UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS
Master of Science Information Systems
Research Project

Project Title: Towards the Development of a Framework for Open Courseware for Public Universities in Kenya.

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P56/71357/2007

Presented in partial fulfillment of the requirements of the award of the Degree of Master of Science in Information Systems

DECLARATION

I, **Kinoti Patrick** do declare that this piece of research project is entirely my own and where there's work or contributions of other individuals, it has been dully acknowledged and also that to the best of my knowledge this research work has not been carried out before or previously presented to any other education institution in the world for similar purposes on any forum.

Signature..... Date..14/4/10.....

Kinoti Patrick

P/56/71357/2007

This research project has been submitted for examination with my approval as the University supervisor.

Signature..... Date..14/4/10.....

Dr E Omwenga

University of Nairobi

DEDICATION

To my dear wife Angel and son Sos.

ACKNOWLEDGEMENTS

Many people have offered assistance during this Msc project and I cannot name all of them here. A number of people come to mind when I look back.

My sincere gratitude goes to the supervisor Dr E Omwenga for constant guidance, positive criticisms and above all his viable suggestions and priceless advice that was very important and which tremendously contributed to the successful writing of this report.

This work would not been possible without the constructive criticisms of Prof Rodrigue, Mr D Orwa, Mr Ruhui, Mutahi Theuri ,Prof Okello-Odongo and Mrs Muthoni Masinde. Your inputs during the proposal and progress presentations were most invaluable .It is these that kept me on course. I am especially indebted to C Moturi for the final review of my project report and his subsequent guidance.

I also want to recognize the contributions of the Course Coordinator Christopher and E.Miriti, the entire staff of the School of Computing and Informatics, University of Nairobi, Dr Ndege Kenyatta University and Prof Kangethe of JKUAT.

In addition, I would also like to extend my gratitude to all respondents who endured time and again in responding to my interviews and questionnaires distributed and for their patience and cooperation.

I also wish to acknowledge all my classmates with whom we brainstormed and worked towards the successful accomplishment of this task. Special thanks go to Shem Mbandu, Dorothy Nzou and Charles Katua all of the MSc IS (11) class.

Finally, I pay a multitude of thanks to the Almighty Lord for according me an outstanding opportunity to undertake such a challenging project.

ABSTRACT

Open Courseware (OCW) refers to university course materials which may includes lecture notes, presentations videos, syllabi and course outlines that are shared for free on the web. Open courseware concept has gained popularity especially in developed countries. However, this is not the case with developing nations such as Kenya. OCW provides opportunity for less developed nations Kenya included for increasing more ways to learn and research for its citizens. A number of underlying factors seem to hamper any effort towards this direction. It is for this reason that this has become an interesting topic of research.

The purpose of the study was to develop a framework for implementation of open courseware for Kenyan public universities. Towards achieving this goal, the research set to investigate the factors that discourage or/and encourage open courseware in Kenyan public universities and what needs to done to improve the implementation.

Through the guidance of African Virtual University (AVU) framework of Open Education Resource (OER) model, a survey was conducted on three public universities to find out the factors influencing implementation of Open courseware in public universities of Kenya. Data was collected through questionnaires administered to students, lecturers and university administrators, although interview and observation were also used to gather information. In total 630 questionnaires were distributed to the three public universities 522 valid responses were received. The result of survey was used to propose a framework for open courseware suitable for Kenyan public universities situation. The framework was validated by use of data collected from 91 students, 23 lecturers and 8 university administrators across the three public universities.

The findings of study uncovered extent of popularity of open courseware in Kenyan public universities and the range of issues that affects implementation of open courseware. The study was also able to explore the readiness of public universities to offer open courseware in terms of available ICT infrastructure and human capacity. The findings show some significant factors that influence implementation of open courseware in public universities of Kenya. The study further provides a generic framework for implementation of open courseware in Kenyan public universities and can be utilized by other universities in developing nations as guide of open courseware implementation. The major limitation of the study was that it only concentrated on the public universities of Kenya.

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Chapter 1: Introduction

1.0 General Introduction

The past ten years has seen rapid development in Information and Communication Technology (ICT), and an accompanying explosion of ICT-related activity in the higher education sector, as higher education institutions and national systems grapple with the challenge of how best to deploy the potential of ICT to the benefit of students, academics, and countries. This study explores open courseware as one of the options of utilizing available ICT and how best to undertake it in Kenyan public university.

Open Courseware (OCW) refers to university course materials that are shared for free on the web. OCW is a fast growing phenomenon in the tertiary education arena especially in developed world. Unfortunately Africa especially Kenya has not been enthusiastic to adopt it (Materu,2004). The primary characteristics of OCW are that it is offered for free, does not lead to a degree, and does not grant access to faculty. The OCW consists of syllabus, lecture notes, online presentations, and reading recommendations, which makes it particularly useful for use by other faculties (Ann Margulies, 2005).

The open source approach is not by itself distance learning and neither does it replace face-to-face learning nor is it a degree granting initiative (Materu,2004). Rather, it facilitates availability, development, and distribution of the best available learning materials in a cooperative and collaborative manner, thereby tapping the best brains around the world for the benefit of all, with continuous improvement. Unlike distance learning programs that charge tuition, provide formal instruction and limit participation, Open Courseware offers all course materials free to everyone with online access. Educators may upgrade their classes; students may enhance their coursework or pursue self study; the general public may glimpse the depth and breadth of what leading universities are offering and benefit from reading materials and lectures.

The development of open courseware is a recent phenomenon. Since the Massachusetts Institute of Technology (MIT, 2007c) posted its course contents in Web, institutions seeking to mainstream flexible learning are increasingly adopting the open-source courseware concept that is, making their courses and programs a set of global public goods, available on the Web to any educational institution or individuals interested in using them, provided that they adhere to some basic rules of engagement.

The essentially costless, instant availability of the materials has opened up the faculties pedagogical methods to inspection by all.

OCW is based on philosophy of sharing knowledge. The sharing of knowledge is not a new phenomenon. We share knowledge freely every time:

- Parent intervenes in the upbringing of child; or
- Teacher presents a lesson.

Knowledge is infinitely scalable because it grows with reuse. Fortunately, when we share knowledge, we still have it for ourselves to use. Sadly, much of the world's knowledge is locked behind copyright and consequently access to this knowledge is restricted, especially for the majority of citizens in the developing world (OECD,2007). Advances in digital technology and collaborative authoring software, enables those who believe education is of common good to work together in the creation of free content for education. As Neil Butcher (2009) pointing out, you have no choice about free sharing of educational content. The wave is building, and really the key question is: how do we ride it rather than being drowned by it.

The fact that the present conventional classroom-based approaches to teaching and learning will not be capable of meeting the escalating demand for higher education in the knowledge society represents a major leadership challenge.

One of the arguments why Open Courseware has not been adopted by many of the leading universities in the world especially in developing countries is that it may interfere with existing academic programs. Universities especially in developing countries rely on funds they generate from conventional training to finance their respective education programs and in development of their institutions. There are a number of challenges that discourages adoptability of OCW in developing countries such as Kenya as the researcher seeks to find out.

Universities in Kenya face significant challenges related to providing increased education access, while containing or reducing costs. Meeting increasing demand for quality higher education is an important consideration in the policy debate and institutional development in Kenya whom demands often greatly exceeds capacity in the existing higher education system.

The Kenyan Government initiative to provide basic education to its citizen by provision of free primary and waiving of tuition fee for secondary schools is likely to increase demand for quality higher education. The government because of its economic constraints cannot be able to provide free higher education and despite assistance accorded to needy and bright students in form of scholarships

and bursaries to finance higher education, many of them will most unlikely access quality higher education. There is need for alternative education program to cater for higher education demand.
The government has reacted to the problem increased demand for higher education by increasing the number of universities and allowing more colleges to offer various courses. With the mushrooming of many institutions of higher learning education standards is bound to be greatly compromised especially on contents taught. Preliminary study show that if leading public universities in Kenya adopt Open Courseware, their contents can be used as benchmark by learners and educators in other institutions higher learning thereby improving quality of training in those institutions.

The researcher feels that Kenyan public universities should do more to improve access to quality education. According to Peter Branwel(2009) universities are stores of expertise and knowledge capital. Students need their learning and development affiliated with and accredited by particular institutions, and they need exposure to new thinking and people. Universities provide hubs for research and support, exposure and promotion for researchers. Universities bring great economic benefits by attracting research, enhancing the skills and education levels of the population, and connecting with the local economies and communities around them. They confer considerable economic benefits to graduates. Universities provide spaces for developing expertise, validating learning and they bring prestige to those affiliated to them. This is not going to change. Instead they will have to start to open up continued learning and innovation to a wider population. Giving more people more ways to learn and research will be the only way to reconcile aspirations to maintain a world class education system with high participation rates and moves towards equality of access.

In recent past, advancement in broadband digital technologies has enabled high speed internet connectivity. The laying of fiber optics connecting Kenya to the outside world and subsequent internal country network has improved internet connectivity. Now it is possible to easily access multimedia contents such as videos, audio and textual contents. The question that lingers in minds of countries educationist and other stakeholders is how best the available technologies can be harnessed in education. Most of the universities in Kenya have embarked in development of online courses to improve access to their education programs. However, the researcher feels that by developing open courseware the universities can reach not only to the students who have registered for courses but also to general public especially the less privileged who cannot meet the cost of university education.

In this study we will try to answer some of pertinent questions based on factors that influence implementation of open courseware in Kenya and probably come with a framework for open

courseware implementation. We will seek to examine early adoption of open courseware and try to draw analogies with what can be done in Kenya in that respect.

The effort of the researcher is line with 'Creating a world where each and every person on earth can access and contribute to the sum of all human knowledge' (Cape Town Open Education Declaration, 2008).

1.2 Problem Definition

Open courseware (OCW) is a fast growing phenomenon in the tertiary education arena especially in developed world. Although the concept is yet to have measurable effects on learning institutions of higher learning, there are indications that Open courseware is viewed as a valuable opportunity by institutions in developing countries (Materu, 2004).

The open courseware concept has been adopted in various models in developed nations such as USA, Japan, China and others. However, developing nations have not been very enthusiastic about it.

Despite several talks and conferences that have been held in Kenya about open courseware, Kenyan Universities have not embraced the concept of open courseware.

1.3 Significance of the Research

As Prof. V.S. Prasad(2002) observes, "The OpenCourseware concept is based on the philosophical view of knowledge as a collective social product and so it is also desirable to make it a social property."

In line the philosophy, OCW is one the growing new trends of openness in education and research globally. Many universities and other institutions of higher learning of the world especially in the developed world are complying with the trend by adopting open courseware. The researcher seeks to find out whether this phenomenon can be applied in Kenyan situation.

Preliminary study shows that the adoption of open courseware has a potential to provide access to quality higher educational contents from leading universities free of charge and therefore this can be solution to monumental problems facing education sector in Kenya.

It is expected that the outcome of the study will enable the education stakeholders to identify benefits and factors that discourage implementation of open courseware in Kenyan setup.

Recommendations from the study will benefit education stakeholders in following ways:

1.3.1 Kenyan Government.

The government will be able to get insightful information on how to improve access to higher education and monitoring of quality of what is offered by the institutions.

The information from the study will further provide innovations which support the recent government policies and projects notably setting of digital villages, improvement of bandwidth through laying of undersea fiber optic cables which will connect Kenyan ports with Middle East.

1.3.2 Public Universities

The study will provide vital information to university management on how they can improve the status of their institutions by joining other key players in the world in provision of open education supported by technology. It will create opportunity for Kenyan public universities to set an example to the rest of Africa universities by providing a model demonstrating the value of openness. Other ways the universities might benefit include:

- By subscribing to open courseware, the universities will strive to provide best quality material so that they can remain significant in the face of public scrutiny which will go long way to improve the quality of education offered through extensive research. Through web based feedback system, authors will receive constructive criticism and comments from the users on relevance of the contents.
- By opening up their courseware to peers around the world, faculty publicize themselves among peers, students and other interested parties. This might attract funding for research and/or more students to the university;
- OCWs can also greatly contribute in strengthening the educational infrastructure of the institute providing distance education. Also lots of educational materials are being created by the students and faculty members of the educational institutions. These knowledge archives are lost after certain period of time. A well organized OCW project can disseminate and preserve for wider audience in future also.
- Builds global awareness of your universities unique educational approach and curriculum
- Improves recruitment by helping the right students find the right programs at the universities.
- Provides a resource for students, faculty and alumni that support learning and collaboration.

- Fosters connections with colleagues around the world
- Preserves a record of teaching innovations and allows others to build upon them

1.3.3 Private universities and Commercial colleges

The study will provide awareness to the trainers and students of commercial colleges about the availability of open courseware contents for use in teaching and learning. Trainers can adopt the contents for use in their delivery and also improve on the same.

1.3.4 The general public of Kenya

This research will provide vital information to the parents, students and the general pubic on the role of pubic universities in Kenya in supplementing educational needs. Open courseware will advance knowledge by unlocking information for the benefit of all.

The finding of study will also be of interest to education stakeholders in Africa in planning for a cost effective and efficient open courseware framework suitable for the situation.

1.4 Research Objective

1.4.1 Overall Objective

The overall objective is to develop a conceptual framework for adoption of open courseware which is suitable for Kenyan public universities.

1.4.2 Specific Objectives

The study seeks to

- To determine the extent of popularity and usage of open courseware in Kenyan institutions of higher learning.
- To examine the issues surrounding implementation of Open Courseware in Kenyan Public Universities setup.
- To establish the level of ICT preparedness of the university in readiness for open courseware.

1.5 Assumption of Study

The study assumes that

- Information based on experience of the early adopters on the subject under study exists.
- Respondents will be corporative and willing to assist.

1.6 Scope of Study

The research concentrated on Kenyan public universities situated either in Nairobi City or on a distance of not more than 60km from the city to assess some of factors that encourage and/or discourage adoption of open courseware in public universities of Kenya. The studies also reviewed some of available literature on major OCW initiative at international level.

The researcher opted to concentrate in public universities because they are main hubs of academia in the country. Public universities have goodwill of public and government and they can champion for service of the general public.

Chapter 2: Literature Review

2.1 Introduction

Literature from fields of studies that directly address Open Courseware in universities was reviewed and that which focuses on addressing issues of Open courseware of early adopters was explored. Across the fields of literature, relevant documents were identified from existing extensive research database, updated with summary information from recent publications. This process generated a structure which was interrogated in order to facilitate the development of a synthesis of literature, and hence a theoretical framework of the research.

Before examining the adoption of open Courseware in Kenya Public universities, it is important that the definition of OCW, early adopters, Motivation factors, issues and constraints of courseware is discussed.

2.2 Basic Definitions

2.2.0 Courseware- educational software: software and data used in computer-based training (msn Encarta, 20th century).

2.2.1 Open Courseware (OCW).

According to Opencourseware Consotium(2007) an Open Courseware is a free and open digital publication of high quality university-level educational materials often including syllabus, presentations videos ,lecture notes, assignments, and exams organized as courses. While OpenCourseWare initiatives typically do not provide a degree, credit, or certification, or access to instructors, the materials are made available under open licenses for use and adoption by educators and learners around the world.

The Open courseware Consortium (2007) further defines an OCW site:

- Publishes course materials created by faculty (and sometimes other colleagues or students) to support teaching and learning from at least 10 courses from a duly accredited institution

- Is IP-cleared, meaning that the Opencourseware publisher has the rights to make the materials available under open terms and that nothing in the materials knowingly infringes the copyrights of others.
- Offers the materials free of charge for non-commercial users universally accessible via the Web
- Permits use, reuse, adaptation (derivative works), translation, and redistribution of the materials by others.

Anne Margulies, for MIT in research bulletin (2005) in her opinion says "Generically, open courseware is best understood as a free and open digital publication of high-quality teaching materials organized as courses. The idea here is that open courseware is a publication of course materials created by faculty (and sometimes other colleagues or students) to support teaching and learning. For any given course, the published materials should fully convey the parameters of the course's subject matter and ideally represent a substantially complete set of all the materials used in the course"

There is confusion with the actual terminology in use that is Open Courseware and Open education resource (OER). Some commentators prefer to use 'open courseware ', others 'open educational resources' (UNU,2009).

2.2.2 Open Education Resource (OER)

Participants at the UNESCO forum convened in Paris by UNESCO 1-3 July 2002 defined Open Educational Resources as: The open provision of educational resources enabled by information and communication technologies, for consultation, use and adaptation by a community of users for noncommercial purposes. Further they categorically specified that the resources are intended for college and university faculties to adapt in accordance with their curricular and pedagogical requirements;

OER is a broader umbrella comprising an array of open resources to support teaching and learning. Certainly open courseware is one sort of OER, but there are many others such as Learning object collection such as Rise connenxion and Reference collection such as UTOPIA, Tools resources such as Sakai, FOSS(Free open source software), collaborative sites such as wikipedia.

2.2.3 Online learning- Learning which medium of instruction is computer technology (Wikipedia, 2009).

2.2.4 Sustainability

In a paper commissioned by the OECD(2007), Wiley gives a working definition of sustainability. In the context of his paper, a context that is also applicable to this research, he suggests that sustainability can be seen as, "An open educational resource project's ongoing ability to meet its goals". He suggests that such a project has to find sustainability in two areas: the production and sharing of the resources, and the use and reuse of the resources by end users.

2.3 Background information on Open Courseware.

To help us understand the history of open courseware, challenges faced by early adopters and its impact of on education it is of paramount important to look at experience of early adopters.

2.3.1 Massachusetts Institute of Technology experience

The Massachusetts Institute of Technology (MIT) is the inventor and the main promoter behind Open Course Ware, However many other universities from all over the world are issuing Open Course Ware by now.

The MIT set up OCW in the year 1999 as an alternative to traditional distance-learning programs. Currently, there are more than 1600 MIT courses are available as OCW and the MIT is by far the biggest supplier of OCW (MIT, 2007c).MIT OCW is a free publication of course materials used at university. Students can:Get lecture notes, problem sets, labs and more,watch lecture videos and demonstrations and study a wide variety of subjects

Figure 2.1 MIT OCW Webpage. Adopted from www.OCW.mit.edu/ accessed on 2nd feb 2009.

A certain notion of Open Course Ware is organized by the Open Course Ware Consortium organization which is a collaboration of more than 200 higher education institutions and associated organizations from around the world creating a broad and deep body of open educational content using a shared model(MIT, 2007c).

The original MIT Open Course Ware was based on what was taught at the university and consists of syllabus, presentations and reading recommendations, therefore it is particularly useful for faculty who use it to enrich their own teaching. The material of e.g. the Open University is based on distance learning courses, therefore it is meant for self learners in first order (MIT, 2007a).

The original intention of MIT OCW was to spread teaching material amongst academics with the aim of comparing and enriching course materials. What has transpired is the heavy use of OCW by self-learners (Olaf Resch,2007).

According to A Olaf Resch(2007),the MIT's course of action is different from the distance-learning-programs other (elite-) universities established. Even though the reason for both is to broaden the student body and to make courses available to a more general public, distance-learning still sticks to the traditional patterns of entry-requirements, fees, examinations and degrees. The MIT OCW approach has an altruistic motivation, but also leads to some additional advantages:

- Signaling of innovation leadership.
- Prevention of demarcation difficulties between the (expensive) presence studies and a (cheaper) distance-learning equivalent.
- Increased reach of the own course knowledge to a wide audience.
- Opportunities to sell additional teaching-material, e.g. case studies and books.
- Promotion of the expensive presence study courses.

