The researcher observed that, both currently and formerly established universities have their own institutional website as WAN and locally connected computer LAN network architecture.

The universities also have Internet connection and Internet services in ICT lab, office and wireless access point in many areas in the campus. For common service, the universities have ICT rooms (ICT pool) to give Internet service for all university community. And they have no central teaching and learning resources which results they have no multimedia content preservation system. Even though formerly established universities have started developing digital library, they have no multimedia digital library. The universities have no problem of computers and most of them have enough computers which were bought by universities and/or donated by donors.

4.2. Discussion

University libraries have multimedia content which were acquired mostly with books; embedded in books. Other mechanism is via purchase and donation. The mostly available format was Video files. Even though the libraries have multimedia content, users couldn't access the contents. This case is similar to the report of Oshinike and Adekunmsi (2012) in Nigeria, who reported that 65% of the respondents, a larger percentage had no access. University library in Ethiopia has a behavior of acquiring multimedia content in line with study conducted by (Neo and Neo, 2000), the advent of multimedia and multimedia technologies has changed the way educators teach and students learn. Multimedia application design offers new insights into the learning process of the designer and forces him or her to represent information and knowledge in a new and innovative way. It is found that Ethiopian university libraries have such vision to include multimedia content in their collections.

In line with the recent study conducted in Nigeria (Oshinike and Adekunmsi, 2012) most of the students and academic staff accessed/visited video files from Internet/web. They used multimedia content for laboratory session, to support class room learning and teaching.

In line with the thought of (Tapscott, 1998) that ICT (Information and Communication Technology) revolution is changing the world rapidly, and creating a generation that is media-hungry and technologically savvy. This new generation is using digital media for learning and communicating. Accordingly, ICT level in Ethiopian higher education reach high level and the vision for ICT also indicates such moment. The result of the study shows that there were ICT facilities in all universities. Among facilities, Internet facility takes the most room and the users used Internet mostly for education purpose. And most of the students used Internet every day from ICT lab and/or mobile and academic staff used Internet service from office and mobile

including laptop computer, the speed of Internet connection was medium and rate of access time was enough. Majority of the professionals believed that there is infrastructure to support multimedia contents and there is ICT facility for teaching and learning purpose to use multimedia content in the class. And universities brought the idea of using video conferencing to conduct classes. To interact with Internet service users didn't feel any difficulty. Most of the respondents (academic staff) had taken IT course and training in their education to use Internet easily. Most of the universities considered in the study signed an agreement with International organization to enlarge ICT level of development.

As university communities used multimedia content, there are ICT facility to handle multimedia content, easy to use Internet and multimedia content, in line with research conducted in Nigeria (Oshinike and Adekunmsi, 2012), there were no audio visual center or Multimedia digital library system in Ethiopian universities and there were no central database to handle multimedia content which come with books and acquired via purchase and donation. Because of the absence of digital library and audio visual center in the campus, the users couldn't access multimedia content.

According to the result of the present study and related studies, multimedia content and multimedia digital library contribute a lot in education. In line with (Neo and Neo, 2000) study, most of students and academic staffs (95.7%) agreed on the importance of multimedia content to support teaching and learning since the advent of multimedia and multimedia technology has changed the way educators teach and students learn. In line with the study of Neo (2010) graphics, animation, audio and video which all brought about tremendous change in the method of information disseminations, which are able to present real life situations and capable of attracting the attention and emotions of users, most staffs raised the importance of multimedia

content/ audio visual material to support lecture class, support laboratory or practical session. Moreover, similar to Malikand and Agarwal (2010) result, multimedia facilitates mastering basic skills of student by means of drill and practice session and others for advanced learning and teaching. And compared with these results, result of this research also indicated that multimedia contents help distance students to learn practical session since distance learner has no chance to get practical session, which is also in line with the results of Oshinike and Adekunmsi (2012).

Multimedia as an access to knowledge is one of the possibilities of information and communication technology that has tremendous impact on learning. Again in line with result of the study by Ahanger & Little (2008), distance education involves providing a user with instructional materials for self or group learning for geographically dispersed students. These students feel lack of interactive materials to understand the ideas and this can be solved by using multimedia content which demonstrate practical session for distance education students on what the regular students learned in the class. Multimedia content can facilitate and support teaching and learning activities as reported in Malikand and Agarwal (2010) finding, that is multimedia contents helps in problem solving by means of learning, by doing , understanding, abstract, concepts, provide enhanced access for teachers, and students in remote locations, facilitate individualized and cooperative learning, helps in management and administration of classroom activities and learning content and simulate real life problem handling environments and audio visual material provide better knowledge since there is high level of understanding. From the result of this study, most of respondents believe that interactive material increase student's attention and success. This result was similar with the result of Neo (2010) who reported that multimedia technology is vastly used in many fields and characterized by interactivity which is simple to use navigation which enable the users to control the sequence of concepts that they

wishes to present and also multimedia has a feature of easy to understand and easy to use and resulted multimedia contents are easy to use. The study conducted by Deborah (2010) on assessment of benefit of multimedia objects in the teaching of American history course revealed that, there is high degree of student interest, expand students understanding in using digital media and aided learning process, which is in line with this study result. If there are multimedia content, the staffs, professionals and students need multimedia media implementation to handle multimedia content and to get access to the content. Similarly, the result of this research indicates different contribution of developing multimedia content as well as when compared to other results of study.