The MIT pays a great attention to communicate the purposes of OCW. Especially the altruistic motivation component provides effective arguments to justify the concept. In addition, two key aspects, the lack of certification and the missing contacts to lectures by the learner, help the MIT to distinguish OCW obviously from the regular MIT courses (MIT 2007b).

According to by Kirkpatrick (2006) senior production editor, OCW access data shows that visitors to the site fit three general profiles: educators (16 percent), students (31 percent), and self-learners (48 percent). Visitors utilize the site for various reasons, the most popular of which are enhancing personal knowledge; complementing a subject for which one is currently enrolled; and helping educators to plan, develop, or teach a course.

Individual MIT OCW course sites contain descriptions and highlights of the courses, syllabus, course levels, and notes on any special technical requirements to view the embedded files.HTML provides the basic structure for the course pages, but most content (lecture notes, exams, etc.) is provided in PDF. Other files include Java Applets, Real Player (for audio and video), Java, Shockwave, STATA (for statistics), and MATLAB (for math), the applications for which are available for free download on the OCW site. Some of courses contain full series of video lectures, but the number is probably limited, due to bandwidth and accessibility issues and production costs. (Kirkpatrick, 2006).

Due to large size of MIT materials, programmers could not handle the hand-coded html they were forced to utilize CMS(Contents management system) .MIT choose chose Microsoft CMS 2002, mostly because Microsoft offered the software at a low cost. Since Microsoft CMS is proprietary, MIT is not permitted to give it away for free. However, MIT has collaborated with other members of OCW Consortium to develop contents management system (CMS) for OCW publication called educommon which can be used for free by other adopters.

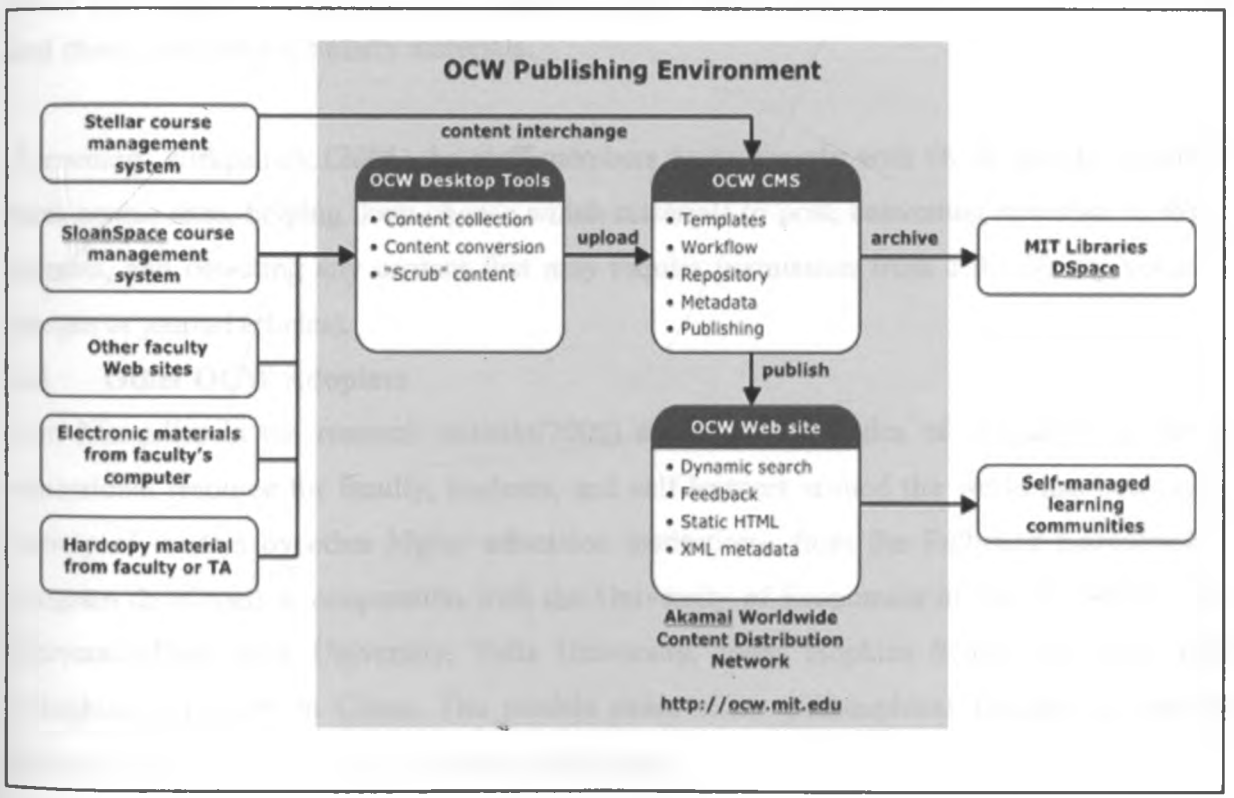


Fig 2.2 MIT publishing environment adopted from MIT press 2006

According to the MIT OCW Web site (2009), the "content delivery infrastructure includes a sophisticated Publishing engine, content staging server, and a content delivery network utilizing Akamai's EdgeSuite Platform. . . . Akamai pulls content to refresh its cache from a production UNIX server (a.k.a 'server'). The functionality that requires dynamic interaction (e.g.: Search and Feedback) is implemented using Java, on a Tomcat application server running under Apache Web server." Since Akamai's EdgeSuite platform comprises "over 18,000 servers deployed in over 1,000 networks across more than 69 countries," it allows OCW to deliver its content using mirror sites worldwide, closer to the users, for a higher-performance connection. The OCW office also works with the MIT Libraries to develop a uniform metadata structure. Using XML (stored in an SQL server), the metadata is created "at the course, section and resource level within MIT OCW." A Web interface based on C# and .NET creates and maintains the metadata Through a project called CWSpace, the MIT Libraries have been working to achieve a system to coordinate metadata content and protocols, so the OCW course content can be archived by the Library's DSpace digital repository which is another open source platform for OCW that contains research papers, data sets, out-ofprint books published by The MIT Press, graphs and charts, and other scholarly materials.

According Kirkpatrick (2006) the staff members work directly with OCW faculty members to plan their course sites, helping them choose which materials to post, converting materials to Web-friendly formats, and detecting any content that may require permission from a third-party vendor (such as images or journal articles).

2.4 Other OCW Adopters

Ann Margulies in the research bulletin(2005) asserts that the idea of providing "a free and open educational resource for faculty, students, and self-learners around the world has been adopted in a variety of models by other higher education institutions, from the Fulbright Economics Teaching Program developed in cooperation with the University of Economics in Ho Chi Minh City, to Rice University,Utah State University, Tufts University, Johns Hopkins School of Public Health, and Tsinghua University in China. The models share many philosophical foundations, and they take different forms based on specific institutional goals.

Outside the USA and Europe, developing countries in Africa, Asia and Latin America have demonstrated unprecedented interest in OCW. Several universities in China, Vietnam, Africa and LatinAmerica have acquired or are in the process of negotiating acquisition of mirror servers hosting

the MIT OCW. China has launched its own initiative – the China Open Resources in Education (CORE). The aim is to leverage existing talent in the country in collaboration with US universities to develop open source resources to be shared among educational institutions (Materu, 2004).

Based on that revelation from MIT and other early adopters' experience, it is understood that adopting to open courseware is a big challenge for other university especially in developing world. Most of the OCW projects are either sponsored or done in collaborative mode by a number of organizations. This is the idea which contributed to formation of open Courseware consortium and other bodies in various countries which work in collaborative mode such as Japan Open Course Ware Alliance (JOCW) which combines six Japan universities (Kubayash & Kuwafushi, 2006) and CORE in China.

The MIT Model is highly ambitious, complex and expensive for universities especially in developing countries such as Kenya to use. However, a lot can be borrowed from the MIT experience. The MIT has set the pace and institutions keen to adopt courseware have the choice of either using the MIT framework or design their own based on their environment.

2.5 Lesson learnt from OCW early adopters

Based on the lesson learnt from the literature review of the early adopters of Open Courseware many issues have been pointed out as the challenges that discourage adoptability of open courseware. The researcher considers the issues faced by the early adopters and correlates them with Kenyan situation.

Kenya is a developing nation faced with enormous challenges of finance and other problems associated with such countries. In recent past Kenya has shown remarkable improvement in ICT industry which is the main driver of OCW initiative. However based on lesson learnt from early adopters of the OCW concept, it is a big challenge for the country's institutions of higher learning to adopt.

Some of the issues that need to be addressed for open courseware implementation to be realized in Kenyan Universities based on the experience of early adopters and relevant to Kenyan situation includes the following:

- Meeting the cost of Open courseware-Set up and maintenance cost for OCW is high. Cost will be incurred in planning, setting websites, preparing materials, hosting and publishing materials, supporting and maintaining the sites. Sustaining the economic viability of OCW in the long term so that they remain freely available in an open marketplace. According to the report by study conducted by Materu(2007) one of the unresolved issue is that cost of support and maintenance of open courseware which is considerably high

- Handling copy right issues-Open courseware raises question of how the intellectual property right of authors will be protected. According to JOCW(2007) Consortium ,educators can usually find relevant resources in the Web that they may want to incorporate into their courses. However, copyright consideration is a serious roadblock even if the original intention of the content author was meant to provide the resource for free access and use. The OCW materials should be intellectual property-cleared, meaning that the university has the rights to make the materials available under open terms and that nothing in the materials infringes the copyrights of others.
- Technical support-Finding suitable infrastructures and technologies to convey OCW in a feasible, useable, effective and economically viable way. Also issues of resource interfaces, resource interoperability and integration also arise.
- Institution policies-Do the Kenyan institutions policies and mission statements provide for open courseware? What policies - institutional, national, or regulatory -- are necessary to remove barriers to the success of open courseware? What practical, feasible initial steps should be considered? According to forum by UNISCO Paris 2002, one of the core issues to consider is the institutional commitment and policy structure.
- Instructor motivation-OCW provide no clear incentives of engagement to the faculty.No reward system for instructors who publish their material on OCW(Kubayash,2008).
- Quality of materials-This raises the question of whether the OCW contents can be utilized if it is posted for public use. Another question is whether people can trust the quality of open contents given that it is provided for free (UNESCO,2005) .
- Best practice – lack of good practice models to follow can make adoption difficult, with high risk of failure. Other than existing OCW websites, there is limited documentation on good and bad practice related to OCW, which requires each university to either simply copy what has been done by others or re-invent the wheel. Neither option is entirely satisfactory (UNU,2008).

In order to understand and look for ways of addressing the pointed out challenges that discourage adoptability of OCW in Kenya. We have reviewed the solutions by the early adopters.

In the proceeding sub headings we further carry out a comprehensive literature review on some of pertinent issues of OCW adoptability to gather more information about how the problems can be

tackled in Kenya. We notice that Kenya being a third world country has some special needs that are not prevalent in developed countries. Some of these issues are:

2.5.2 Motivation of OCW Developers.

OCW does not generate a revenue stream and, unlike an on-campus library, for instance, which also incurs costs rather than generates funds, the main beneficiaries are meant to be people outside the university. Hence, the motivation for university leaders to invest in OCW is unclear.

The OECD(2007) states that institutions that are involved in OER projects mention six types of reasons for doing so:

- The altruistic argument that sharing is in line with academic traditions and is a good thing to do;
- Educational institutions should leverage taxpayers' money by allowing free sharing and reuse of resources;
- Quality can be improved and the cost of content development reduced;
- It is good for the institution's public relations to have an OER project as a showcase for attracting new students;
- There is a need to look for new cost recovery models as institutions experience growing competition;
- Open sharing will speed up the development of new learning resources, stimulate internal improvement, innovation and reuse, and help the institution keep good records of materials and their internal and external use.

Study conducted by Kubayash T and Kuwafuch A (2008) to find out new moves in promoting e-learning in Japanese Higher education, pointed out that there is no reward system in place for instructors providing their teaching materials for OCW. About the merit of instructors to provide course materials for OCW the following were mentioned in the study by the interviewee as typical answers:

- It provides a support for digitalizing the teaching materials
- It saves the time to prepare for the teaching materials for students in classroom.
- It provides an opportunity for getting feedback on the materials
- It helps to have the copyright cleared by making them available on the Internet
- It increases a possibility for publication

- It is an ideal project since it is difficult to implement Open Educational Resources by individual researchers.
- It provides an opportunity to restructure and systemize the lectures by participating in the OCW project.
- It offers a personal satisfaction just to know that the people of foreign countries where they would never have a chance to go will use the materials of their lectures through the OCW.

Based on the motivation factors, instructors and other developers dedicate their time and effort in implementing the OCW. Lesson learnt from MIT experience indicate participation of individual MIT professors in OCW is entirely voluntary (Calhoun L, 2007).

2.5.3 Copyright and intellectual property rights

Copyright is one biggest challenge that faces whoever attempts to publish materials online. Most of materials taught in universities are borrowed from various authors and publishing such materials on the web may interfere with copyrights of others. The researcher investigates the copyright protection employed by early adopters in an attempt to find out whether the same is applicable in Kenyan situation.

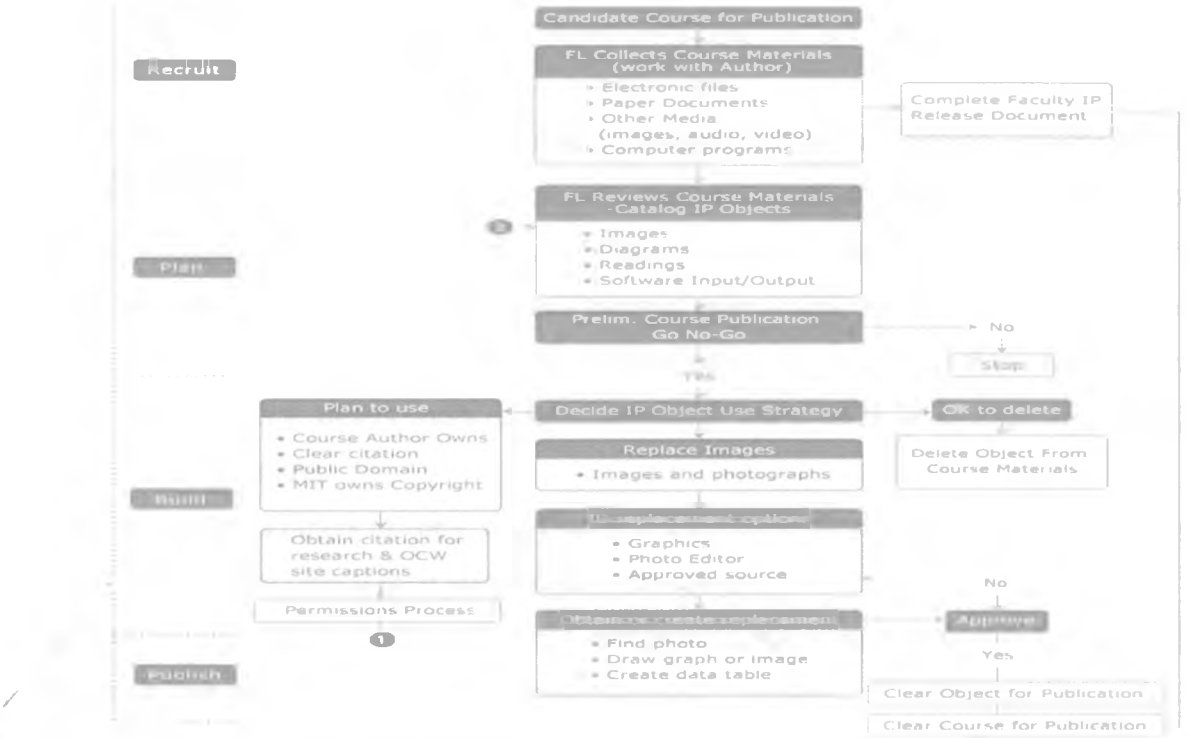
The OpenCourseWare (OCW) approach works in harmony with national and international copyright law to allow authors to retain copyright to their intellectual property while giving users permission to use, adapt, and redistribute their teaching materials for non-commercial purposes.

Educators can usually find relevant resources in the Web that they may want to incorporate into their courses. However, copyright consideration is a serious roadblock even if the original intention of the content author was meant to provide the resource for free access and use. The OCW materials should be intellectual property-cleared, meaning that the university has the rights to make the materials available under open terms and that nothing in the materials infringes the copyrights of others.

For instance, according to Japan open courseware consortium (JOCW) Osaka University deal with clearing copyrights on the course material provided for OCW of which the instructor is not the original author. In the initial year they dealt with 160 cases of which the approved cases were 111 or 70%. The breakdown of these approved cases shows 75 cases (about 70%) for OCW publication, revision by the third party and redistribution, 28 cases for publication and redistribution, and 6 cases for only OCW publication. In processing the copyright clearance, it is pointed out such problems that it takes too

much time to specify the author, or that it is much too difficult to get approval from publishing companies. (Kubayash & Kuwafuch,2008).

MIT IP review and clearance process



Third-party IP permissions sub-process

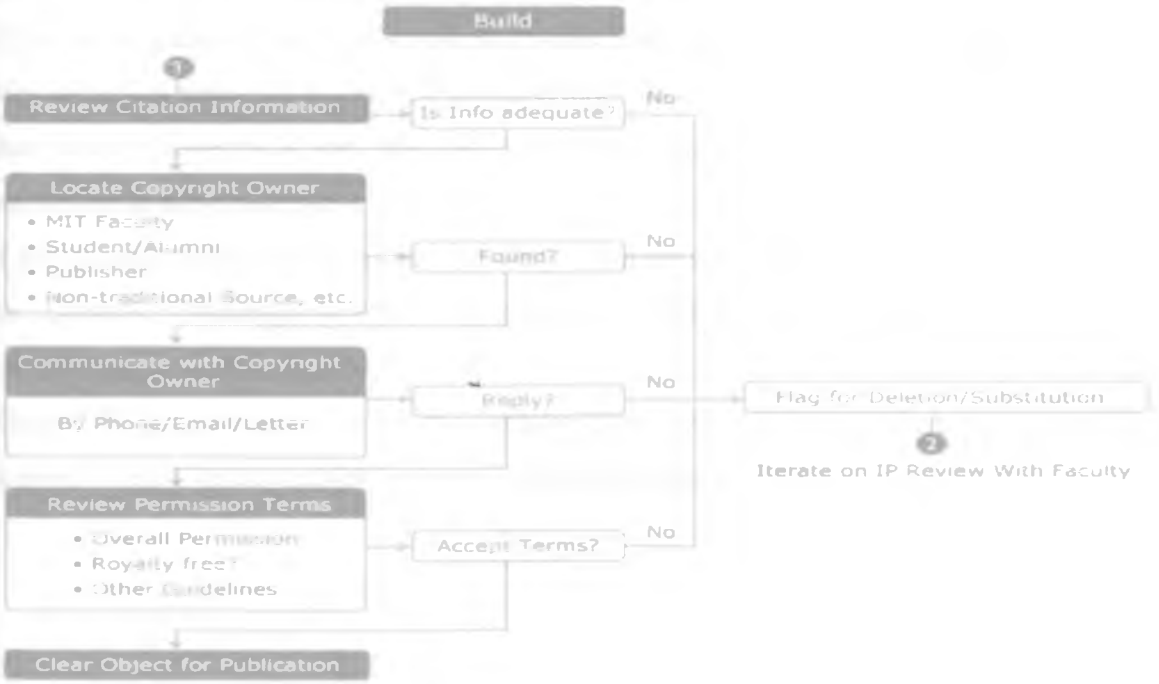


Fig 2.3 IP clearance process adopted from MIT OCW Consortium 2005

According to MIT online publication (2003), OCW usually has open copyright licenses similar to that of OSS(Open Source Software), in order to enable the public to access, copy and distribute the content materials.

A set of well-defined open copyright licenses, such as those provided by Creative Commons, allows the users to confidently use the resources in the designated manner. For example, MIT OCW uses four of the eleven available Creative Common licenses: attribution, share alike, non-commercial and exceptions.

Creative Commons is an initiative of, by and based in the law School of Stanford University. Under the initiative (established as anon-profit organization), a set of licenses for regulating collaboration in OCW has been developed. These licenses take the place of similar ones in the commercial software industry but are available for free to developers and users of open source courseware. Altogether, there are types of licenses. For each of these licenses, the author retains the copyright of the courseware but offers some of his/her rights to others under certain conditions. Based on creative commons (2009) the most common license types are:

- *Attribution license*: allows others to copy, distribute, display and perform one's copyrighted material and derivatives thereof – but only if they give credit to the author.

A Non-commercial license: allows others to copy, distribute, display and perform one's copyrighted material and derivatives thereof – but only for noncommercial Purposes.

- *No Derivative Works license*: allows others to copy, distribute, display and perform one's verbatim copies of copyrighted material but not derivative works based upon it.

- *The Share-Alike license:* allows others to distribute derivative works of one's copyrighted work but only under a license that is identical to the author's license.

One cannot have both the Non-derivative Works and the Share-Alike licenses. The principle underlying feature in creative commons is freedom to modify, distribute and display without the fear of being sued, provided one adheres to some seemingly simple principles. It must be stated, however, that Creative Commons licenses are legitimate legal documents and violation is prosecutable in court.(Creative Commons,2009).

Most OCW projects appear to use the Creative Commons Attribution–Noncommercial-ShareAlike licence, which is more restrictive(United Nation University,2009).

2.5.4 Cost implications of OCW

Meeting the cost of open courseware project and sustaining such project is one of the biggest challenges for university. Kenyan public universities in particular may have problem in financing open courseware project given that there is no direct revenue is expected from the project.

The researcher tries to find out ways of meeting the costs by reviewing experience from the early adopters and by seeking cheap alternatives to OCW implementations.

According to the report by study conducted by Materu(2004) one of the unresolved issue is that cost of support and maintenance is considerably high. This might limit effective participation by less-endowed institutions, particularly those in developing countries. Long-term financial sustainability of Open education is still an open question.

According to research journal by the United Nation Universities (2009) indicate that a key issue in financial sustainability is whether the production of Open courseware uses a producer-consumer model or a co-producer model . A producer-consumer model is typically more centralized, is usually a form of institutional publishing, and has higher costs associated with the publishing staffing and workflow for providing quality review, production consistency and copyright clearance of third-party resources. An example of this model is the MIT OpenCourseWare initiative. A co-producer model is typically decentralized and based on a community of volunteers that work together to create resources for the community. Examples of this include LabSpace of the Open University of the United Kingdom and WikiEducator of the Commonwealth of Learning.

From the perspective of early adopters of OCW it is difficult for the university to go alone in adoption and subsequent maintenance of the OCW due to cost involved and level of planning required. Model adopted by India involves a consortium spanning a number of universities, educational institutions and other interested organizations.

According to Kirkpatrick (2006)," The MIT OCW Web site [http://OCW.mit.edu] officially launched its pilot program in the fall of 2002 with the help of $11 million from the William and Flora Hewlett and the Andrew W. Mellon foundations (and $1 million from MIT)"

2.5.5 Cost Management

Cost management is one big challenge for the project to survive and grow. Such factors as digitization of original course materials, academic support structures, and technology support systems will influence cost.

- It will vary in size, scope, number and types of courses to be published and the current formats of the materials for those courses to be published, especially the IP review and clearance issues

- Existing institutional infrastructure and services, and their capacity to support open courseware
- Timeline for deployment (gradual roll-out or high-impact launch)
- People and the efficiency of performance, the whole publishing process
- Potential cost components

Lesson learnt from early adopters show that the cost of the project will highly be determined by implementation infrastructure adopted .Since OCW is open source initiative, it can take advantage of open software in development of software infrastructure for publishing the courseware; this can lead to great reduction in setup cost. A number of open source systems such as educommon, moodle, sakai and others have been developed specifically to support open courseware. The MIT has used a number of proprietary software such as Microsoft CMS which add on the cost of publishing (MIT ,2007C).

EduCommons is an OCW management system built around a workflow process that guides users through the process of publishing materials in an openly accessible format. This includes uploading materials into the repository, dealing with copyright, reassembling materials into courses, providing quality assurance, and publication of materials. In eduCommons content, objects have states and people have roles. This allows content and courses to be pushed through a workflow that ensures quality assurance and tracks intellectual property issues (UNESCO, 2002).

Moodle is a course management system (CMS). It is a free, Open Source software package designed using sound pedagogical principles, to help educators create effective online courses with opportunities for rich interaction. Modular design means that people can develop additional functionality. We can download and use it on any computer. It can scale from a single-teacher site to a University with 200,000 students (UNESCO, 2002).

2.5.6 Sustainability of OCW projects

Lesson learnt from UNU(2009) which relates to sustainability, and which concern all OCW projects around the world. In general, OCW does not generate a revenue stream and, unlike an on-campus library, for instance, which also incurs costs rather than generates funds, the main beneficiaries are meant to be people outside the university. Hence, the motivation for university leaders to invest in OCW is unclear. This suggests that it may be difficult to maintain a budget line for OCW in the regular university budget and that when times are hard OCW represents a soft target for cuts. To date, there are no examples of OCW projects being closed down at any universities, which is a good sign. However, the lesson that the UNU team has learnt from experience to date is that no university appears to have found a way of ensuring long-term sustainability.

Report by Mellon (MIT ,2007a) indicate that MIT OCW sustainability plan for Steady State operation (2008 and beyond) is based on a reduced publication work load (approximately 200 courses per year) and combines continuing MIT budget support, fundraising, and modest generation of revenue from Amazon commissions on sale of course related books.

2.5.7 Technical infrastructure for OCW

Infrastructure for OCW will have far fetching implications on the setup and maintenance costs.

There is need to review the technical infrastructure of early adopters in an effort to come up with a suitable technical model for Kenya universities. The report from UNESCO (July 2003) highlighted that if open resources are to be made broadly available, some technology fundamentals must be in place:

- Connectivity, including required bandwidth and access to the material in locations with limited bandwidth;
- Software that works on a variety of platforms, using agreed standards;
- Software that permits easy modification of content as the resource is adapted for local use;
- Systems that support multiple languages;
- An infrastructure made workable through the existence of technically capable people.
- Training – developing and maintaining local technical competence --is a key requirement

The type of technology infrastructure required depends on several factors: publishing goals, existing systems infrastructure on your campus, existing publication processes, timelines for publication, number of end users and their geographical distribution, and budgets among other factors. Open courseware technology infrastructure consists of several components, including desktop tools for building course web sites and file conversion, web authoring tools, workflow, metadata capture and publication tools (mostly custom implementation), content staging infrastructure, content publication infrastructure, content repositories (file storage) Implementation. In summary, key components of open courseware architecture includes

- Course planning application
- Content management application (CMA)
- Content repository
- Content delivery application (CDA)

The MIT OCW infrastructure model portrays complexity in its approach as shown below.

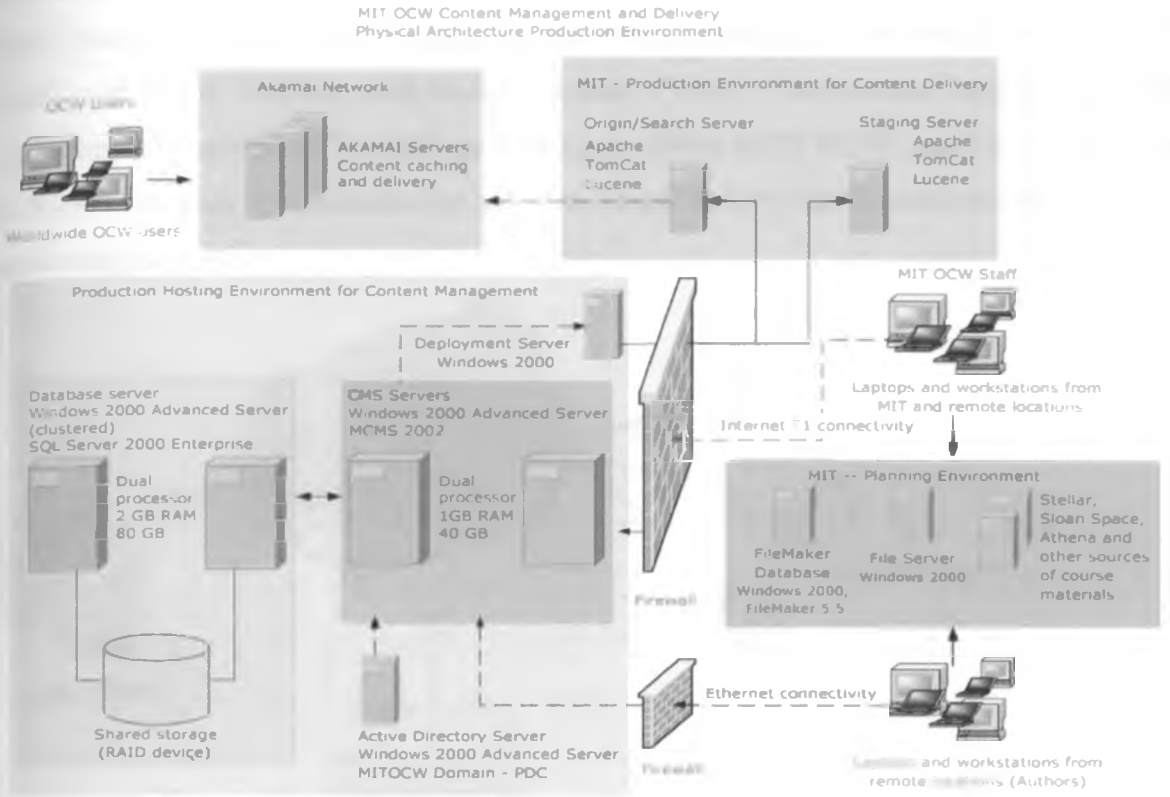


Fig 2.4 Content management and delivery physical architecture production environment adopted from sapient for MIT.

This is a large-scale digital publishing infrastructure that consists of planning tools, a content management system (CMS), and the MIT OCW content distribution infrastructure.

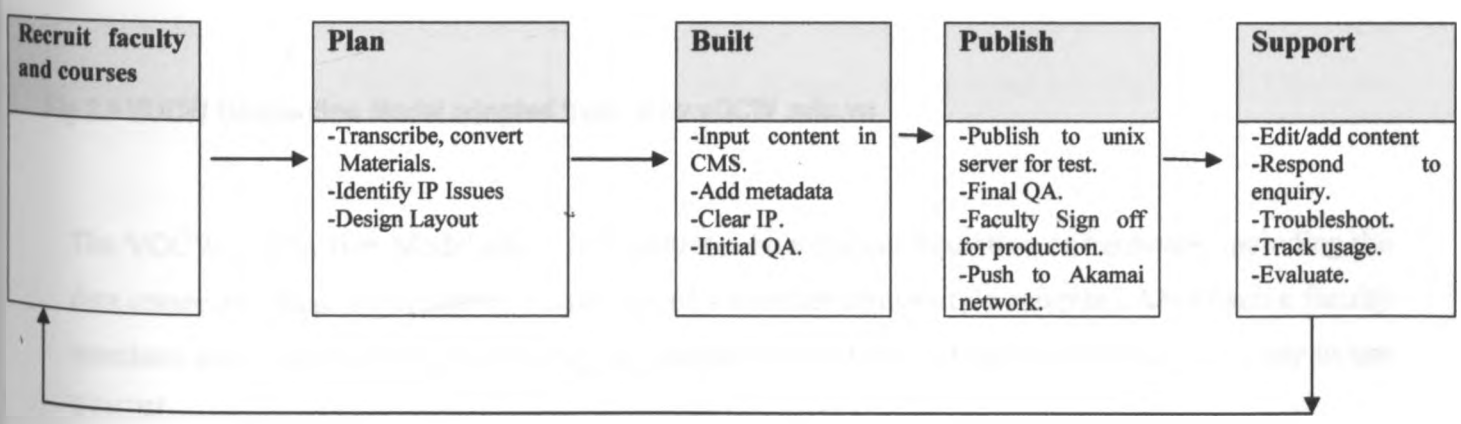


Fig 2.5 MIT OCW content publication lifecycle adopted from MIT OCW Consortium 2005.

2.6 Adoption models in developing countries-Vietnam experience

According to VOCW(2006), Vietnam OpenCourseWare (VOCW) is a joint project, which began in 2005, involving the Ministry of Education and Training (MOET), the Vietnam Education Foundation (VEF), and VASC Software and Media Company (VASC). International support is provided by the Massachusetts Institute of Technology OpenCourseWare (MIT OCW) project for model courseware, by Rice University Connexions for software tools, and by the OpenCourseWare Consortium for networking contacts.

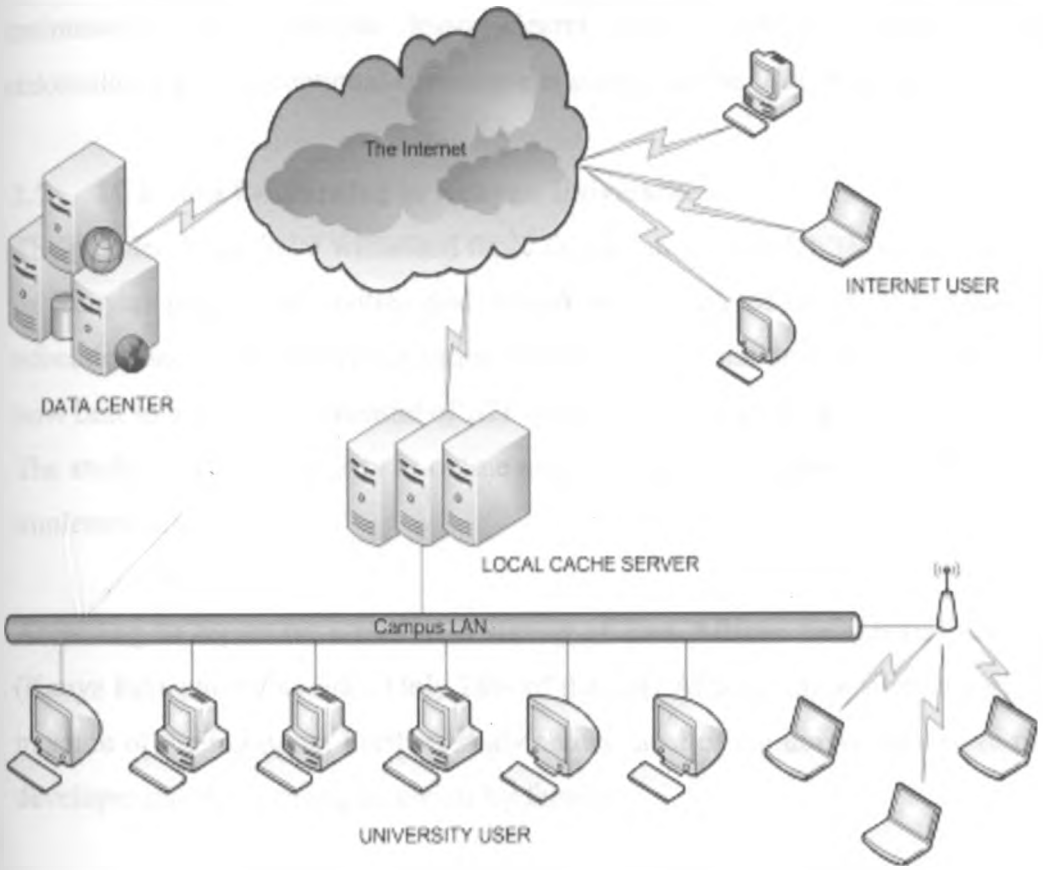


Fig 2.6 VOCW Connection Model adopted from www.vOCW .edu.vn

The VOCW Connection Model above demonstrates how the configuration of hardware, including the data center and local cache server, makes use of a member university's campus LAN to serve faculty members and students, thus, minimizing the Internet connection cost for the member university to use VOCW.

The VOCW model uses 3 data centers in different Vietnam cities and 14 local cache servers for member universities. VOCW adopted the Rice University Connexions software tools which are an open source to implement the VOCW. The tools which was developed by Rice University in 1999 and have been known as "the evolution in publishing". VOCW uses creative commons to protect the intellectual property of the authors.

The choice of Vietnam Model was for the reason that the country is in third world category like Kenya. The approach adopted by Vietnam has taken concern of cost implication by reducing setup and maintenance cost. Another lesson learnt from Vietnam experience, Government education stakeholders and international communities supported the VOCW project.

2.7 ICT and E-Learning in Kenyan Universities

The past ten years have witnessed rapid development in information and communication technology in Kenyan public universities and accompanying explosion of ICT-related activity in the higher education sector, as higher education institutions and national systems grapple with the challenge of how best to deploy the potential of ICT to the benefit of students.

The study identifies maturity in online and e- learning as one the key prerequisite of success in OCW implementation.

According to report on e-readiness survey of East African universities 2008 conducted by KENET (Kenya Education network). Only 28% of the East African universities reported to be using e-learning in some of their courses. Further, study shows most of the universities were not tracking progress on development of e-learning materials by faculty.

The study also found that there is limited training for technical ICT staff on professional courses and e-learning and limited faculty training on e-learning, productivity tools and other internal ICT training. Addressing this means aggressive capacity building for both technical ICT staff and faculty.

Kenya has been quite fortunate in that the local access fiber infrastructure has been constructed for all KENET member institutions using funding from government. Universities in Kenya can therefore start enjoying fiber bandwidth once it goes live in the country.

Dr Christine Geith in his journal compared and contrasted the open learning with online learning and their potential for addressing human rights "to" and "in" education. He accessed open learning and

online learning using the "4-A Framework of the Human Rights Obligations" by Tomasevski [2004]. The 4-A's emphasize rights to as well as rights in education and include 'availability,' 'accessibility,' 'acceptability,' and 'adaptability'. He points out that online learning is strong in availability and accessibility for example online learning is financially sustainable if it is the core business of the organization but sustainability of open learning remains an open question.