Similar to the study and result of (Sreekumar, 2010), the need of multimedia content for education is high and to bring such collections to the learner and teachers, researchers designing and implementing multimedia digital library is important since it is compulsory for teaching and learning. As multimedia content is important to support practical session multimedia digital library can facilitate, simplify the way to present. According to the result and compared with the result of (JanSerrington & Ran Oliver, 2009), as multimedia content need preservation, multimedia digital library help as a tool to preserve multimedia content and considered as central resource management. As compared to the result of (Ahanger & Little, 2008) research result showed that multimedia digital library can fully support distance education and also support teaching and learning in class and outside the class. As indicate in the result Multimedia digital library can enhance theoretical teaching and learning in class. Therefore, the findings of this study lead to developing a prototype of multimedia digital library for Ethiopian higher education. However, it was found that there are challenges to manage multimedia content and implement/ put practical learning support in place such implementation of multimedia content management

system. It was revealed that the serious challenge was lack of skilled man power the finding which is in line with Oshinike and Adekunmsi (2012), because of lack of training. Again as a technique, providing training and implementing multimedia content management system was forwarded as a solution by present research and previously conducted research in Nigeria by Oshinike and Adekunmsi (2012).

4.3. Implementation of the prototype

4.3.1. Architecture of the prototype

Architecture defines how the system is defined, constructed; describe what the critical components were and how they fit together. For Omeka implementation after Omeka installed on the server with its all requirements such as Apache web server, MySQL database and PHP5 programming language, the user can access multimedia content from the server through local area network (LAN). Users browse the content by using keyword (tag), collection, collection category and item itself. Both users and administrator can be on the same side via cable or wireless. Administrator configures the system, add collections, and add items to the system whereas the end user (non administrator) browses contents.

General architecture of Omeka open source software application 0looks as figure 4.1 below
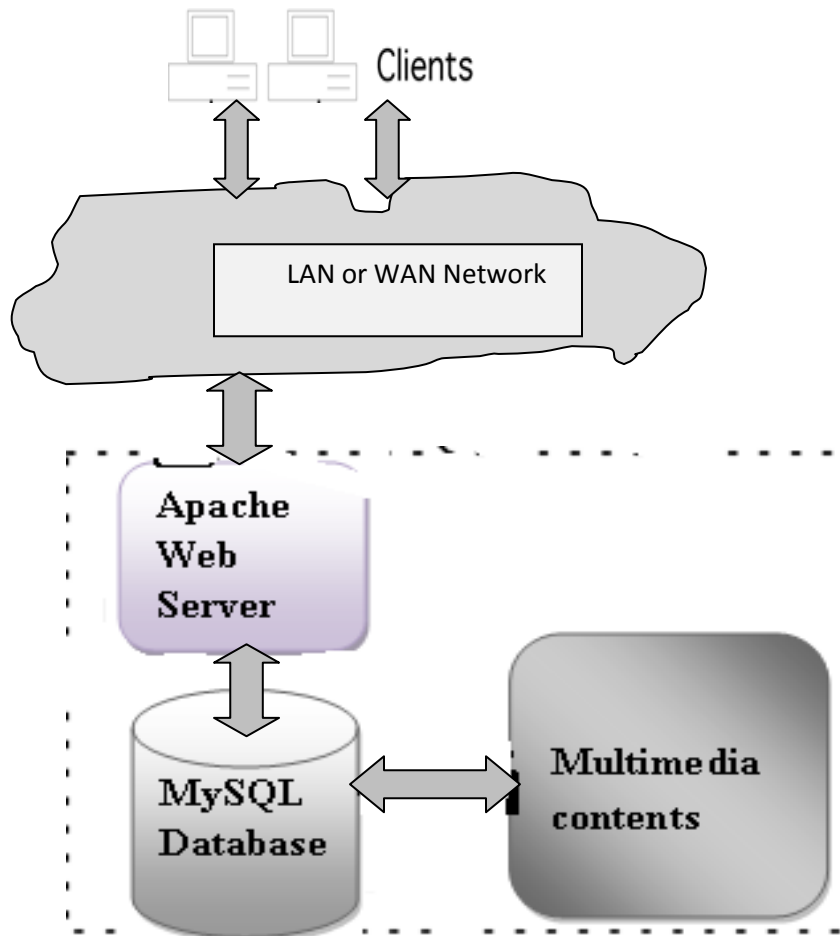
Figure 4.1: Omeka application architecture

4.3.2. Administrator user interface

In order to implement Omeka multimedia digital library prototype the administrator has to manage the system, add collections, add items, configure the interface to be available for the users. Administrator adds items/ collections by using Dublin core elements and the user uses those Dublin core elements to access the material. The interface by which administrator adds items/ collection showed on the following figures, figure 4.2 and figure 4.3.