The combination of online learning and Open Learning can address all 4 human rights to enable not only availability and accessibility, which are strengths of online learning, but also acceptability and adaptability, which are strengths of Open Learning. In combination, online learning and Open Learning holds the promise for lower costs and scalability for both existing and new types of institutions. In combination, they also hold promise for extending learning beyond the traditional boundaries of the virtual and physical classroom. In view of Dr Christine framework we will find out the extent of use of online learning in Kenyan Universities as well as its implementation infrastructure. We will further find out whether it is possible to combine online and open courseware to reduce on cost and address the four human rights.

2.8 AVU(Africa Virtual University) Framework.

In pursuit of suitable framework for open courseware for Kenyan public universities, The AVU framework of OER was reviewed.

The AVU study on OER(AVU,2005) identifies challenges inhibiting anticipation in the effective creation, organization, dissemination and utilization of OERs in sub-Saharan Africa. The articulation of the study stems from the AVU-MIT OCW Pilot Project Final Report (September 2005) conducted in East Africa and the AVU's Gap Analysis (July 2005) a study analyzing the open, distance and e-Learning(ODel) capacity of universities at 17 institutions in 16 African countries. The studies elicited four fundamental challenges inhibiting participation in the OER movement: sensitization, technological infrastructure, and capacity enhancement and governance structures.

The studies describe a framework for the development, management, distribution and utilization of Open education resource. This has been articulated through the framework as shown in the diagram below.

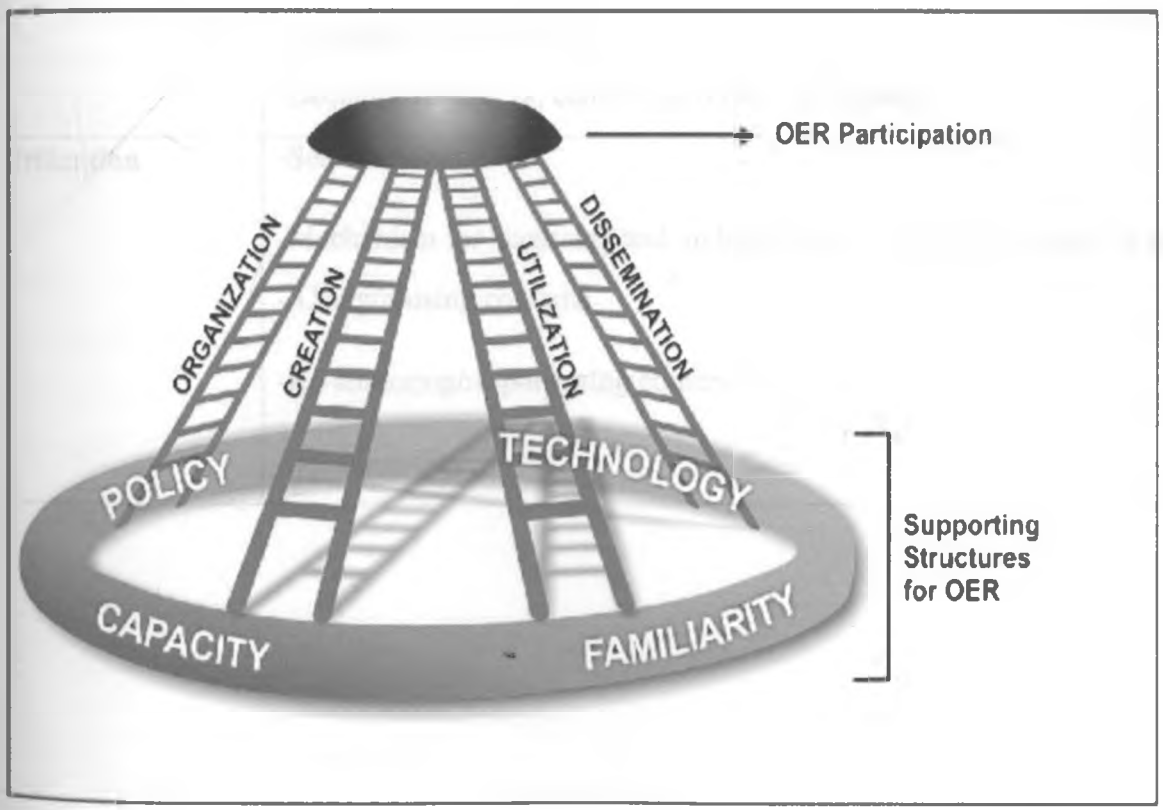


Figure 2.7 AVU OER Architecture: Adopted from Discussion Paper presented to world summit in Tunis– November 2, 2005.

Table 2.1 Elements of AVU OER Architecture

Creation	-Developing capacity to create Open education resource - Iterative process for Open resource creation - Localization and contextualization of materials. -Quality assurance mechanism
Organization	- Governance and management -Institutional development -Developing knowledge sharing culture -Packaging and marketing.
Dissemination	-Delivery Method for remote and local access Storage/portal mechanism. -Tagging and metadata mechanism -Repository development - Scalability of delivery -Decentralization vs. centralization or combination
Utilization	-Sensitization -Mechanism for accessing and updating open education resource materials. - Using/reusing contents -Re-authoring/re-purposing contents -Sustainability

Based on the experience of early adopters and reports of studies carried out Africa regions, the researcher acknowledges the AVU framework of development, management, distribution and utilization of open courseware resource. One of the strength of AVU OER framework considers open courseware challenges especially eminent in Africa. Awareness, capacity building, technology and policies or institution structures which are the main concerns. The framework shows that to participate in Open Courseware the four elements creation, organization, dissemination and utilization are building structures of Open courseware implementation.

The AVU OER model sets the benchmark of our study. The framework has been selected due to its suitability to Kenyan Context .However, some gaps have been identified.

AVU framework Gaps.

- It does not lay emphasis on the quality and relevance of open courseware materials.
- It doesn't show how the adoption process will be implemented. The sequence of adoption is necessary for seamless and successful implementation of open courseware.
- It does not clearly articulate who is involved for the success of the components.

From the discussion we hope to come up with an improved conceptual framework for open courseware that can address variety of needs in OCW adoption in context of Kenyan society. We notice that Kenya being a third world country has special needs that are not prevalent in the developed countries. Therefore, more to incorporating strength identified in the frameworks reviewed so far, we will try to come up with a model that will enhance adoption of OCW in Kenya. We will address that bearing in mind the issues that encourage or discourage adoptability of open courseware in Kenyan and the ICT readiness.

We believe we will improve on the existing frameworks and come up with a practical modality for adoption.

Chapter 3: Research Methodology

3.0 Overview

The research is a field survey research design whose objective is to disseminate findings regarding factors that discourage or/and encourage open courseware in public universities of Kenya with a view of developing an implementation framework.

In approaching this study, we sought to address the following questions:

- We wanted to find out whether open courseware is popular in Kenyan public universities. This would help us to know whether Kenyan public universities are aware about open courseware and how much they use.
- We also hoped to explore the issues surrounding implementation of open courseware in Kenyan public university. This would help us to know how to address the issues for open courseware implementation to be realized in Kenyan Universities.
- We also felt it was important to carry out technical assessment on the capacity of public universities in Kenya to implement open courseware. This will include assessment of existing ICT infrastructure, internet facilities and preparedness in terms of electronic contents.

In pursuit of answers to the questions we have used AVU OER Model fig 2.7 as a guide to assist us in designing instruments of our study. Some part of the research is quantitative which involves making inferences or generalization while the rest is qualitative which involves focus on in-depth information.

3.1 Target Population

The target population for this research was the public universities in Kenya from which those situated in the Nairobi city and its environs were selected as a representative group for the study. Therefore, the coverage research included three(3) public universities out of seven(7) in Kenya by year 2009.The study area was selected due to the reason that the university are within Nairobi area and therefore convenient in terms of time and cost of the researcher. University administrators, lecturers, students, ICT technical personnel were identified as potential participants.

Although, this research has targeted university students as the only users, OCW is an open initiative which targets the general public which refers to anyone with internet connection. However, the researcher identifies student as the most accessible consumers and whose information is very relevant to our research.

3.2 Sampling Frame

As indicated above, the sample unit constitute of three public universities situated in Nairobi and its environs. Below is a list of public universities that will be visited

1. University of Nairobi
2. Kenyatta University
3. Jomo Kenyatta University of Agriculture and Technology

Where time and resources allow, a research should take as big a sample as possible, since this would ensure reliability of the results (Mugenda & Mugenda, 2003). We used the following formula to determine the minimum sample size for our research.

$$n = \frac{Z\alpha 2\, p\,(1-p)}{d^2}$$

Where

$Z\alpha$ the standard normal deviate at the required confidence level.

n is the sample size.

d is the level of statistical significance set

P is the proportion in the target population estimated to have characteristics being

Measured

$Z\alpha$ represents that value such that the probability of a standard normal variable exceeding it is $(1 - \alpha)/2$.

This value for a chosen α level can be obtained directly from the table giving Z value for the standard normal distribution. Using a confidence level of 95%, the $Z\alpha$ is 1.96. Since there is no estimate available of the proportion in the target population, then 50% was used (Mugenda & Mugenda, 2003) i. e. P = 50% and we desire accuracy at the 0.05 level, i.e. d = 0.05%, then sample size is:

$$n = \frac{1.962 \times 0.5\,(1-0.5)}{(0.05)^2}$$

$$n = 384$$

From the above formula, the sample size to be used must be at least 384. However, since larger sample sizes give more reliable results, we targeted to have 400 valid responses. To achieve this, we picked a

sample size of 450. Our sample was drawn from students at the university who are expected to be main users of open courseware once adopted at the university. The researcher considered the size of university in coming up with the number of respondents in each university.

Table 3.1 No of respondents selected per university

Universities	**No of respondents**	**Total Student population**
University of Nairobi	200	45,000
Kenyatta University	150	23,000
Jomo Kenyatta University	100	15,000
Total	**450**	**83,000**

Further 150 lecturers were selected across the three universities for the exercise. However, most of the other part of research was qualitative. Purposeful, judgmental and snowball sampling methods were used to draw samples from target population.

Purposeful –We selected samples from population that had the information required as per my objectives of study and also due to nature of confidentiality of data. The purposeful sample included university Registrars, Technical personnel and faculty directors.

Snowball-I was recommended to contact some persons who had relevant information that i needed.

3.2.0 Data collection

Data collection was conducted on three public universities to test the hypothesis. Questionnaires, interview and observations was used to collect primary data while secondary data was collected by review of documents.

To counter the effect of late or no response to questionnaires was administered by post, and to provide an opportunity for conducting interviews and observation, the questionnaire were personally administered. The intention of conducting interviews was to supplement information collected from questionnaires.

3.2.1 Data gathering instrument

Methods of data collection that was deployed were the questionnaire, interview, observation and use of documentary evidence.

Questionnaire

Questionnaire was designed to be as straightforward as possible so as to allow respondents answer questions correctly. The major considerations and which has been employed in our study in formulating questions are content, structure, format and sequence (Nachmias,2005). Our survey questions were concerned with facts, futuristic opinions, attitudes and opinions about open courseware implementation in Kenya. The questions in our questionnaire were unambiguous and easy for respondents to complete. Our research also adopted a 5 – point likert type questions. Likert type questions are used to assess perceptions and they have the advantage of yielding continuous data that lends itself to many statistical analyses. The questionnaire was composed closed-ended questions and an open-ended question.

To collect all required data based on the objectives of study, the questionnaire were divided into four parts. Each part was divided into section which elicited specific information from the respondent. In formulation of questions AVU OER Model was used as a guide. Most of information obtained was quantitative though most parts of it were qualitative.

Parts of questionnaire and their objective

The four parts of the questionnaire were divided based on the four elements of our study organization, creation, dissemination and utilization as per the AVU model.

Part 1: Was administered to students at the university. It was meant to elicit information about ***utilization*** of open courseware that is: internet use, awareness and use of OCW in universities, OCW concept support by student and quality of materials at the university.

Part 2: Was administered to university lecturers. It was meant to get information on ***creation*** of open courseware that is: preparedness in terms of electronic content development, Copyright issues, motivation of instructors and their personal opinions about OCW.

Part 3: Was administered to university administrators. it was meant to get general information the ***organization*** of open courseware, that is: OCW awareness ,concept support by university management, Policy issues, costing and other issues surrounding adoptability of OCW and their personal opinions about OCW.

Part 4: Was administered to ICT technical personnel or Manager. It was meant to elicit information on ***dissemination*** of open courseware that is: university ICT infrastructure, existing online and e-learning, and other personal comments about OCW.

Interviews

Interview are necessary to supplement questionnaire and for clarification purpose. University ICT director and some university registrars were asked oral questions. Questionnaire was the guide in questions asked on the interview. The selection was based on the role within the university as far as implementation and maintenance of open courseware is concerned. Informal individual discussions and on spot interviews were carried out on some lecturers and technical staff members.

Observation

The researcher visited the three universities ICT centers and computer laboratories. In some of the universities the researcher was taken through the learning management systems used for online learning.

Documentary review

The researcher also involved the survey of documents. Such documents that were surveyed are e-readiness report 2008 for East Africa universities.

Studying available information on internet about the early adopters did the documentary review. We have reviewed the experience of some of those who have already adopted the OCW. We have been able to look at success stories from many of the countries and how they have been able to tackle some of the challenges. Out of this we will be able to come up with reasonable recommendation for best practice as far as OCW adoption is concerned.

3.2.2 Reliability and validity of instruments

Validity

Validity is concerned with whether the findings are really about what they appear to be about (Kothari, 2006). Validity is defined as the extent to which the data collection method or methods accurately measures what they were intended to measure. There are two forms: external and internal. The external validity of research findings refers to the data's ability to be generalized across persons, settings, and times. Internal validity is the ability of a research instrument to measure what is purposed to measure.

The following are measures that were taken to ensure validity:

- Data was collected from reliable sources, from reputable public universities.
- Survey questions were made based on literature review to ensure the validity of the results.

- The questionnaire was pre-tested for meanings and semantics against the definitions of the constructs by experts.

Pre test of questionnaire was done using content validity Index (CVI). Four experts were given questionnaire to rate the relevancy using 4-point scale of relevant, Very relevant, quite relevant, somewhat relevant and not relevant and computed to give the content validity index(CVI).

The CVI of four were 0.75,1,0.75, 1 which is above the 0.5 that qualify the instrument .The results of CvI is shown below.

Table 3.2: CVI Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Relevance	4	.75	1.00	.8750	.14434
Valid N (listwise)	4				

Reliability

Reliability is an assessment of the degree of consistency between multiple measurements of a variable. It demonstrates to which extent the operations of a study, such as data collection procedures can be repeated with similar results. A measure is said to be reliable if a person's score on the same test given twice is similar.

Reliability of the instrument was tested by subjecting the instrument through a pilot study at Kenya Methodist University (KEMU), to find its appropriateness to the intended purpose. Forty students and 10 lecturers were selected for the exercise.

The pilot data was subjected through reliability analysis using alpha (Cronbach) to measure internal consistency based on average inter item correlation. The results of reliability analysis are shown in below.

Table 3.3 Reliability Analysis.

RELIABILITY ANALYSIS - SCALE (ALPHA)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
INTERNET	28.4500	26.9718	.4103	.7287
CONNECT	28.0250	33.2558	.0634	.7580
ONLINE	30.2250	32.0763	.1625	.7529
FREE	27.3750	29.6763	.2894	.7431
OCW	31.4500	30.3051	.6528	.7200
VISIT	31.1750	27.2763	.5103	.7124
OUTCOME	30.5500	22.5103	.4935	.7294
OTHERS	27.5250	27.1788	.6924	.6948
APPROPRI	27.6750	28.0712	.4892	.7166
QUALITY	28.1750	32.8660	.0801	.7594
INFO	27.3750	26.8045	.7775	.6867

Reliability Coefficients

N of Cases = 40.0 N of Items = 11

Alpha = .7475

As the table shows, the reliability analysis gave an alpha coefficient exceeding 0.70, which is regarded as acceptable reliability coefficients. Hence, the results demonstrate that the questionnaire is reliable measurement instrument

3.2.3 Data analysis

The response from various subjects was organized in understandable form and analyzed using descriptive statistics with the aid of SPSS. Results were presented using frequency tables, graphs, cross tabulations, Descriptive statistics tables, and percentages.

3.3 Implementation framework

A major model which provides systematic approach for OCW in public universities of Kenya will be sought. In pursuit of that, a workable framework is of paramount importance. To come up with implementation framework, we have studied number frameworks and we have correlated with the existing situations, heavily borrowed from the literature review and studies that will be made on Kenyan public universities. Our main concern is not only OCW implementation in public universities but also how best this adoption process will be implemented in a cost effective manner suitable for Kenyan situation.

This realization brings about need for an implementation framework OCW in Kenyan public universities which we will use as a benchmark to address the concern of our target group.

CHAPTER 4: Findings and Interpretations

4.0 Introduction

In this section the finding of the study are presented and discussed. From the data collected, an attempt has been made to extract any common trends that exist in support of or contradicting the hypothesis as stated in the problem statement i.e "The open courseware concept has been adopted in various models in developed nations such as USA, Japan, China and others. However, developing nations have not been very enthusiastic about it.Despite several talks and conferences that have been held in Kenya about open courseware, Kenyan Universities have not embraced the concept of open courseware."

The sample was made up of 450 students and 150 lecturers at the three public universities. Useful responses were obtained from 392 students representing a response rate of 87% and 111 lecturers representing a response rate of 74%. Frequency table below shows the number of respondents from the three selected public universities.

4.1 Characteristics of respondents

Table 4.1: Distribution of Respondents across University

Universities		Students		Teaching staff	
		Frequency	Percentage (%)	Frequency	Percentage
Valid	JKUAT	75	19.1%	27	24.3%
	KU	139	35.5%	36	32.4%
	UON	178	45.4%	48	43.2%
	Total	392	100.0	111	100.0

As shown in the diagram, most of respondents were from University of Nairobi and the least from JKUAT. In general, valid responses were obtained from a total of 503 respondents and consisted of students and teaching staff.

Figure 4.1: Distribution of student gender across universities

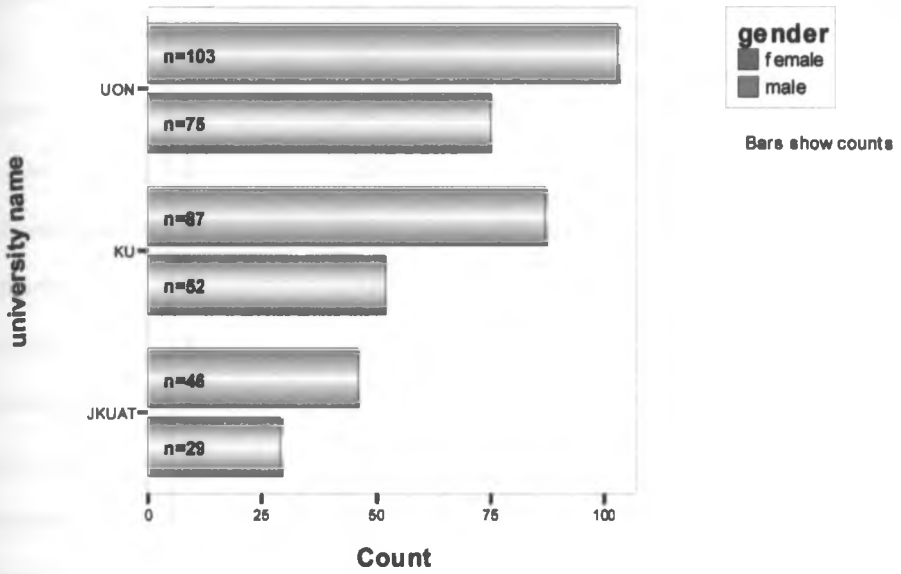


Figure 4.1 shows majority of respondents from student's population were male in all universities.

Table 4.2: Respondents Level of study

Level of study

		Frequency	Respondent Percent
Valid	Postgraduate	12	3.1
	Undergraduate	380	96.9
	Total	**392**	**100.0**

Table 4.2 shows that majority of respondents were undergraduate students.

Table 4.3 Respondent's Course of Study

Courses	Frequency	Percentage
Architect	8	2.0
BA	17	4.3
BCOM	39	9.9
Biochem	8	2.0
Biological sciences	4	1.0
Chemistry	7	1.8
Civil Eng	8	2.0
Communication	4	1.0
Comp science	34	8.7
Economics	16	4.1
Education	72	18.4
Ele Eng	12	3.1
Eng & Tech	14	3.6
Engineering	24	6.1
Environment studies	12	3.0
Food science	10	2.6
Health Science	4	1.0
History	4	1.0
Hospitality	4	1.0
Kiswahili	4	1.0
Jounalism	4	1.0
Linguistics	4	1.0
Mathematics	15	3.8
Maths and comp	2	.5
MBA	5	1.3
Medical lab	7	1.8
Nursing	2	.5
Medicine	3	.8
MSC CS	4	1.0
Msc IS	4	1.0
Philosophy	3	.8
Physics	6	1.5
Production and nuitration	4	1.0
Sociology	24	6.1
Total	392	100.0

The table above shows the students responses from each the courses. Education had the highest (18.1%), followed by BA(15.8%),Engineering (14.8%), BCOM (9.9%) and computer science (8.7%) and the rest 36.1%.

Table 4.4 Lecturers Highest Education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Masters	82	73.9	73.9	73.9
	PHD	29	26.1	26.1	100.0
	Total	111	100.0	100.0	

4.2 Reliability

Reliability Analysis on the questionnaire using the data from field was performed using Chronbach's alpha. The results of the reliability analysis are presented in Table 4.4. As the table shows, the reliability analysis gave an alpha coefficient of 0.7252 which exceeds 0.7, which is the lower limit of the acceptable reliability coefficient, thus demonstrating reliability.

Table 4.5: Chronbach's alpha on field data

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
INTERNET	27.1260	26.1516	.3847	.7037
CONNECT	27.1928	27.9498	.1817	.7330
ONLINE	29.3445	29.9635	.1208	.7304
FREE	26.1157	26.2417	.3499	.7088
OCW	30.2982	27.3593	.7317	.6912
VISIT	29.9460	21.9790	.6073	.6616
OUTCOME	29.5681	19.3130	.5800	.6724
OTHERS	26.2005	27.6504	.3646	.7085
APPROPRI	26.3985	26.4362	.3325	.7114
QUALITY	27.0746	29.3578	.1082	.7362
INFOR	26.3136	26.3395	.6725	.6825

Reliability Coefficients

N of Cases = 389.0 N of Items = 11

Alpha = .7252

4.3 Internet access

Internet is the main infrastructure component which delivers the open courseware. It is inconceivable that successful implementation of open courseware would be affected by the level of internet access and usage amongst the consumers. This study targets students as the main consumer of open courseware. Some of indicators of internet access are:

- Internet use
- Satisfaction with Internet connection
- Buying of online materials
- Use of free materials on internet

In all the four items above we adopted 5-point likert scale. Descriptive statistics for the four items is shown on the diagram below.

Table 4.6 Internet Use Descriptive Statistics

Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Frequency of internet use	392	1	5	3.44	.976
satisfaction with Internet connection	392	0	5	3.36	1.010
How many times have you bought materials such as books online	392	1	4	1.22	.517
How often do you use free online contents	392	1	5	4.44	1.012
Valid N (listwise)	392				

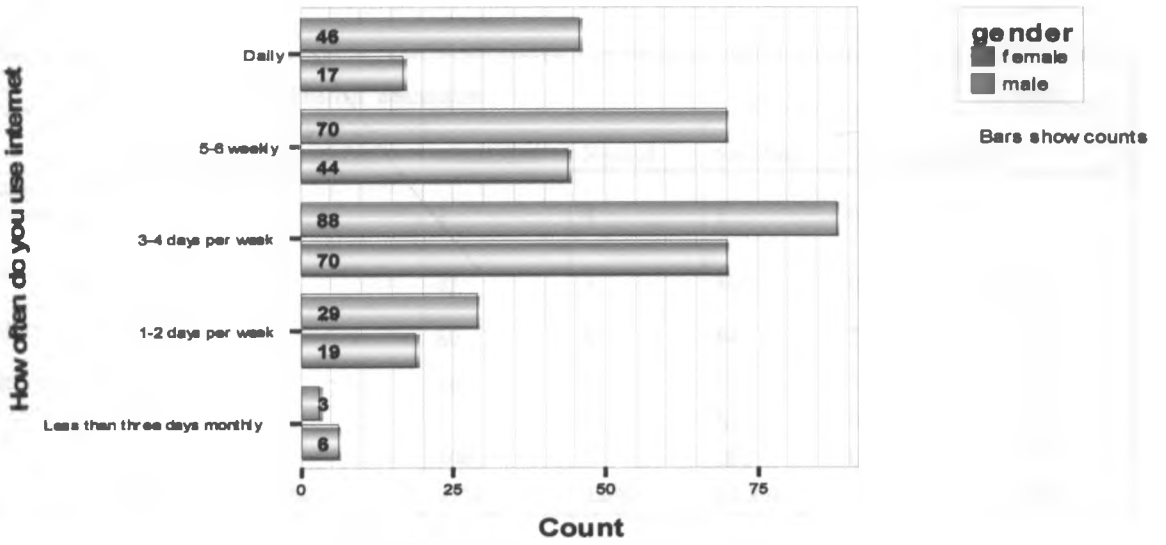
Table 4.5 shows descriptive statistics of the frequency of internet use, satisfaction with the internet connection, frequency of buying online materials and frequency of use of free online contents .It is only frequency of buying online materials that is below average.

4.3.1 Internet Use in the universities

Internet usage by student is a strong indicator of universities preparedness to embrace innovations and technologies such as open courseware. The researchers were mainly concerned with how often students use internet and what they use it for at public universities in Kenya

Table 4.6 depicts how internet usage scores amongst the students at the university. A score of 3.44 indicates above average. However standard deviation of 0.976 is significant. The figure 4.2 sheds more light on internet use by students at the universities in Kenya.

Figure 4.2 Frequency of Internet Use.



Explanation of the Key

Count refer to number of respondent

Figure 4.2 shows that most of respondents use internet 3-4 days per week and further indicates male respondents have higher frequency of use than their female counterparts. There were very few respondents who use internet less than three days monthly.

4.3.2 Internet Connection.

Satisfaction with Internet connection is indicator of internet access. The study examines respondent's satisfaction with internet connection. From Table 4.6 the mean for satisfaction with internet connection is 3.36 which is above average. It shows generally students at the university are satisfied with the already available internet connection.

The table below shows satisfaction with internet connection against internet use.

Table 4.7 Satisfaction with internet connection

How often do you use internet * satisfaction with Internet connection Cross tabulation

Count

		satisfaction with Internet connection						Total
		i don't know	very unsatisfied	unsatisfied	Neutral	Satisfied	Very satisfied	
How often do you use internet	Less than three days monthly	2	0	2	4	1	0	9
	1-2 days per week	1	7	27	3	10	0	48
	3-4 days per week	0	1	60	0	94	3	158
	5-6 weekly	0	0	16	0	95	3	114
	Daily	0	0	1	0	62	0	63
Total		3	8	106	7	262	6	392
Percentage (%)		**8%**	**2%**	**27%**	**1.8%**	**66.8%**	**1.5%**	**100%**

The above table shows that most of the respondents (66.8%) are satisfied with internet connection. Some interesting observation is that average users and heavy users of internet are generally satisfied with the internet connection at the universities as opposed to the heavy users of internet.

4.3.3 Use of free materials

Table 4.6 shows that use of free materials has very high score (4.44) however the deviation is quite high. The results indicate that respondent heavily access free contents on internet.

4.3.4 Buying materials including books online

Table 4.6 shows that buying books internet had very low mean (1.44) and also the deviation is low. The result indicates that respondents do not buy materials online. However there are number reasons which contribute to the situation as indicated in the table below.

Table 4.8 Reasons for not buying materials online.

Reasons	Frequencies	Percentage(%)
Buying materials online is expensive	258(65.8%)	26.46
I don't understand payment process	292(74.5%)	29.9
I don't trust payment	163(41.5%)	16.71
Why buy books when I can get what I need for free	178(45.4%)	18.25
Internet access and connection	84(26.34%)	8.75
Total	975	100

The above table shows most of the respondents (74.5%) indicated the reason they don't buy books online was that they don't understand payment process. Most of respondents also indicated that buying materials online is expensive (66%) and some do not trust payment (41.5%) while very few felt internet access was the impediment.

Table 4.9 Correlations

Pearson Correlations

	How often do you use internet	Satisfaction with Internet connection	How many times have you bought books online	How often do you use free online contents
How often do you use internet	1	.497(**)	.108(*)	.431(**)
satisfaction with Internet connection	.497(**)	1	.088	.246(**)
How many times have you bought books online	.108(*)	.088	1	.050
How often do you use free online contents	.431(**)	.246(**)	.050	1
Number	392	392	392	392

** Correlation is significant at the 0.01 level (2-tailed).

The result seems to indicate that there is positive correlation of all the four items of internet access. The four items generally indicate that students at the university have access to internet .It further shows that they are generally able to accomplish tasks using the available connection.

Interview with informants from the three universities revealed that all the three university have internet bandwidth above 5 mbps which is provided by KENET(Kenya Education Network) as ISP.

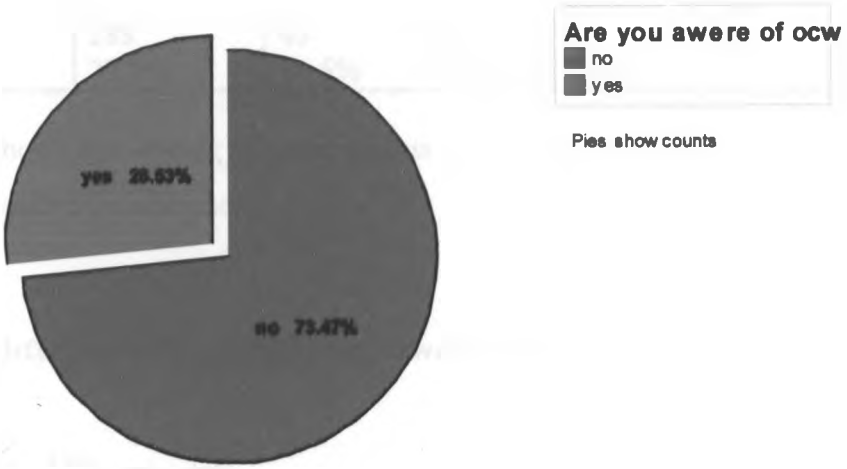
4.4 OCW Awareness

For successful implementation of open courseware in public university all stakeholders need to be aware of its existence so that they can use, support and contribute to its success. From the study there is no particular university in Kenya has so far implemented open courseware. However, the concept of open courseware is not absolutely new phenomenon to some of the university stakeholders. We sought to get this information by asking direct question on awareness and we further investigated about the use and satisfaction with outcomes of accessing already existing open courseware such as MIT OCW sites.

Interview with Informants from three universities were the study was conducted and observations indicates that open courseware has not been adopted by any of the three

universities. However, through investigation we were found that universities provide some materials for open access to the public. For example University of Nairobi provides listing of journals, course listing, course outlines, and some academic staff profiles through the websites. We further assessed concept awareness by the students across the three universities. Results are shown and discussed below.

Fig 4.3 Awareness of Open Courseware



The figure above illustrate that majority (73.47%) of respondents are not aware about open courseware. It shows the level of awareness is very low amongst students at the Kenyan public universities.

Out of 21 university administrators contacted in the three public universities, majority (14) were not aware of existence of open courseware.

We further investigated about students who have ever visited the open courseware website to know the extent of access to such websites and their outcomes with the visits. Results are shown below.

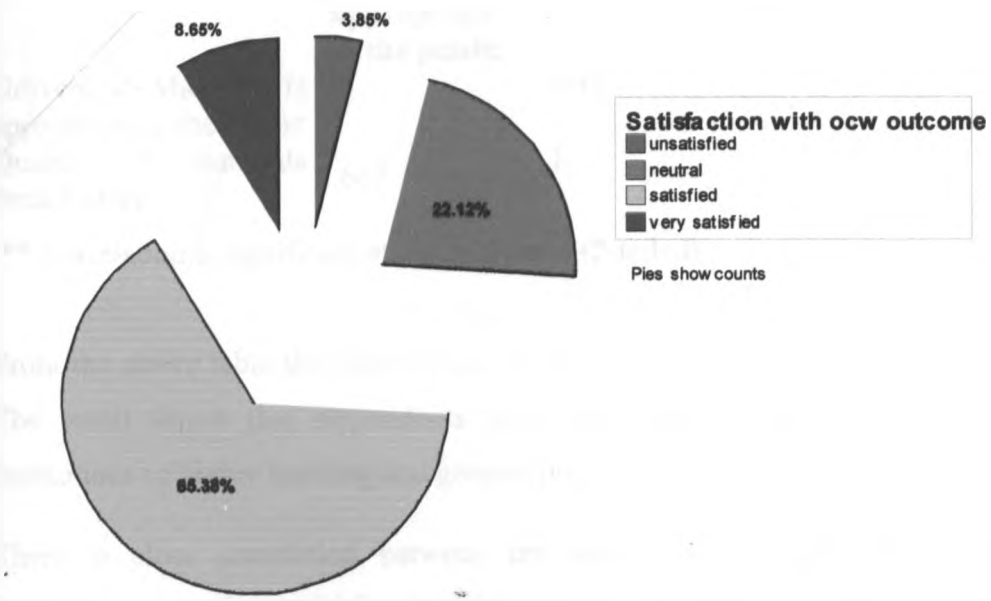
Table 4.10 Are you Awere of OCW * frequency of visit to existing OCW sites Crosstabulation

Count

	frequency of visit to existing OCW sites						
	not applicable	once	Twice	3-5 times	6-10 times	uncountable times	Total
Are you awere of OCW	No	288	0	0	0	0	0	288
	Yes	0	45	21	15	6	17	104
Total		288	45	21	15	6	17	392
Percentages		73.5%	11.5%	5.4%	3.8%	1.5%	4.3%	100%

Table 4.8 shows that among the respondents who are aware of open courseware majority (46.87%) have only visited the site once.

Fig 4.4 **Satisfaction with the open courseware site visit outcomes.**



As illustrated by the diagram above, majority of respondents (65.38%) who visit Open courseware sites are generally satisfied with the outcome of the visit which means they are able to accomplish objectives of visiting the sites.

Based on this revelation it led us to conclude that awareness level of open courseware is very low among students at Kenyan public universities and very few learners utilize open courseware in learning.

4.4 Relevance of materials

For successful implementation of open courseware, relevance of the contents to the user will greatly determine the utilization of the contents. Care should be taken in that the design of contents. The material should not only be useful to the university students but also majority of the public. We were interested to get the perception of students on the quality materials offered at the public university and whether they find material appropriate to other students in the country.

Table 4.11 Correlation for relevance of materials.

	N	Minimum	Maximum	Mean	Std. Deviation
University Material is appropriate to the public	392	1	5	4.16	1.008
Quality of materials from lecturers	392	1	5	3.84	0.792

	University Material is appropriate to the public	**Quality of materials from lecturer**
University Material is appropriate to the public	1	.667
Quality of materials from lecture	.667	1

** Correlation is significant at the 0.01 level (2-tailed).

From the above table the mean values of two items of open courseware concept support is high. The result shows that respondents agree that materials are appropriate to students in other institutions of higher learning and general public.

There is close correlation between the items under investigation. However, the item for appropriateness of material for the public has a higher deviation. The table below sheds more light.

Table 4.12 University Material is appropriate to the public * Quality of materials from your lecturer Crosstabulation

Count

		Quality of materials from your lecturer					Total
		very poor	Poor	fair	good	very good	
University Material is appropriate to the public	Strongly disagree	7	4	0	0	0	11
	Disagree	4	20	3	1	0	28
	Neutral	0	0	14	8	0	22
	Agree	0	0	63	92	0	155
	strongly agree	0	0	56	101	16	173
Total		11	24	136	202	16	389
		2.8%	**6.2%**	**35.0%**	**51.5%**	**4.1%**	**100%**

The above table indicates that respondents who felt materials from their lecturer were poor, generally also felt materials were not appropriate for students in other colleges to use. On the other hand, respondents who felt materials from their lecturers were good subscribed to the idea that the materials were appropriate for other students to access and use.

University administrators and managers who were contacted indicated that they support the idea of offering open courseware by their respective universities .In addition university administrators generally agreed with the following as some of the benefits that open courseware can bring to university.

- Open contents will extend quality of education to the Kenyan public especially those who would not afford or others who do not meet university entry criteria.
- Universities will strive to provide good quality materials in face of public scrutiny
- The university will join other key players in the world in provision of OCW. This would improve status of the university.
- OCW can contribute in strengthening the education infrastructure to offer distance education
- Other tertiary institutions in the country can benchmark with what your universities is offering

- OCW will take advantage of recent government initiative such as laying of undersea fiber optic cables connecting Kenya and the rest of the world and setting up of digital villages.

4.5 Issues Surrounding Adoption of Open Courseware.

Preliminary study indicates that there are number of issues that may act as a roadblock to implementation of open courseware.

The researcher sought to get some information and perception from specific respondents who had the information about some of the challenges of open courseware implementation in Kenyan public universities.

University administrators generally agreed that the five items listed below are the major issues that pose a great challenge to OCW implementation in universities of Kenya

- Lack of awareness
- Conflicts with intellectual property rights such copyrights of authors
- Set up and maintenance cost
- University policies
- Motivation of contents developer
- Quality of materials

Most these items have been explored in this study as you will find in the proceeding sub topics. Some of the items have already been discussed.

4.5.1 Intellectual property rights

Copyright is one of the challenges for anyone who attempts to publish materials online. Materials are published on OCW site under open terms which means the public can access for free and use the materials in different ways. The study sought to establish how much lecturers in Kenyan public universities use copyrighted materials and whether lecturers are willing to share materials under open licenses which means allow the end user to use, reuse, adapt and distribute for non commercial purpose .We further wanted know whether it is possible to carry out copyright clearance before materials are published in OCW.

Table 4.13 Copyrights descriptive statistics

	N	Min	Max	Mean	Std. Deviation
How regularly do you use copyrighted materials in instructions	111	1	4	3.05	1.155
Copyright clearance can help to solve IPR problems	111	2	5	3.91	1.133
willingness to share academic work to the public under open terms	111	2	5	3.43	.969
Valid N (listwise)	111				

Table 4.13 shows that the means of three copyright items is above 3.0 which indicate lecturers generally use copyrighted materials in their instructions and they are generally willing to share their academic work under open terms. Further they generally agree that copyright clearance by lecturers or external bodies can help to solve IPR issues.