Figure 4.2 Creating or browsing collection
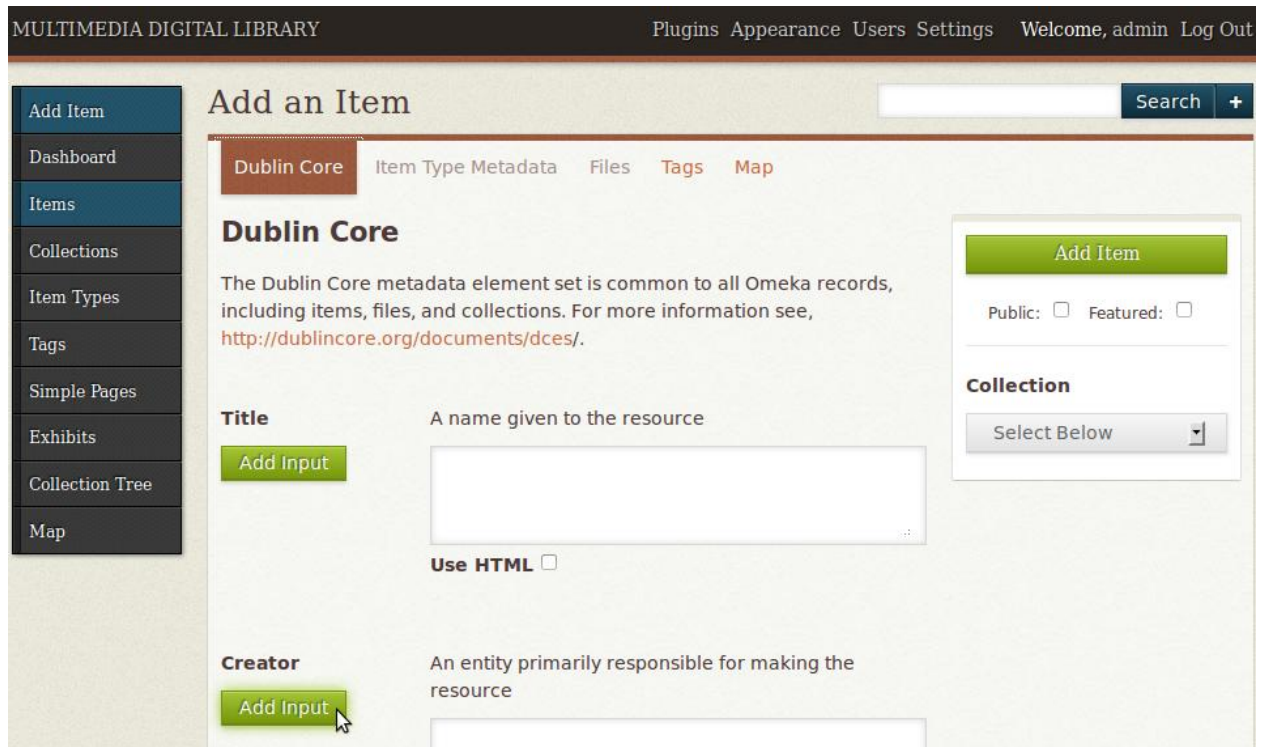
Figure 4.3 Add item to the collection

4.3.3. End user interface

End users can access collection or items from user interface by using interface links. These are items, collection and collection tree. By items users directly access the items, by collection users go through items by parent collection. And through collection tree users access the items when there are too many collection and items are there. Users use hierarchical way of accessing materials from the system.

Users can find the items from user interface by using collection control. This control take the end user to all collection included in the system. User can go to their specific collection search for items. The following figure, figure 4.4 shows created collection page of prototype.
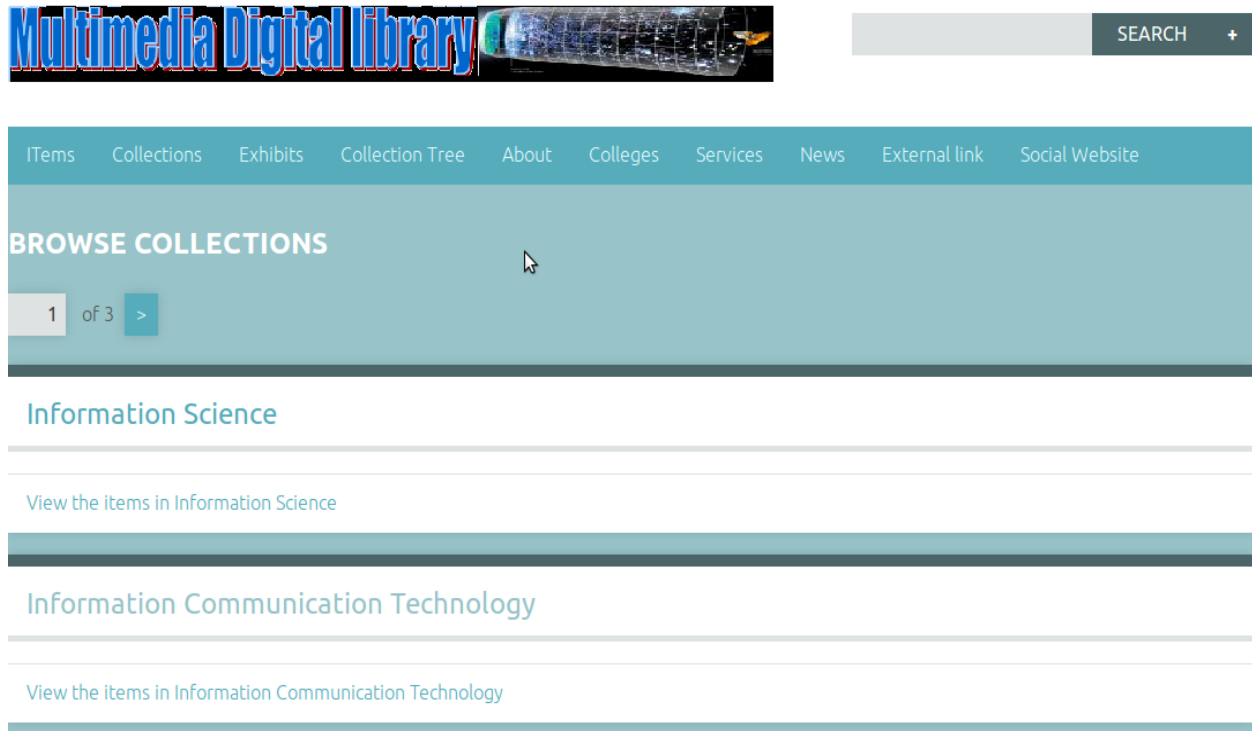
Figure 4.4: Created collection on user interface