Most of university administrators and management who were contacted pointed out that copyrights issue was major challenge in implementation of open courseware.

Some informants provided that the solution to copyrights issue is for universities to come up with clear copyright policies. Other informants felt that Kenyan government laws do not provide open licenses adopted by open education resource such as open courseware.

Further most of informants felt that people will always question issue of copyright for their own material. They will require a kind of compensation for trouble taken to produce the material for open courseware.

Some lecturers indicated that they have no problem with others using materials for academic work but they fear that someone may take their work and claim their own and perhaps copyright it themselves.

4.5.2 Motivation and attitudes of instructors who develop the contents

Motivation of content developers is another major challenge that has been recognized in this study. Interviews with university administrators and other informants indicated that motivation of faculty members should be given high consideration.

The study sought to find out whether lectures are comfortable to share their academic work to the public under open terms and also whether they agree that by publishing materials in open courseware can bring other gains such boost their reputation as content developer. Further we sought to find out whether lecturers are comfortable with video recording of their lessons. Results are indicated below.

Table 4.14 Descriptive statistics for motivation of lectures

Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Comfortable sharing education materials	111	2	5	3.77	1.024
audio and video recording	111	3	5	4.54	.536
boost reputation as content developer	111	2	5	3.96	.631
Valid N (listwise)	111				

The mean values of items of motivation as indicated in Table 4.14 are above 3.0 and however deviations of the items somewhat high. Result show that lecturers who are the content developers are generally comfortable to share their academic work with the public and they also strongly accept audio and video recording of their lesson. Further lecturers generally accept that by publishing materials in open courseware, it boosts their reputation as content developer.

We further sought to know whether lecturers may not participate in open courseware on specific situations and conditions.

Table 4.15 Frequency for Reasons why Instructor may NOT Participate in Open Courseware

ITEMS	Frequency	Percentage
IF no reward system in place	**73(65.5%)**	**28.18**
If I do not understand the process by which OCW course materials are published.	**69(62.16%)**	**26.64**
My materials are not sufficiently polished and organized for publication	**55(49.55%)**	**21.23**
No time to participate	**5(51.35%)**	**22**
	256	**100**

Table 4.15 shows some of the reasons why lecturer may not participate in open courseware. Majority (65.5%) felt that they cannot participate if there is no reward system in place. This seems to indicate that for lecturers to participate in open courseware there should be clear terms of engagement. The results further show that majority (62.16%) of respondents stated that they can't participate if the publishing process is not transparent. The implication here is that for the success open courseware implementation the contents developers should understand the publishing process and other aspects of implementation. For instance contents developer should clear about licensing.

Results also show that majority (49.55%) felt the materials were not well polished for publishing and 51.35% of respondents also pointed out that there was no sufficient time to participate in open courseware. This implies for success to be realized, before open courseware is implemented there is need for content developer to prepare materials in form and standard required for publishing. Further the result also indicates that lecturer in Kenyan public universities do not have time to sufficient required to participate in open courseware.

One of the informants stated that creation of open material should not be viewed as addition burden but rather an integrated part of scholarly endeavor that is useful.

On one to one interview with one of the university administrator, she pointed out that sensitization is required to demystify the whole issue of OCW and for people to understand that sharing is noble and that

you are contributing to scholarship. Money is not everything. Knowledge power is more essential and you get global recognitions for sharing eg MIT is famous for OCW

The results led to conclusions that Kenyan public universities lecturers are willing to provide their materials under open terms which means they allow the public to access their materials for free, adopt and reuse the material for non commercial use only if some condition of engagement are put in place.

4.5.3 Financing

Any institutions that embark on implementation of open courseware should consider setup and maintenance cost .Like other online projects OCW requires a lot of money in development of implementation infrastructure, development of contents, consultations, training, advocacy and payment staff. Sustainability of the project given that open courseware may not generate income by itself is even a bigger challenge. Due to confidentiality of the subject the study did not investigate the financial status of the universities.

The study sought to find out from the university administrators and other informants on options available of meeting costs.

Opinion of senior managers in three universities suggested that open courseware is a good idea but universities may not have enough financial resource to sustain the project.

Some of suggestions sampled on costing were:

- Most of the administrators and other informants suggested that government and non governmental organizations could sponsor the project.
- A number of university administrators also felt that university could solicit support from international OCW movements while others felt that universities can work in collaborative mode.

4.5.4 Institutional policies

The study investigated about existence of institutional policies that encourage open courseware. Information from the three public universities administrators contacted indicated that material sharing is within their mission statements but is not well defined within the universities policy documents.

4.6 E-contents Preparedness

It inconceivable that for success of open courseware depends on ICT preparedness especially the e-content development .OCW are online materials published for public access. Before university embarks on implementation process, it is important to consider the state of current lecturer's materials. It is also important to know whether lecturers at the university have attended any content development training.

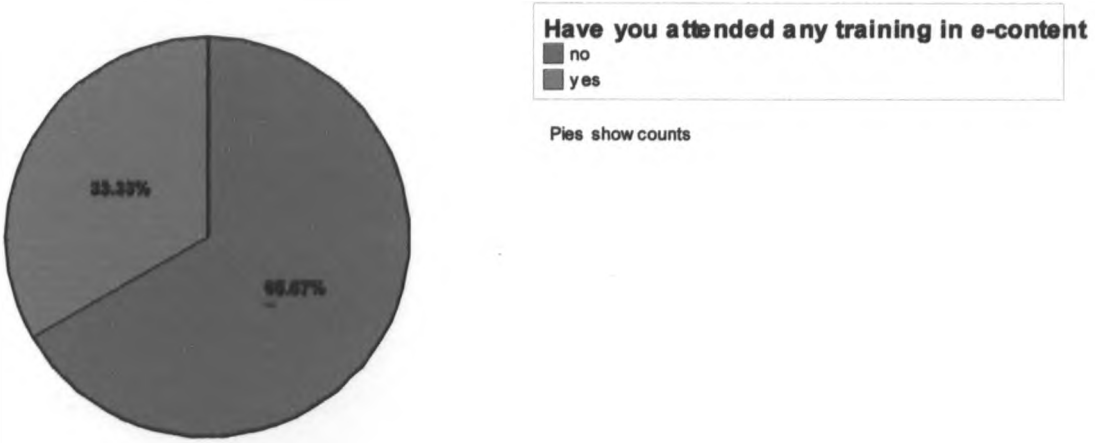
The study sought to find out e-content preparedness by lecturers in public universities of Kenya. Results are shown below.

Table 4.16 Descriptive statistics of lecturer's materials format

	N	Minimum	Maximum	Mean	Std. Deviation
Handcopy	111	.00	.95	.5059	.30397
Electronic	111	.05	1.00	.4869	.30134
Valid N (listwise)	111				

Table 4.16 show that slightly most of lecturer's materials (50.58) are in hand copy (both handwritten and photocopied) form .

Figure 4.5 Training in e-content development chart



Majority of respondents (66.67%) have not attended training in e-content development. However, all university ICT managers indicated that they have training program for their lectures on e-content. For instance Kenyatta University indicated that they have their own format for writing materials but they also outsource experts to train lecturers on development of materials but they carry out in-house training on use and uploading materials on the Moodle e-Platform.

4.7 Universities ICT Infrastructure

The underpinning of open courseware is ICT. With the right implementation infrastructure institutions will be able to leverage open learning resources, foster greater user interaction and usher in a higher quality of learning experience. The study sought to find out existing ICT infrastructure suitable for open courseware implementation.

One of the indicators of university ICT readiness for open courseware is the existence of online learning. Interviews with e -learning directors of the universities and observations revealed that all the three visited universities have online learning in different forms.

University of Nairobi and Kenyatta University online learning systems are currently very active unlike JKUAT which at the moment is not.

Table 4.17 Framework of comparison of the three universities ICT infrastructure

ITEMS	Kenyatta University	University of Nairobi	JKUAT
Internet bandwidth	12 Mbps	34Mbps	5 Mbps
Dedicated content repository servers	2 servers(1+backup server) with space of I Terabyte	2 dedicated servers	-None -Some of online materials are on CD/DVDs
University Connection	There is a network connection in all lecturer offices, Libraries and computer labs.	There is a network connection in all lecturer offices,Libraries and Computer labs All University campuses interconnected in a Fiber WAN.	There is cable network connections in all lecturer offices and computer labs and WIFI wireless in most of university compound
Curriculum for training lecturers in e-content development	There is format for developing materials. outsource trainers and Carry out in-house training especially on uploading of contents to LMS	There is a predefined format. There is a section within ICT center whose staff are purely for E-content development and training	-Outsource Some lecturers have been trained on content development and uploading of contents to CMS
When was online learning started?	More than 3 years ago	More than 3 years ago	1-3 years ago
CMS/LMS	Moodle	Chisimba wedusoft	Moodle
Category of LMS	Open source	Open source	Open source
Courses already on online	About 50 courses very active	165 courses	1 course is online
Online Content format	-Most is Textual, some video and audio	Textual & audio	Textual
Weakness with online learning at the university	-Internet bandwidth is not sufficient to support very many concurrent accesses. -Off campus access is slow.	-slow Speed of internet connection. -acceptance buy faculty to change to this new technology of knowledge dissemination	-Acceptance by faculty for mainstream courses -Insufficient Bandwidth

Chapter 5: Suggested Framework

5.1 Introduction

This chapter contains the proposed framework as well as the discussions and framework validation. AVU model (see section 2.8) was used as reference in creation of this framework.

The purpose of the study was to find out factors that discourage or/and encourage open courseware in public universities of Kenya and how to overcome challenges that discourage implementation of open courseware. Finally, the researcher intended to develop an open courseware framework for Kenyan public universities.

5.2 Current State of Open courseware in Kenya.

Open courseware so far has not been implemented in public universities of Kenya. However, the universities are offering distance and online learning using different kind of models. In the recent past universities in Kenya have shown great interest and have developed their respective online courses offered through available ICT infrastructure. The trend is that more and more lecturers are converting materials to electronic format and are participating in education delivered through technology. Based on this study and observations, public Universities in Kenya are in formative stage of online learning. The universities are yet to reach maturation stage as compared to counterparts in western countries. Lesson learnt from those who have adopted open courseware; imply that most of successful implementation has been institutions which already had good history of online learning such MIT.

It is encouraging to note that the internet connectivity in public universities has greatly improved especially due to fiber optics connectivity and is even expected to improve further. Most of major towns and cities in Kenya are in process of being connected through fiber linking the Kenyan coastal region and outside world. Another opportunity is the proposed digital villages in Kenya. Digital village are ict centers that will be established in rural areas of Kenya to provide ICT facilities to the community living around. If the project is successful and if Open courseware is implemented in public universities, the society can benefit from accessing learning materials for free from leading institutions of higher learning.

5.3 Conceptual framework

The suggested open courseware framework suitable for Kenya was derived from literature review, AVU Framework (2005) and the study carried out at the public universities in Kenya.

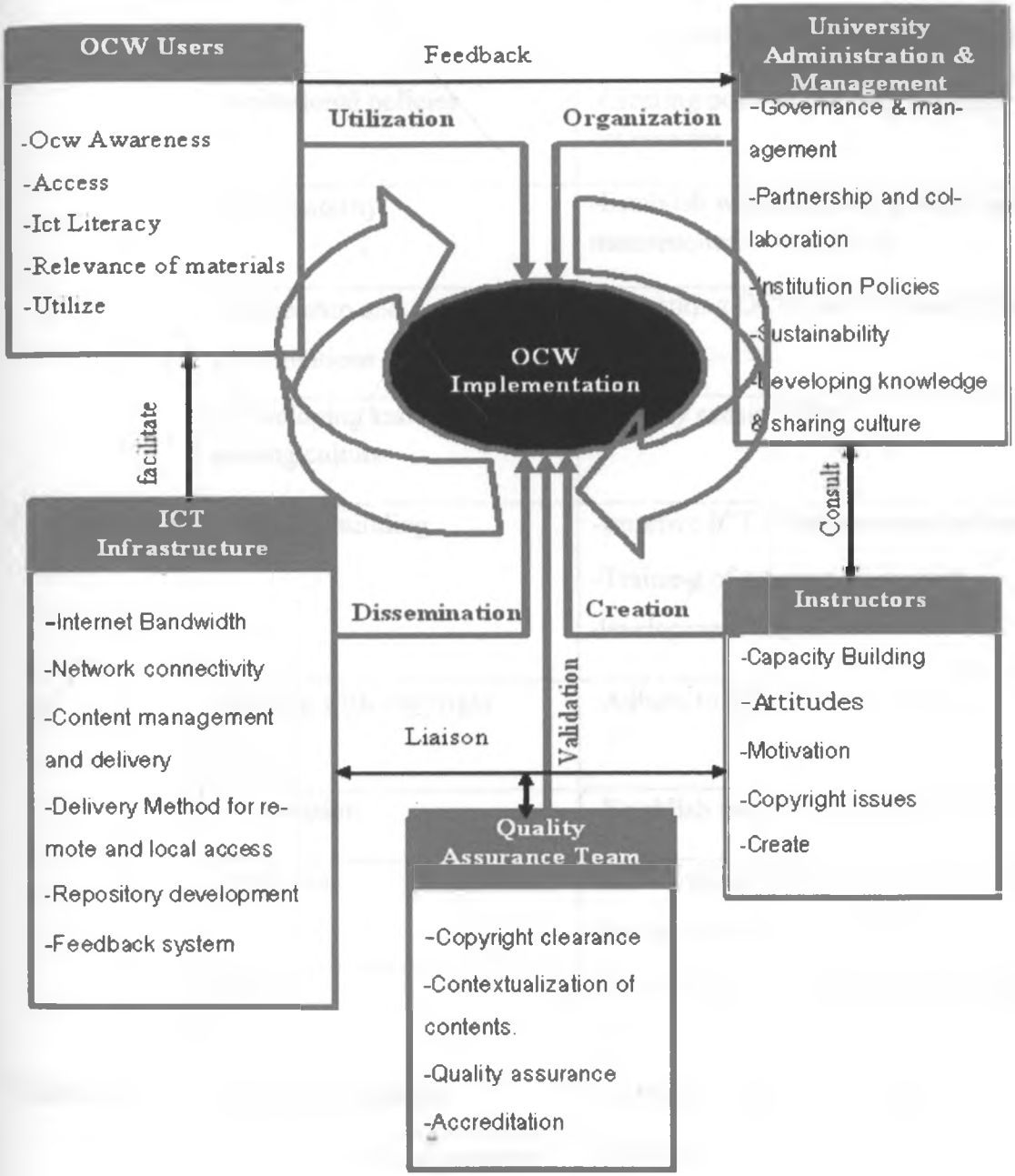


Figure 5.1 Proposed Open courseware Conceptual framework.

5.4 Framework Dimensions

Dimensions	Components	Processes
Organization	-Governance and management	- Setting up taskforce to spearhead the project -Formulating plan of implementation.
	-Institutional policies	-Creating policies that support open courseware.
	-Sustainability	-Establish ways of meeting setup and maintenance cost of OCW.
	-Partnership and collaborations	-Consulting OCW partners and building alliances.
	- Developing knowledge & sharing culture	-Faculty sensitization
Creation	-Capacity building	-Improve ICT literacy among lecturers -Training of tutors in E-content development
	-Dealing with copyright issues	-Adhere to IPR
	-Motivation	-Establish ways of motivating lecturers.
	-Attitudes	- Developing positive attitudes towards sharing education materials.
	Create	-Prepare digital materials for publishing in OCW sites.
Validation	Copyright clearance	-Perform copyright clearance
	Contextualizing of contents	-Perform relevance check
	Quality Assurance	-Perform quality assurance
	Accreditation of materials	-Get official approval and seek authorization for publishing.

Dissemination	Internet connectivity	-Improve internet bandwidth -Improve university network connection
	-Content management and delivery	-Setting up of Content management system (cms).
	-Delivery Methods for remote and local access	- Develop interactive website
		-Centralized vrs decentralized
	-Repository	-Set up contents repository servers
		- Develop tagging and meta data information
	-Feedback system	-Create a self evaluating mechanism to feedback the faculty on the use and impact of open courseware on the users.
Utilization	-Awareness	-Sensitization
	-ICT Literacy	-Improve ict literacy
	-*A*ccess	-Improve internet access
	-Relevance	-Maintain high standards and quality in production of materials
	-Utilize	-Advocacy

5.5 Components of frameworks

The elements and components of open courseware implementation are discussed below:

5.5.1 Organization

One of the key elements of open courseware is organization of which university management is the pivot. The management plays the key role in organizing the open courseware project. Some of the key components of organization are discussed below.

a) Governance and Management

In establishing open courseware some of the issues of governance and management that needs to taken into consideration are:

- A steering committee or advisory board needs be constituted to spearhead open courseware initiative.
- The faculty are the key stakeholder group and a key enabler of an open courseware Initiative. The open courseware organizational focus must be very "faculty centric" and involve faculty as early as possible on the program advisory board.
- You must have clear institutional executive support, including school deans and Department heads.
- The university should engage partners especially the government in the open courseware projects. From the perspective of early adopters of OCW it is difficult for the university to go alone in adoption and subsequent maintenance of the OCW due to cost involved and level of planning required. Most of the model adopted so far involves consortiums spanning a number of universities, educational institutions and other interested organizations. Other models such as Vietnams OCW are 100% supported by government.
- The university must have the skills to support and drive the required processes. For example, leaving the publication process to the faculty will not work well because they are very busy. However, over time, it makes sense to work with faculty to make their course materials more directly compatible with open courseware to make the content migration process as straightforward as possible.

b) Institutional Policies

Institutional policies vary widely on issues of copyright ownership and publication rights of materials created by faculty. There may be an intellectual property policy in place already that may need to be reviewed with Open Courseware in mind. If an institution does not have an established policy, any policy written should consider Open Courseware when identifying copyright ownership and publication rights of the institution.

There are several core issues to consider:

- Intellectual property considerations
- Institutional commitment
- Institutional policy structure
- Cultural and educational exchange: policies and practices
- Issues surrounding the export and import of educational material

c) Sustainability

In general, OCW does not generate a revenue stream and, unlike an on-campus library, for instance, which also incurs costs rather than generates funds, the main beneficiaries are meant to be people outside the university. Hence, the motivation for university leaders to invest in OCW is unclear.

This suggests that it may be difficult to maintain a budget line for OCW in the regular university budget especially for Kenyan situation and that when times are hard OCW represents a soft target for cuts.

It is important to set up an adequate business model in order to guarantee sustainability of the initiative. Although this is a non-profit initiative, resources must be made available and sustained.

d) Partnership and collaboration.

Partnership and collaboration is key in open courseware implementation. Since OCW is a non profitable initiative and considering the high setup and maintenance cost. It is difficult for the university to go alone in the implementation. Considering Kenyan situation the government should be forefront in supporting the initiative considering the main beneficiary is not the university but the general public. The support will entail financial and

advocacy roles. The participating university should also consider working closely with other education stakeholders such as AVU, KENET and NGOs. In additional, there exist international bodies such as OCW consortiums, UNESCO, World Bank and others who support the initiative.

e) Developing Knowledge and sharing culture

The open courseware team has to constantly sell and advocate the value of participation in the open courseware program to the faculty and department leadership. There is need for the university management to build support with department heads and have them become advocates to the faculty. University also needs to embark on though campaign internally and among other universities to sensitize instructors on the need for open sharing education contents. It is of great significance that Faculty members be informed of benefits of participating in open courseware.

5.5.2 Creation

The key element of Open courseware implementation is the creation of contents whose, and the essential source is the instructor who provides that content and agrees to make it freely and openly available. Whether Open courseware is driven by 'top-down' institutional systems or 'bottom-up' individualized initiatives, university lecturers are pivotal to creation of the educational substance. Some of the key components of creation are discussed below.

a) Capacity building

Open courseware by its very definition is free digital university contents that are delivered through technology .For the instructors to participate in open courseware they must have capacity to create digital contents. Considering the costs and complexity of contents production, it is much better if lecturers produce digital contents ready for publishing. It is therefore of great essence for the instructors to have the requisite skills of developing digital contents. Some of the

b) Copyright issues

Copyright consideration is a serious roadblock even if the intention of the content author was meant to provide the resource for free access and use. In the process of preparing contents, instructors research contents from various sources of which some may have various copyrights and other restrictions. Instructors may also raise issues of their intellectual property rights. As one

instructor put it, "I have no problem with someone else accessing my materials for free and even possibly enriching it for training others but I have issue with someone else using my materials for commercial purposes".

At this stage intellectual property issues should be identified. Some of indicators of copyrights are frequency of use of copyrighted materials and willingness to share materials under open licenses.

c) Motivation of instructors

There is no clear incentive of engagement for the faculty to participate in open courseware. The greatest concern is the time that is required by instructors to prepare a course that will be available, monitored, maintained, updated and perhaps re-formulated for new settings and different uses. The open courseware materials provided by the instructor will be judged by the peers; therefore effort in producing quality desired is of essence.

d) Attitudes

An attitude is a hypothetical construct that represents an individual's degree of like or dislike for an item. Attitudes are generally positive or negative (Wikipedia, 2009).In order to make open courseware a success, there is need for full co-operation from instructors who are the creators of the contents. Developing right attitudes among the instructors towards free sharing of materials with the public is a major milestone for open courseware implementation.

e) Creation

Creation in this aspect refers to preparation of materials for publishing in open courseware platform. Deliverable from creation are materials in digital form and which intellectual property issues have been dealt with.

5.5.3 Validation

For successful implementation of open courseware, validation of materials to be published is of great necessity. Quality assurance mechanism guarantees that materials are validated for publication. Quality in this sense refers to the relevance of material to the public, compliance

to education standards and integrity, organization of contents and compliance to intellectual property rights. Some of components of validation are explained below:

a) Copyright clearance

Instructors obtain contents from various sources. The materials may be protected against distribution through copyrights. The OCW materials should be intellectual property-cleared, meaning that the university has the rights to make the materials available under open terms and that nothing in the materials infringes the copyrights of others. Copyright clearance may involve seeking approvals for publication from original author and publishers of materials.

b) Contextualization and localization of contents

Materials from course instructors have been designed for their students at the university. If the same contents are to be available for public view, it is important to consider relevance of the contents to other people outside the university in diverse thematic areas of research and training. Before contents are published it is of essence to evaluate the contribution of such contents to the knowledge society.

c) Quality assurance.

Is a planned systematic pattern for all actions necessary to provide adequate confidence that the product, or process by which the product is developed, conforms to established quality standards (Somerville 1989).Quality assurance is applied not only in validation but also in creation and dissemination of contents.

Quality assurance will involve checking the contents for consistency, pedagogical aspects, compliance to education standards and organization of contents. By publishing materials in the web for open access through OCW, university is allowing the public to judge what is offered by the institution. If materials are of poor quality, it may be threat the reputation of not only the author but also the university. The university should strive to provide best quality material to avoid negative criticism by the public. Reliance should be made on standards and specifications to the extent possible.

d) **Accreditation of contents**

Accreditation is the official approval of contents for publication in OCW sites. Once materials have approved they can be placed possibly in a separate repository of accredited materials. Faculty should seek mandate of publishing the contents from course authors to avoid issues of ownership later on. It is common practice for university and contents authors to enter in agreement of ownership. At this stage it also important to spell how frequent updating of contents will be taking place.

5.5.3 Dissemination

A key component of open courseware is dissemination of contents whose cornerstone is technology. The technology is based on the ICT infrastructure for publishing the contents. Open courseware technology infrastructure consists of several components, internet connectivity, desktop tools for building course web sites and file conversion, web authoring tools, workflow, metadata capture and publication tools, content staging infrastructure, content publication infrastructure, content repositories (file storage) Implementation. The technology should be designed to allow the use of a variety of appropriate tools, with a minimum of integration problems. The choice of technology should consider setup and maintenance cost. In our framework we endeavor to recommend use of cheap but efficient technology suitable for Kenyan situation. Some of the key components of dissemination have been discussed below:

a) **Internet Connectivity**

Connectivity is a key issue in this initiative. This entails special care in addressing bandwidth problems. The university should be well served with internet and the bandwidth should be big enough to allow access of not only textual information but also multimedia contents. Sufficient campus network connectivity is also crucial to facilitate easy creation and updating of contents by course authors at the comfort of their offices or in the universities compound. For instance wireless access through WIFI or WiMAX technologies can connect instructors using laptops or other mobile devices in order at get feedbacks from users of their contents and also enable easily update their contents.

b) **Content management and delivery**

Contents delivered through open courseware should be easily searchable and well organized for open access. Care should be made for usability considerations, which means contents, should be easy to edit or modify (formats, specifications) and should accommodate different kinds of access considerations. There is need for content management systems which provides a means of managing large amounts of contents and at the same time providing room for incorporating other pedagogical aspects. From literature review we found out that a number of content management systems are available and which are suitable for open courseware. The early adopters of open courseware have already created some course management systems for OCW such as educommon and moodle .The study recommends implementation of open courseware to minimize on setup and operation cost.

c) Repository Development

Development of content repository should act as a prerequisite long before university embarks on open courseware implementation. Universities that have matured in e-learning already have established repositories where contents are archived. Repository in this aspect refers to data servers with very big space for storage of contents. Issues such as security and scalability of contents should for taken into consideration. To improve performance and to manage quality of contents there is need to set up content staging servers. Lastly, preparing contents for web access also require inserting metadata information.

d) Delivery methods for local and remote accesses

In most cases, local access of online contents does not pose a big problem to users as the remote access. Some of remote users may access courseware contents using very slow connections given the situation of internet in our country. For example it can be extremely difficult to watch or download video contents using slow connection. Before university implements open courseware it is important to consider the connections of the expected users especially for remote access. In addition, a whole range of delivery modes should be made available for cases where connectivity at sufficient bandwidth would cause a problem.

e) **Feedback systems**

Criteria for the assessment of outcomes on the user of open courseware should be defined. Feedback mechanisms should be designed and implemented. It should allow users to express their views on their experiences with the courseware. In addition the site should include access counter to tell the number of people who visit the site.

5.5.4 Utilization

Utilization in this sense refers to usage of open courseware materials .This may entail learners using the materials for additional learning and research, instructors from other institution using the materials in their training and other people using the materials for personal study. In all the modes user of open courseware is at the center stage. Below are some of the discussions on the components of utilization

a) **Awareness**

One of the most important aspects of open courseware implementation is for targeted citizenry to be sensitized of the availability of open courseware. The public should have information about what is available on open courseware and benefits of using the materials. One of the indicators is awareness of the already existing Open Courseware and frequency of open courseware visits.

b) **ICT Literacy**

Open courseware is delivered through ICT. The open courseware users must be skilled in use of technology. They should be able to use ICT in learning and research. Basic ict requisite skills are needed for one to be able to search open courseware materials on internet, interact with the site in different ways, save contents and provide feedbacks.

c) Access

Access in this sense refers to availability and use of internet. The open courseware is accessed by users through various internet connections. It is important to consider various internet access points for the targeted audiences. It is also equally important to consider internet usage culture of the audience. People who frequently use internet are likely to utilize open courseware much more than those that don't .Another; aspect to take to consideration is what the targeted audience access on internet. Do they utilize internet for research and learning?

Indicators of access include *frequency of internet use, buying of online materials, internet connectivity and use of free internet contents.*

d) Relevance of materials

Relevance concerns with how pertinent, connected, or applicable something is to a given matter. A thing is relevant if it serves as a means to a given purpose. The relevance of a Website can be assessed by use of updates and other information that makes the visitors experience. In assessing for relevance, there is need to see how much material is available that would inform citizens. The impact of the contents on the learner will greatly determine the utilization of the contents. Care should be taken in that the design of contents. The material should not only be useful to the university students but also majority of the public.

e) **Utilization**

Utilization in this context refers to use of open courseware material by the end users if it published .Indicators of utilization is whether end users support and subscribe to concept of open courseware. The other is indicator is whether end users can utilize the materials for research or self study if they are availed on internet.

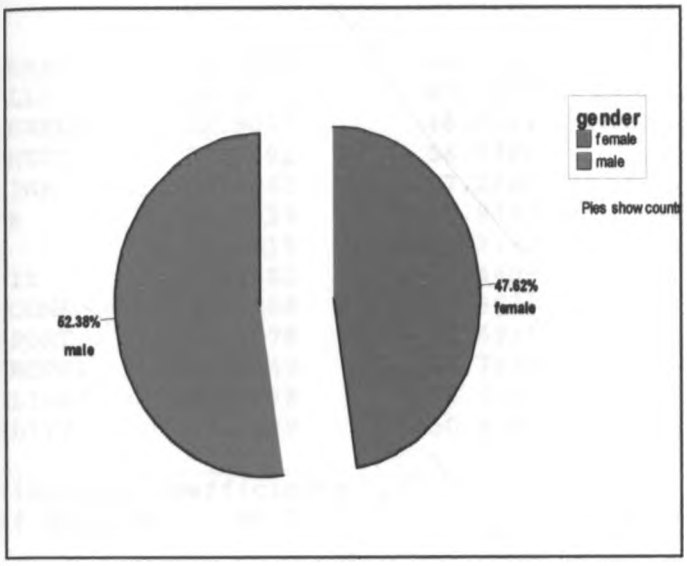
5.6 Framework Validation

The proposed framework was tested so as to assess whether it can be used by universities in Kenya to evaluate readiness for Open courseware adoption. This was done by developing a questionnaire based on the framework elements. The questionnaire contained a perception test item for each of the elements of the framework.

A total of 100 questionnaires were distributed to students and 30 questionnaires to lecturers in the three public universities. There were 91 valid responses from students and 26 responds from lectures giving a response rate of 91% and 87% respectively.

5.5.1 Characteristics of response

Figure 5.2 Gender distribution



From the data that was collected from students across the public universities, there were 48 male and 43 female giving a percentage of 52% and 48% for male and female respectively.

5.2 Respondents University distribution

Universities		Students		Teaching staff	
		Frequency	Percentage (%)	Frequency	Percentage
Valid	JKUAT	17	18.7%	7	26.9%
	KU	28	30.76%	9	34.62%
	UON	46	50.54%	10	38.47%
	Total	**91**	**100.0**	**26**	**100.0**

Most of the respondents (50.54%) students and (38.47%) teaching staff were from university of Nairobi.

5.5.2 The Reliability Test

The questionnaire was subjected to a reliability test. The chronbach's alpha was found to be **0.8143** which is above 0.7 which qualify the instrument as shown by table 5.3.

Table 5.3 Reliability Analysis

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
LITERACY	34.5934	60.9106	.2143	.8171
SKILLS	31.9011	49.0679	.7304	.7776
INTERNET	32.3077	48.2154	.6606	.7817
CONNECT	31.7692	56.2462	.5559	.8006
ONLINE	33.7692	57.2462	.2082	.8205
FREE	31.7033	55.9443	.2292	.8221
OCW	35.1319	57.2713	.5771	.8031
VISIT	34.7802	53.4400	.4389	.8027
OUTCOME	33.7802	43.8623	.5116	.8122
SUPPORT	31.1978	56.6938	.4159	.8058
APPROPRI	32.0549	48.7636	.6635	.7819
UTILISAT	31.1978	56.6938	.4159	.8058
QUALITY	32.1429	50.8794	.6981	.7831

Reliability Coefficients
N of Cases = 91.0 N of Items = 13

Alpha = .8143

5.5.3 Framework Validation

Framework Validation was performed using Regression Analysis.

Regression analysis is a statistical method to deal with the formulation of a mathematical Model depicting relationship amongst variables which can be used for the purpose of prediction of the values of dependent variable, given the values of the independent variable (Kothari, 2008). Regression analysis is hence used to explore the relationship between one continuous dependent variable and a number of independent variables or predictors, usually continuous.

In this analysis, it is typical to use R^2 to describe the quality of the relationship between the actual response variable and the predicted response variable. Values for R^2 range between 0 and 1, with values closer to 1 indicating a better fit.

Our research model on element utilization when subjected to regression analysis yielded an R^2 value of 0.840 indicating a good research model as shown in table 5.4

Table 5.4 Regression Model Summary for Utilization

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.916(a)	.840	.834	.35406

a Predictors: (Constant), Relevance, Awareness , Access

Regression analysis allows for sophisticated exploration of the interrelationship among a set of variables, making it ideal for the investigation of complex real life research questions (Kothari, 2008). It can tell you how well a set of variables is able to predict a Particular outcome.

The Sig. Value, tells whether the variable is making a statistical significant unique contribution to the equation. If the Sig. Value is less than 0.05, then the variable is making a significant unique contribution to the prediction of the dependent variable. If the value is greater than 0.05, then you can conclude the variable is not making a significant contribution to the prediction of your dependent variable.

Fig 5.3 Utilization Validated Model

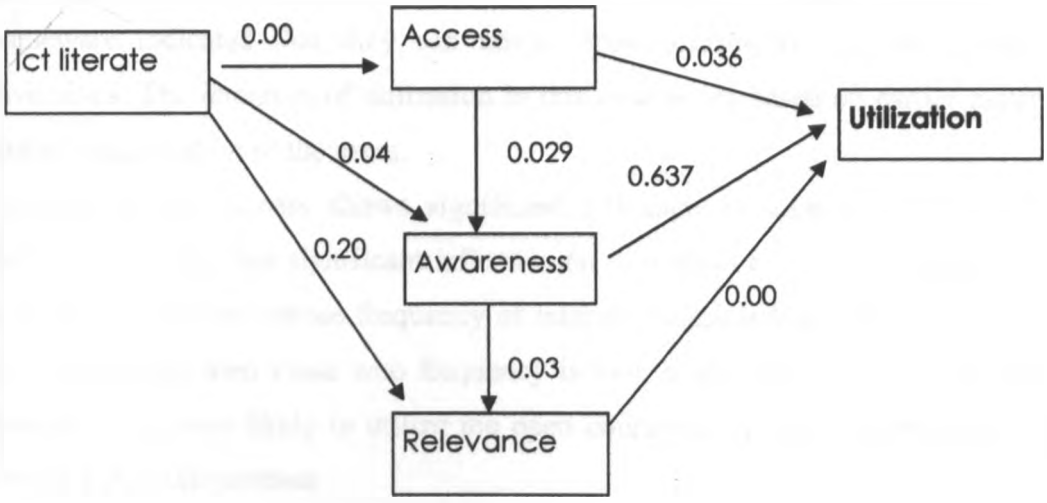


Fig 5.3 shows significance values for construct based on their contributions to the utilization of open courseware. The table below further provides regression coefficients under element utilization.

Table 5.5 Regression Coefficients for constructs under Utilization

Constructs	Dependent	Beta	Significant value. (sig)	Comments
Literate	Access	.522	.000	There is influence
Literate	Awareness	.300	.004	There is influence
Literate	Relevance	.197	.200	There is no influence
Access	Awareness	.228	.029	There is influence
Awareness	Relevance	.308	.003	There is influence
Access	Utilization	-.110	.036	There is influence
Awareness	Utilization	-.021	.637	There is no influence
Relevance	Utilization	.979	.000	There is influence

If Significant value <0.05 there is influence of the construct on dependent variable.

The construct of awareness did not have significant influence on utilization although it was greatly expected it would. Indeed, awareness of open courseware is a determinant of utilization. The outcome is as a result of futuristic kind of approach since the open courseware is not already implemented in Kenyan public universities. That means even those who are not aware about open courseware indicated that they can utilize open courseware if it is implemented in public universities. The intention of utilization in this case is not based on earlier experiences rather on futuristic expectation of the users.

However, internet access shows significant influence on awareness of open courseware and internet access also has significant influence on utilization of open courseware. This is explained by the fact that users whose frequency of internet access is high are more likely to be aware of open courseware than those who frequency is low. it also shows that those who access internet frequently are more likely to utilize the open courseware if open courseware is implemented in Kenyan public universities.

Regression test on Creation

Our research model on element creation when subjected to regression analysis yielded an R^2 value of 0.798 indicating a good model.

Table 5.6 Regression Model Summary for creation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893(a)	.798	.770	.579

a Predictors: (Constant), average quality, average capacity, average attitude

Fig 5.4 Creation Validated Model

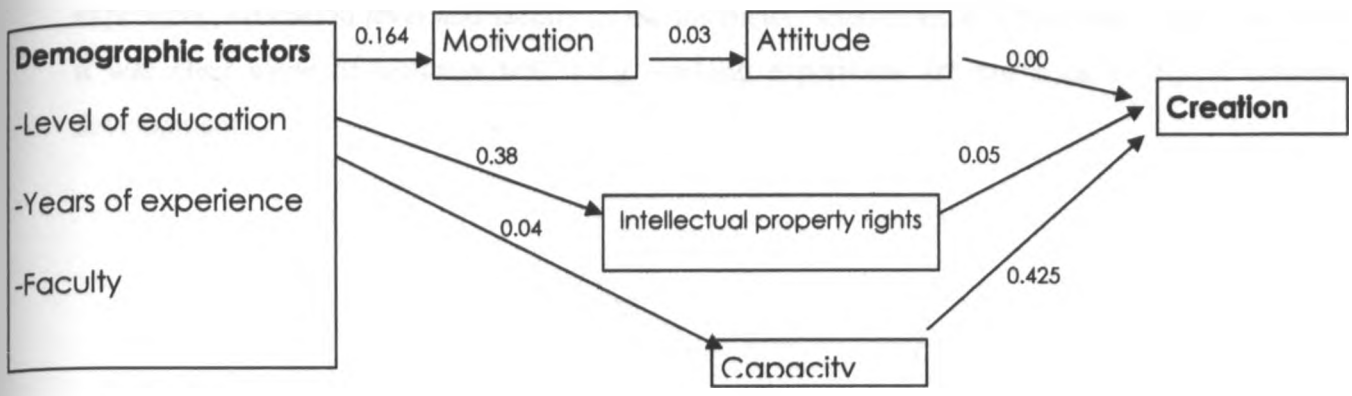


Fig 5.3 shows significance values for variables based on their contributions to creation of open courseware materials. The table below further provides regression coefficients under construct creation.

Table 5.7 Regression coefficient for constructs under creation.