Addition to collection control user can find the items by using collection tree which help the user to go through all collection in hierarchical form. This helps the users to get the items quickly and effectively. The following figure, figure 4.5 shows the interface on which user see collection tree/ hierarchy.
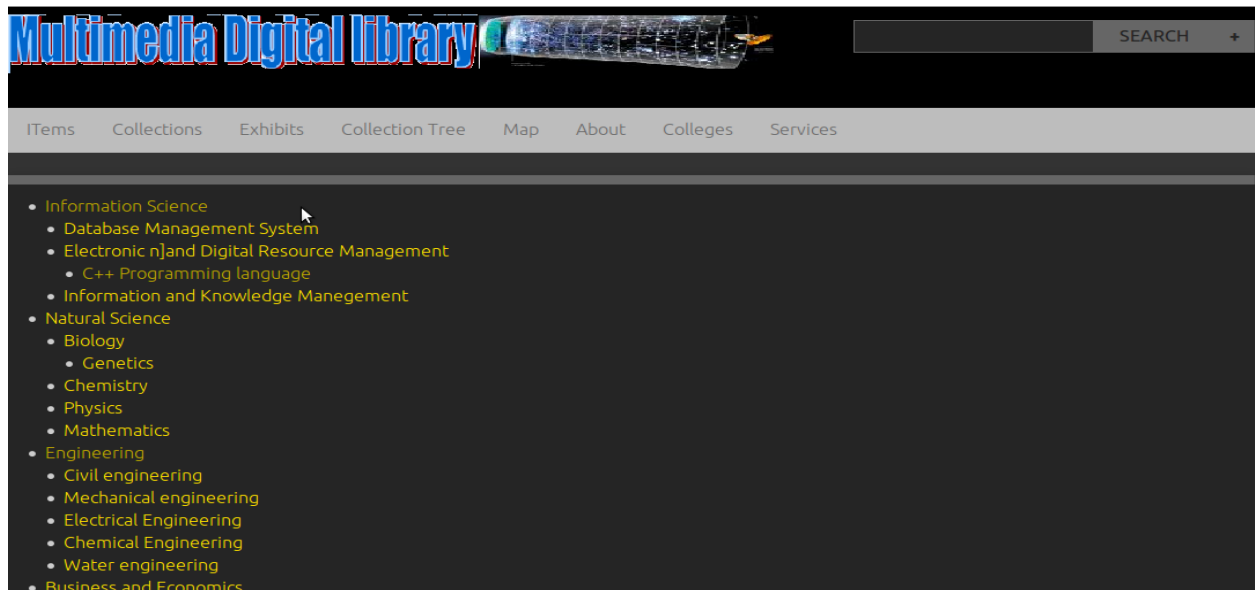
Figure 4.5: Collection hierarchy for end users

User can search items by using key word/ tag. Users can get keyword directly from the user interface or they can write their own keyword in search text box on the user interface. The following figure, figure 4.6 shows the search result by using keyword.
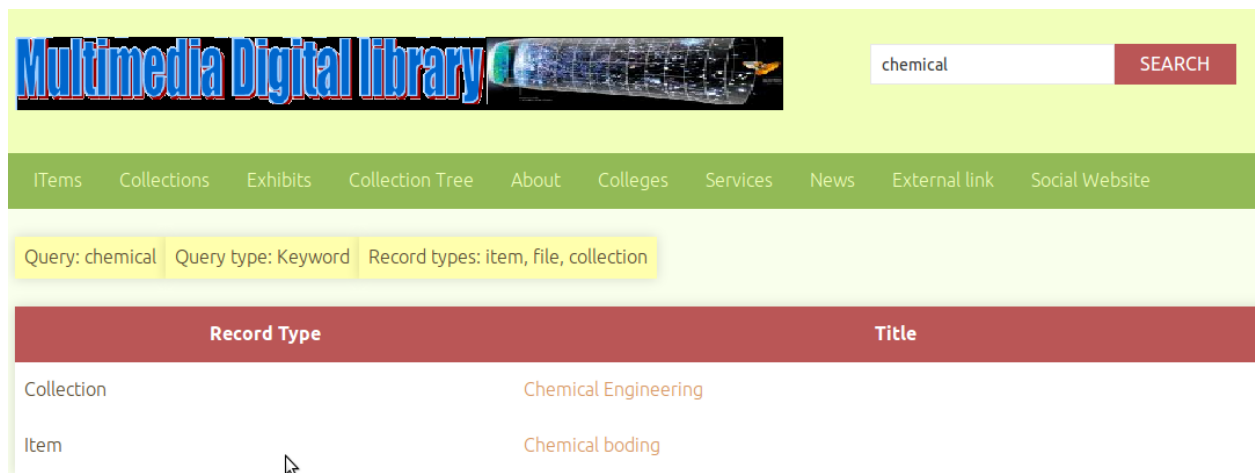
Figure 4.6: Omeka multimedia keyword search

4.3.4. Testing and evaluation of the prototype

4.3.4.1.System center evaluation

There are two types of system performance evaluation methods user centered evaluation and system centered evaluation. Both of the methods are used. To conduct system centered evaluation, the researcher used 20 multimedia content from which 10 of the contents were video, 10 of them were image. Those content added and easily accessible from user side, by browsing their collections, collection category and item themselves.

4.3.4.2.User acceptance testing or user center evaluation

User acceptance testing is a form of testing to verify if the system can support day to day business scenarios to validate the searching, browsing of items. Acceptance testing is independent of the system development process and performed by end users and stakeholders before formally implemented. Performing system acceptance testing depends on different user acceptance criteria like functionality, correctness, validation, verification, easy to use and user interface. The prototype showed to librarian to test the administrator side and to end users academic staff and students the user side of the system to test what the prototype can do including its user interface. Accordingly the researcher prepares 10 evaluation criteria for librarian to evaluate the work of administrator page, and 13 evaluation criteria to evaluate the activities and of user side of the system and.

The following table shows the analyzed data about user acceptance of the system which collected from the librarian.

Table 11: Librarian's response on evaluation of the system

No	Evaluation criteria	Status	*Frequency*	*%*
1	Learning to operate the system	Difficult	0	0
		Easy	10	100
2	Exploring new features by trial and error	Difficult	0	0
		Easy	10	100
3	Remembering names and use of commands/ buttons	Difficult	1	10
		Easy	9	90
4	Help message on the screen	Unhelpful	1	10
		Helpful	9	90
5	System speed	Too slow	1	10
		Enough	5	50
		Fast	4	40
6	System reliability	Unreliable	3	30
		Reliable	7	70
7	The system gives error message that clearly tell me how to fix problems	Strongly disagree	0	0
		Disagree	0	0
		Undecided	0	0
		Agree	6	60
		Strongly agree	4	40
8	Whenever I make a mistake using the	Strongly	0	0

		disagree		
system, I recover easily and quickly		Disagree	0	0
		Undecided	0	0
		Agree	3	30
		Strongly agree	7	70

From table, table 11 above the librarian feel no difficult operate the system as administrator and they could explore new features by trial and error. And 9 (90%) of librarian remember the names and use of commands/ buttons on the interface. While operation 5 (50%), 40 (40%) said the speed of the system is enough and fast respectively from which 7 (70%) inclined to that system is reliable. And 6 (60%) of librarian agreed, 4 (40%) strongly agreed that they system gives error message how to fix problems from which 7 (70%) of them agreed, 3 (30%) of them strongly agreed that whenever they make a mistake during using the system, they recover easily and quickly. From this it can be said that, librarian can easily manage the administrator side of the system easily.

The following table, table 12 shows the analyzed data about user acceptance of the system which collected from the respondents/ end users.

Table 12: End user response on evaluation of the system

No	Evaluation criteria	Stongly disagree	disagree	Undecided	Agree	Strongly disagree
1	Overall, I am satisfied with how easy it to use this system.	0	0	1 (2%)	47(94%)	2(4%)
2	It was simple to use this system	0	0	1(2%)	45(90%)	4(8%)
3	It can effectively follow my education using this system	0	0	0	33(66%)	17(34%)
4	I am able to get resource I want quickly	0	0	1(2%)	28(56%)	21(42%)
5	I feel comfortable using this system	0	0	1(2%)	28(56%)	21(42%)
6	It was easy to learn to use this system	0	0	2(4%)	28(56%)	20(40%)
7	I believe I became productive quickly using this system	0	0	2(4%)	26(52%)	22(44%)
8	The system can provide additional information	0	0	0	31(62%)	19(38%)
9	The organization of the system screens is clear	0	0	0	28(56%)	22(44%)
10	The interface of this system is pleasant	1(2%)	0	2(4%)	28(56%)	19(38%)
11	I like using the interface of this system	0	0	3(6%)	25(50%)	22(44%)
12	The system has all the functions and capabilities I expect it to have	0	0	2(4%)	29(58%)	19(38%)
13	Overall, I am satisfied with this system	0	0	2(4%)	34(68%)	14(28%)

From table, table 12 above 47 (94%) of the users satisfied with how easy the system to use by which 45 (90%) of the users agreed that the was simple to use. 33 (66%) of users agreed that the

system follow their education they able to got the resource they want quickly. 28 (56%) of users agreed, 21 (42%) of user strongly agreed that they feel comfortable to use the system and it was easy to use and learn. Addition to multimedia content, 31 (62%) of user agreed and 19 (38%) strongly agreed that the system can provide additional information. Two third of users agreed that organization of the system screen was clear and interface of the system was pleasant and liked to use it. And 29 (58%) of users agreed and 19 (38%) of users strongly agreed that they system has all functions and capabilities they expected to have. As overall, 34 (68%) of users agreed and 14 (28%) strongly agreed that users were satisfied with the system. From this it can be said developed prototype was easy to use and accepted by users.

CHAPTER 5

5.0.Conclusion and Recommendation

5.1.Conclusion

The study revealed that, multimedia content can accelerate and enhance teaching and learning in higher education. Interactive materials enable user to understand better than theoretical learning. For this all university library has multimedia content and can easily acquire but there is lack of skilled human power to manage the content. Even though there were challenges to handle multimedia content, the universities have good ICT facility to handle multimedia content and the vision of the universities on ICT facility made the system easy. As a solution to the challenges, providing training, providing advanced learning for librarian, developing multimedia content management system was the solution. Among the system multimedia digital library is the former. Currently there is no multimedia content management system in all universities but as important it provides a lot. To initiate, the researcher developed a prototype by using Omeka open source software for multimedia digital library. The research lacks implementation but which open a door to the future.

5.2.Recommendation

➢ The library should develop multimedia collection development policy to acquire multimedia content as it acquires other hard copy materials.

➢ The library should provide continuous training to librarian on how manage multimedia content.

➢ Adequate, competent and experienced ICT technical staff and librarian should be available.

➢ The library should provide a habit of locating multimedia content to the users.

➢ The universities should pay attention to library development. The university should highly support library based projects.

➢ The universities should work on ICT development which facilitates internal service such as local file server than directly connecting Internet.

➢ The university should implement multimedia digital library to enhance teaching and learning process and to preserve multimedia contents.

➢ The libraries should acquire multimedia content to support teaching and learning.

➢ The libraries should develop multimedia content locally.

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APPENDICES

Appendix A: Research Questionnaire

<div align="center">

Jimma University

College of Natural Sciences

Department of Information Sciences

</div>

Questionnaire for librarians and IT professionals

Dear respondent

I kindly request you to participate on this research that aims "Developing multimedia digital library for the enhancement of teaching and learning process in Ethiopian Public Universities." The main principle is to facilitate interactive teaching and learning materials access to higher education staffs and students using multimedia digital library which comprises multimedia contents; audio, video, image, graphics, animation rather than text based materials.

The research focus on your need to multimedia content, use of multimedia content and current status of ICT and Multimedia content usage in your area. Your views are highly valuable regardless of whether you already have experience with multimedia content usage, multimedia digital library or not. Result from this response form a crucial component of this research and will provide important input to design and develop a model for implementation in multimedia digital libraries. Your answer will be treated with high confidentiality and the data will be transferred to third party for another purpose.

I appreciate the value of your views. Please do not hesitate to contact me for clarification on any aspect in this questionnaire at the following address.

Mr. Regasa Alemu

MSc student (University of Jimma)

E-mail: regasaalemu@yahoo.com

Mobile No.:+251-910740243

Section A: General information

The following questions are for classification purpose only. They will not be used to identify any individual. Please fill in only one response per question.

1. Which university are you from?

    Adama University (ASTU) ☐   Jimma University ☐

    Wolkite University ☐   Metu University ☐

2. What is your gender?   Male ☐   Female ☐

3. Please select your academic status

    BA/BSc degree ☐   Master's Degree ☐   Doctorate degree (PhD) ☐

    Diploma ☐   others, please specify……………………

4. Year of service in Higher Institution/work experience

    1-5years ☐   6-10years ☐   11-15years ☐   16-20years ☐   above 20years ☐

Section B: Status of ICT development in library, Multimedia content and Multimedia digital library

1. To what extent you agree or disagree with the following statements regarding ICT facility in your library, multimedia content, Multimedia digital library.

    Thus   1= strongly disagree,   2 = disagree, 3 = are undecided,   4 =, agree 5 = strongly agree

	Statements	1	2	3	4	5
1	My library has multimedia contents (audio, video, graphics…)					
2	There is Internet service and connection in the university					
3	There is multimedia digital library					
4	There is multimedia content preservation system					
5	There is ICT infrastructure to support multimedia contents					
6	There is central database to handle multimedia content					
7	There is ICT facility for teaching and learning to use multimedia					

	content in the class					
8	There is video conferencing facility in my university					

2. What multimedia contents are available in your library? (You may tick (√) one or more answers)

Audio ☐   Image ☐

Video ☐   Games ☐

Graphics ☐   Simulators ☐

Animation ☐

3. What multimedia content development activities are available?

Conversion to digital content ☐

Local digital content development ☐

None ☐

4. What acquisition method you use to build multimedia contents?

Purchase ☐

Donation ☐

Exchange ☐

Subscription ☐

Embedded in books ☐

None

Section C: Challenges and techniques to manage and implement multimedia digital library

1. What do you think are the challenges to your university to put practical learning support in place?
    (You may tick (√) one or more answers)

    Lack of skilled human resource ☐

    Lack of proper Infrastructure   ☐

    Insufficient instructors' awareness to integrate multimedia content in the curriculum   ☐

    Resistance to new system or technology ☐

    Insufficient ICT facility in University ☐

2. What do you think can be a techniques to manage multimedia contents (You may tick (√) one or more answers)

    Provide training to professionals ☐

    Develop multimedia content management system ☐

    Use multimedia content compression techniques ☐

    Implement multimedia content development policy☐

    Create awareness for users on multimedia contents ☐

    Others, please specify …………………………………………………..

Section D: Role of multimedia content and multimedia digital library

1. Please indicate the extent to which you agree or disagree with each of the following statements regarding multimedia content usage and multimedia digital library in your institution

    Thus 1= strongly disagree,   2= disagree, 3 = are undecided,   4 =, agree 5 = strongly agree

	Statements	1	2	3	4	5
1	Multimedia content can facilitate and support teaching and learning activities					
2	Audio/Visual materials provide better knowledge					
3	Multimedia digital library can enhance teaching and learning					
4	Multimedia digital library is compulsory for teaching and learning processes.					

5	Multimedia digital library support a teacher in a class and on practical session					
6	Interactive material increase student's attention and success.					
7	Multimedia digital library can serve as resource management					
8	Multimedia Digital library enhance resource preservation					
9	Multimedia digital library reduces resource expense					
10	Multimedia contents are easy to manage and use					
11	Multimedia digital library can fully support distance education					
12	Multimedia digital library enable the users to access resource through LAN and mobile phone					
13	Multimedia contents support practical/laboratory session					
14	Multimedia digital library support teaching and learning in class and outside the class					

Questionnaire for Academic staffs

Section A: General information

The following questions are for classification purpose only. They will not be used to identify any individual. Please fill in only one response per question.

1. Which university are you from?

   Adama University (ASTU) ☐   Jimma University ☐

   Wolkite University ☐   Metu University ☐

2. What is your gender? Male ☐   Female ☐

3. Please select your academic status

   BA/BSc degree ☐   Master's Degree ☐   Doctorate degree (PhD) ☐

   Diploma ☐   others, please specify……………………

4. Year of service in Higher Institution/work experience

   1-5years ☐   6-10years ☐   11-15years ☐   16-20years ☐   above 20years ☐

Section B: Status of ICT development, Multimedia content, Multimedia digital library and others in your area.

5. Have you got a chance to access audio visual content in your library? Yes ☐   No ☐

6. Is there professional digital librarian in your university? Yes ☐   No ☐

7. Have you taken IT course/training in your educational background? Yes ☐ No ☐

8. Is there ICT facility in your university? Yes ☐   No ☐

9. If yes for question 8, for what purpose do you used it? You may tick (√) more than one choice

   Research ☐   Communication ☐

   Project ☐   Entertainment ☐

   Teaching ☐   Others, please specify……………

10. How often do you use Internet service?

    Every day ☐   Once a week ☐

    1-3 days a week ☐   Never ☐

11. From where do you access Internet? You may tick (√) more than one choice

ICT lab ☐   Home ☐

Office ☐   Internet cafe ☐

Mobile phone ☐

12. Do you have difficulty to use Internet? Yes ☐   No ☐

13. What are your mostly consulted information sources for your need? You may tick (√) more than one choice

Internet ☐   Library ☐

CD-ROM/DVD ☐   E-library ☐

Databases ☐   Others, please specify

14. What do you think are the challenges to your university to put practical learning support in place? You may tick (√) more than one choice

Skilled human resource ☐

Infrastructure ☐

Awareness about multimedia integration into the curriculum ☐

Resistance to a new system technology ☐

Others, please specify…………………………………

15. What is your favorite teaching material you mostly visited/used on the web? You may tick (√) more than one choice

Audio ☐   Graphics ☐

Video ☐   Animation ☐

Text ☐   Image ☐

16. Do you think audio visual materials are important to support your teaching activities?

Yes ☐   No ☐

17. If yes for question 14, how does it support? You may tick (√) more than one choice

Support lecture class ☐

Support laboratory session ☐

For advanced learning and teaching ☐

Others, please specify…………………………………………………..

18. Is there audio visual center in your university? Yes ☐   No ☐

19. If yes, have you access to resources? Yes ☐   No ☐

20. How do you get information about new technology in our world? (you may tick one or more answers)

Through Internet ☐

Through Radio ☐

Through TV ☐

From Research ☐

From articles ☐

From Journals ☐

21. How do you improve your education to adapt with rapidly changing technology?

Participate training ☐

Learning in advance ☐

Reading books, journals and articles ☐

Access multimedia contents ☐

Others please specify……….

Section C: **Role of multimedia content and multimedia digital library**

Please indicate the extent to which you agree or disagree with each of the following statements regarding multimedia content usage and multimedia digital library in your institution

Thus   1= strongly disagree,   2 = disagree, 3 = are undecided,   4 =, agree 5 = strongly agree

	Statements	1	2	3	4	5
1	Multimedia content can facilitate and support teaching and learning activities					
2	Audio/Visual materials provide better knowledge					
3	Multimedia digital library can substitute theoretical teaching and learning					
4	Multimedia digital library is compulsory for teaching and learning process.					
5	Multimedia digital library support a teacher in a class and on practical session					
6	Interactive material increase student's attention and success.					
7	Multimedia digital library should be considered as central resource management					
8	Multimedia Digital library help for resource preservation					
9	Multimedia digital library reduce resource expense					
10	Multimedia contents are easy to manage and use					
11	Multimedia digital library support teaching and learning in class and outside the class					
12	Multimedia digital library can fully support distance education					

Questionnaire for Students

Section A: General information

The following questions are for classification purpose only. They will not be used to identify any individual. Please fill in only one response per question.

1. Which university are you from?

   Adama University (ASTU) ☐   Jimma University ☐

   Wolkite University ☐   Metu University ☐

2. What is your gender?

   Male ☐   Female ☐

3. What is your education level?

   Undergraduate (MA/BSc) ☐   MSc ☐   PhD ☐

Section B: Status of ICT development, library and Multimedia content in your area.

1. Have you got a chance to access audio visual content in your library? Yes No

2. From where do you access learning material? You may tick (√) more than one choice

   e-library ☐   CD-ROM/DVD ☐

   Internet ☐   Others, please specify………..

   Database ☐

3. Which type of document do you mostly access on the web (You may tick (√) more than one answer)

   Video ☐   Text ☐

   Animation ☐   Audio ☐

   Graphics ☐

4. Is there ICT facility in your university? Yes ☐   No ☐

5. If yes, what are the basic services provided? You may tick (√) more than one answers

   Internet ☐   Digital library ☐

   Maintenance ☐   Video conferencing ☐

   E-learning ☐   Others, please specify

6. For what purpose do you mostly use Internet in your university? You may tick (√) more than one answer

   Education ☐   Learning ☐

Research ☐   Entertainment ☐

Project ☐   Others, please specify…………..

Communication☐

7. How often you use Internet service?

Every day ☐   Once a week ☐

1-3 days a week ☐   Never ☐

8. From where do you access Internet? You may tick (√) more than one choice

ICT Lab ☐   Mobile ☐   Home ☐   Internet café ☐

9. What is the current status of Internet connection speed in your university?

Fast ☐   Medium ☐

Slow ☐   Fair ☐

10. How do you rate the access time of Internet?

Excess ☐   Enough ☐   Little ☐   Too little ☐

11. What are your mostly consulted information sources for your need? You may tick (√) more than one answers

Section C: Dear respondent this section is about the importance of multimedia content and Multimedia digital library.

Please indicate the extent to which you agree or disagree with each of the following statements regarding multimedia content usage and multimedia digital library in your institution. Tick (√) your choice.

Thus   1= strongly disagree,   2 = disagree, 3 = undecided,   4 =, agree 5 = strongly agree

	Statements	1	2	3	4	5
1	Multimedia content can facilitate and support teaching and learning activities					
2	Audi/Visual material provide better knowledge					
3	Multimedia digital library can enhance theoretical teaching and learning					
4	Multimedia digital library support learning in class and practical session					
5	Interactive material increase student's attention and success.					
6	Multimedia digital library should be considered as central resource management					
7	Multimedia Digital library help for resource preservation					
8	Multimedia digital library reduce resource expense					
9	Multimedia contents are easy to manage and use					
10	Multimedia content help distance students to learn practical session					
11	Multimedia digital library enables users to access resource through LAN and mobile phone					

APPENDIX B: Research Interview

Interview question for librarian

1. How do audio/ visual, image, graphics materials are available in your library?

2. How do you manage audio/visual materials?

3. What is the main subject of multimedia materials?

4. What is your future plan to enhance library services?

5. What is the role of ICT in your library?

6. What do you think will be a challenge if multimedia digital library is implemented?

7. How do you acquire multimedia content?

8. What are the techniques you mostly use to manage/handle multimedia materials?

Interview question for IT professionals

1. How multimedia digital library is important in teaching and learning?

2. What are the role of ICT in teaching and learning in your University?

3. What are the vision of ICT development in your university for teaching and learning?

4. What is the status of ICT to support multimedia content?

5. What are the challenges to implement multimedia digital library?

6. What is the function of designing a prototype before implement particular system?

Appendix C: Observation checklist

Universities	Jimma University		Wolkite university		Adama university		Mettu University	
Observations	Availability	Functionality	Availability	Functionality	Availability	Functionality	Availability	Functionality
Intranet								
Organizational website								
Computers								
LAN								
Internet connection								
Multimedia contents								
Multimedia Digital library								
Central teaching and learning resource								
Internet rooms								
Multimedia content preservation system								
ICT facility to support teaching and learning in a class by using multimedia content								