Constructs	Dependent	Beta	Significant value. (sig)	Comments
DF	Motivation	0.164	0.423	There is no significant influence
DF	IPR	-0.110	0.38	There is no significant influence
DF	Capacity	0.405	0.04	There is significant influence
Motivation	Attitudes	0.560	0.03	There is significant influence
IPR	Creation	0.167	0.05	There is significant influence
Attitudes	Creation	0.765	0.00	There is significant influence
Capacity	Creation	-0.067	.425	There is no significant influence

If Significant value <0.05 there is influence of the construct on dependent variable.

Based on the regression test above, constructs attitudes and intellectual property rights influences construct creation while capacity do not seem to indicate influence on the creation which was

against our expectation. It shows that creation of open courseware contents depends so much on the attitude of the lecturers and also adherence to intellectual property rights.

The lack of significant influence of construct capacity was associated with reason that most of the instructors are already computer literate and are able to create electronic contents therefore other factors seem to strongly influence on creation of contents.

Demographic factors seem to influence the construct capacity. This was interpreted to mean experience, education level and faculty of the instructor determines ICT readiness. From the study it was clear some of lecturers with long working experience are not keen to digital contents development.

5.8 Current State of Public Universities based on Framework Components

Dimensions	Components	Remarks based on Current state of public universities in Kenya
Organization	- Governance and management	-Public universities in Kenya have not implemented Open courseware. -There is no comprehensive plan for OCW in place. However, Kenyan universities and other education stakeholders have held workshops on open sharing of contents. **For more details read 4.4**
	-Partnership and Collaboration	-Some of public universities have established good links with international open courseware consortiums. For example University of Nairobi has in past worked with MIT OCW (AVU MIT Pilot project, 2005).
	--Institutional policies	-There is lack of supportive policies for open courseware -Universities IPR policies do not cater for open content sharing. **For more details read 4.5.4** -Kenyan laws do not have provisions for open licenses.
	-Sustainability	-OCW setup and maintenance cost is high. Universities in Kenya do not have enough funds to support and sustain open courseware project on their own. -Low support from government and Non Governmental organizations. **For more details read 4.5.3**
	- Developing knowledge & sharing culture	-So far a number of Workshops and conferences have been held in the country by education stakeholders to sensitize universities on open sharing of education

		contents. KENET (2009)
Creation	-Capacity building	-Majority of faculty members are ICT literate. -Majority of lecturers have not attended any training in E-content development.
		-Most of lecturers contents is not in electronic format
	-Dealing with copyright issues	-Majority of lecturers obtain materials from copyrighted sources. See table 4.11
	-Attitudes	-Negative attitudes towards open sharing
	-Motivation	-Low motivation of faculty
	-Create	-Materials not well organized for publishing in open courseware site.
Validation	Copyright clearance	- Majority of lecturers obtain materials from copyrighted sources.
	Contextualizing and localization of contents	-Some of universities materials have been created for their students. May not be relevant to the general public.
	Quality Assurance	-Some of lecturer's materials do not meet the standards for open courseware publishing.
	Accreditation of materials	-No policies available to support accreditation of open materials.
Dissemination	Internet connectivity	-Low bandwidth. However. Fiber optic connection has improved bandwidth.
		-Access to internet is limited to some areas of universities.
	-Content management and delivery	-Most of the Universities are implementing learning management systems to support online learning
	-Delivery Methods for remote and local access	-Some of Kenyan universities websites are not interactive.

		-Ict services at the university are centralized and are mostly accessed locally. -Kenet(Kenya education networking) is providing countrywide infrastructure development for higher education.
	-Repository	-Most of the universities have no dedicated content repository or data servers.
		-No metadata database
	-Feedback system	-Online systems are already installed with feedback systems and communication facilities for interactions between faculty and learners
Utilization	-Awareness	-Low awareness level
	-ICT preparedness	-Majority of learners at public university are ICT literate
	-Access	-Learners internet usage level is generally high at the university.
	-Relevance	-Some of university materials are not useful to learners.
	-Utilize	-Majority of learners support the concept of open courseware.

CHAPTER 6: Conclusion and Recommendation

6.0 Introduction

Based upon the findings of the research, this final chapter will present findings on the research objectives and necessary recommendations.

6.1 Research objectives

6.1.1 Popularity of Open courseware in Kenya public University

Popularity of open courseware in public universities of Kenya was assessed. From the study there is no particular university in Kenya that has so far implemented open courseware. However, the concept of open courseware is not absolutely new phenomenon to some of the university stakeholders. Result from the study indicates 73.47% of student in public universities of Kenya are not aware of the open Courseware. Further out of 21 university administrators contacted, majority (14) were not aware of existence of open courseware. These findings were alarming and calls for rigorous campaign and sensitization to raise the awareness level if university wants to embark on implementation of open courseware.

As validated in the previous chapter, ICT literacy and internet access have significant effect on awareness of open courseware. Lack of local open courseware experiences of the respondents introduced bias on constructs awareness to indicate it is insignificant on utilization of open courseware. This is explained by the fact that since there is no open courseware implemented in Kenyan public universities where the study was conducted it is difficult to assess the influence of awareness on the actual utilization of open courseware.

6.1.2 Issues Surrounding Implementation of Open Courseware in Public Universities of Kenya.

From the study it is evident that there are number of issues which if not well addressed may hinder successful implementation of open courseware in Kenyan Public Universities. Through our framework validation, intellectual property rights and attitudes of faculty towards open courseware have significant effect on creation of open courseware materials while quality or relevance of materials and access of materials have significant effects in utilization of open courseware.

In general the study has identified four major issues that pose biggest challenge to implementation of open courseware in Kenyan public universities. The four issues are discussed below.

a) **Intellectual Property Rights**

Open courseware materials are published under open terms which mean the public can access materials for free and use them in different ways. It is evident from the study that majority of lecturers contacted generally use copyrighted contents in their instructions. This is major hindrance especially if the materials are to be published for free and open access.

It was interesting to note that instructors contacted are generally willing to share their materials under open licenses which means they allow end users to use, reuse, adopt and distribute for non commercial purposes.

The study further identified IP clearance as one the solutions of coping with issue of non adherence to copyright laws. IP clearance is the process that ensures the open courseware publisher has the rights to make the materials available under open terms and that nothing in the materials infringes the copyright of other .It may involve getting approvals from authors whose contents have been copied and/or removing such contents. It may also involve making sure fair use of other authors contents which may involve making sure the original authors are properly acknowledged.

However, IP clearance can be time consuming and expensive depending on amount of contents to publish. But, it might be difficult to achieve 100% IP clearance as stated out be Brendan F.D. Barrett in open learning Journal Vol 24 of 2009.

In summary, there are three dimensions of Intellectual property rights considerations:

- Getting permission (a "license") from faculty or other contributors of course materials to publish them on open courseware.
- IP clearance-Clearing (remove/replace) embedded third-party elements from materials to be published to avoid trouble.
- Granting a license to open courseware end-users to use, reuse, adapt, and redistribute materials for non-commercial educational purposes, in accordance with the open courseware concept.

b) **Motivation and Attitudes Towards Open Courseware-**

There is no clear incentive to promote engagement of faculty to devote time and provide their materials for free to the public. The greatest concern is the time that is required from academics to prepare elements of a course that will be available, monitored, maintained,

updated and perhaps re-formulated for new settings and different uses. Open content enthusiasts may be prepared to devote time to creating and adapting materials to a form suitable for open distribution. However, in the case of a large-scale institutional initiative that engages the majority of the teaching staff, any substantial time commitment would be a major barrier to participation

Instructors should be encouraged to devote time and effort in the open courseware perhaps on voluntary basis. However, from the study, it is clear that for lecturers to effectively participate in creation of open contents there should be some conditions of engagement e.g. some form of reward. Lecturers also generally felt that they do not have enough time to participate in open courseware.

Some of respondents expressed very negative attitude towards the whole issue of sharing contents. Others expressed fear that the end users may take absolute ownership of their materials and perhaps use their material for commercial gains. For success in implementation of open courseware there is need for thorough sensitization to demystify the whole issue of open courseware.

In conclusion, the decision for implementation of open courseware may follow top down approach but the actual drivers of real operation and maintenance of open courseware is the faculty members. Therefore motivation and attitudes of instructors is critical.

c) Sustainability of the Open Courseware Project

Open courseware does not generate revenue to the university, it only incurs cost and main beneficiaries are meant to be people outside the university. Setup cost and maintenance of open courseware project is high. From our observation, Kenyan public universities may face problems especially in sustaining large scale open courseware project. From the study, most of the early adopters of open courseware have relied on grants from their respective government, Non Governmental Organization or education foundations for instance; Vietnam open courseware is funded by Vietnam Government, MIT OCW was partly funded by Mellon foundation.

It may be difficult to maintain a budget line for OCW in the regular university budget especially for Kenyan situation and that when times are hard OCW represents a soft target

for cuts. Therefore university must have a concrete sustainability plan before embarking on implementation of OCW.

Although government of Kenya and other sponsors may support the project, they may not provide full support especially in its sustainability. It is important for university to consider cheaper model of implementing open courseware. Some of factors that may influence the cost of an open courseware initiative are:

- Scope of the intended open courseware publication: number of courses to publish over what period of time
- Pre-existing availability of course materials in publishable digital formats
- Feasibility of using existing resources (for example, department-based teaching assistants) to aid in the preparation of faculty materials for publication
- Availability of other in-house services that may reduce the need for or scope of a separate open Courseware publishing organization
- Capabilities of the existing technology infrastructure for managing open Courseware content and for hosting the distribution of that content over the web.
- Availability of open source framework to support open courseware dissemination.
- Whether it employs a producer-consumer model or a co-producer model. Producer-consumer model is more centralized and relies only on the university while co-producer is decentralized and involves collaborations of universities, volunteers and other stakeholders.

In conclusion, based on the above factors, universities which already have an existing and well established online learning infrastructure can easily and cheaply migrate to open courseware.

In summary, it is important to set up an adequate business model in order to guarantee sustainability of the initiative. Although this is a non-profit initiative, resources must be made available and sustained.

d) Quality and Relevance of Open Courseware Materials-

Course materials published on OCW are subjected to public scrutiny. End users will constantly evaluate the quality of content offered by the university. Therefore, quality of

content can positively or negatively impact on the reputation of the institution. Therefore, university cannot afford to compromise on the quality of what it avails to the public.

It is difficult to achieve synergy of Open courseware content in the face of the diverse thematic areas of research and training, and the different approaches and modes of delivering contents. However, the impact and relevance of materials to the targeted end users should be taken to consideration.

From the study majority (56.5%) of students' respondents felt that materials from their lecturers were good and majority (84.34%) also felt that the materials were appropriate for students of other colleges. It was interesting to note that respondents who felt materials from their lecturer were poor, generally also felt materials were not appropriate for students in other colleges to use and vice versa showing close correlation between the two items under investigation. Some of the comments from students were disturbing for example "Why do you have to publish notes from our lecturer on the web, when you can easily get the same from one specific textbook". It is evident that assuring quality of open courseware materials should play a central role for the success of the initiative.

Relevance of material has shown significant influence on utilization of material. The study recognized quality as one of the most critical issues and therefore to include validation of contents as one of the elements of our framework.

6.1.3 Level of ICT Preparedness in Kenyan Public Universities

From our previous discussion universities which rely on the existing state of ICT infrastructure will go along way in reducing the setup and maintenance cost.

One of the critical issues of the open courseware delivery infrastructure is internet bandwidth and connectivity. Open courseware content includes not only the textual data but video and audio which may require high bandwidth for delivery.

Public universities in Kenya are already enjoying undersea fiber optics cable which have improved the bandwidth. Currently, the three university have been provided with a bandwidth above 10 mbps by KENET(Kenya education network).It is encouraging to note that the universities are working on fiber-based local access infrastructure and WIFI networks to improve bandwidth and connectivity for local access.

Interview with informatics also revealed that the bandwidth is projected to improve further. From previous discussion, universities which already have an existing and well established online learning infrastructure can easily and cheaply migrate to open courseware. The study conducted revealed all the three public universities are offering online learning which is supported by open source learning management systems. University of Nairobi uses Chisimba wedusoft and Kenyatta University use MOODLE learning management systems. Based on our observation and interview with the informants, University of Nairobi and Kenyatta university online systems are active and so far are offering a number of courses online.

The study reveals the Kenyan public universities are in formative stages of e-learning but, there are strong indicators of full integration of ICT in education. This is in agreement with study conducted by KENET on East Africa universities in year 2009, the study found that universities in East Africa are at stage 2.2 in the indicator enhancing education with ICT. This means that institutions are at the initial stages of using ICT in learning and teaching.

Another issue is that majority of lecturer in Kenyan public universities have not attended training in e-content development training. However, all university ict managers indicated that they have training program for their lectures on e-content. However, it was encouraging to note the number of lecturers participating in development of content for online learning is on increase.

Universities have also set up repositories for storage of contents e.g University of Nairobi and Kenyatta University has each two servers for storage of contents and backups.

One of the unresolved issues is delivery methods for remote access which includes off campus accesses. The scope of our study did not carry out assessment on the network infrastructure outside the university. But, results from other studies indicate that, it may be difficult to maintain high speed connection in most of places in Kenya especially the remote areas. One of the solutions is to set up distributed systems or mirror servers in various parts of the country. In summary, the content delivery should not only cover the universities but should sufficiently cover whole country.

From our observation, the ICT infrastructure facilities in Kenyan public universities considering the online systems already hosted is impressive but it needs to be improved so

that it can handle the scalability, greater access and flexibility of open courseware. The implementation of open courseware site requires dynamic interactions with search, feedbacks and self evaluation mechanisms. Due to scalability of contents metadata information should be given consideration. Open courseware technology infrastructure consists of several other components, including desktop tools for building course web sites and file conversion, web authoring tools, and publication tools, content publication infrastructure, content repositories Implementation. In summary, key components of open courseware ICT infrastructure includes

- Course planning application for editing and creation of contents.
- Content management application (CMA)
- Content repository
- Content delivery application and network.

In conclusion, we recommend that universities should first attain maturity and success in online and distance learning before embarking on long and sometimes rough journey of implementing open courseware. On this regard we recommend research on maturation of e-learning in Kenyan public universities which above other aspect will evaluate the quality of materials offered online, technical infrastructure, utilization, faculty involvement ,Intellectual property rights, economic implications and the scope of online courses. The reason for emphasis on the existing online course is to reduce costs of open courseware implementation due to availability of ready infrastructure and e-contents. If online courses are offered for a number of years by the universities, high return on investment can be projected. The materials used in online learning can be diverted to open courseware with authorization from the authors based on the existing contracts with the universities.

The researcher proposes open courseware as a great opportunity for universities in Kenya rather than liability as perceived from the studies conducted at the universities Open courseware can improve universities public image in offering quality education and global status due to enrollment as a champion in online education. It can also improve enrollment at the university for instance If you watch a video of an inspiring lesson delivered through open courseware you would most likely enroll for the full course to be taught by the same lecturer.

6.2 Limitations and Suggestions for Future Research

Some limitations or challenges were encountered in undertaking this research project. Lack of funds hindered the research to the extent that the study only concentrated in public university in which student, lecturers and university management were involved leaving out the public who includes students from other institutions, academicians and the general public who are also the target users of open courseware contents. This could have brought about some biasness to the findings of the research especially on some of construct of research such as internet access, awareness and relevance of contents from the university. For instance, Internet access level was high which only involved student in the university but this would be different if all targeted users of open courseware were involved.

Lack of experience of local open courseware implementation made the research to adopt a futuristic approach which could have brought about biasness in our findings concerning the actual perception of people towards implementation of open courseware. Construct such as awareness, which was found to be insignificant to the utilization of open courseware would infact be significant.

The applicability of the constructs proposed in the framework for open courseware implementation needs to be explored in future research. We further suggest future research on the impact of open courseware in Kenyan education system and also on the design of materials for open courseware.

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APPENDIX II: Questionnaire used to collect data.

Part I: This part is to be answered by Students

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

The main focus of the research is to find out the extent of use of OCW and assess the challenges that discourage adoptability by Kenyan universities with a view of developing a framework for implementing open courseware. The questions asked in this questionnaire will be geared towards that end.

The research is purely academic, confidential and will be solely used for that purpose. Your details or data provided will not be passed to any third party without prior permission. I wish to communicate information about the survey results to you should you be interested. Please attach your email address or any other contact if you wish to receive information in this way.

I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Email: kinotshi@yahoo.com)

Section A: Personal details

1. Name of the university_____
2. Your faculty and department_____
3. Email address(optional, if you need a copy of findings)_____
4. Your gender

   Male [ ]

   Female [ ]

5. Select your current level of study

   Diploma [ ] Undergraduate course [ ] Postgraduate studies [ ]

6. Which course are you taking at the university?_____
7. Indicate the year of study_____

Section B: Internet access and use in education

1 How often do you use Internet?

Daily [ ] 5-6 days a week [ ] 3-4 days a week [ ] 1-2 days a week [ ]
less than 3 days a month [ ]

2 Rate your satisfaction with the Internet connection at your university.

Very Satisfied [ ] Satisfied [ ] Unsatisfied [ ] Very Unsatisfied [ ] I don't know [ ]

3 How many times have you bought books such as books and software online or paid subscription fee for electronic contents site?

None [ ] Once [ ] 2-5 times [ ] 6-10 times [ ] More than 10 times [ ]

4 Please state the reasons which discourage you from purchasing materials such books and software's online or subscribing to e-contents site.(tick all that apply)

- Buying books online is expensive [ ]
- I don't understand the payment process [ ]
- I don't trust the payment process [ ]
- Why buy books when I can get what I need for free online [ ]
- Internet access [ ]

5 How many times have you research using free contents available on Internet per semester?

None [ ] Once [ ] 2-5 times [ ] 6-10 times [ ] Uncountable times [ ]

Section C: Awareness of OCW in public universities

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning as it provides the course materials taught at the university for free to anybody with Internet connection. Which means the materials are available under open licenses for use and adoption by other educators and learners? ***OCW does not grant degrees or any certification.***

1 Are you aware that some universities such as Massachusetts university technology (MIT) offer all or some of their course materials for free through Internet. Yes [ ] No [ ]

If your answer is yes, please answer question (i) and (ii) below.

i) How many times have you visited such OCW sites?

I only visited once [ ] twice [ ] 3-6 times [ ] 6-10 times [ ] Uncountable times [ ]

ii) How do you rate your satisfaction with your visit to the website?

Very satisfied [ ] Satisfied [ ] neutral [ ] unsatisfied [ ] Very satisfied [ ]

Section D: Concept support and Quality of study materials

State your agreement or disagreement with the following statements.

i) I would like my university to offer open courseware.

Strongly agree [ ] Agree [ ] Neutral Disagree [ ] strongly disagree [ ]

ii) If what is taught at my university was to be published in OCW site, the materials would be appropriate for other students to use in the country.

Strongly agree [ ] Agree [ ] Neutral Disagree [ ] strongly disagree [ ]

Use this table of ratings to award scores for the questions 2 and 3 below.

Ratings	**Scores**
Poor	1
Very poor	2
Fair	3
Good	4
Very Good	5

2 How do you rate the quality and usefulness of information provided in the following manner?(write the score in reference to the table above)

i) Free contents available on Internet from various authors ___

ii) Purchased online materials ___

iii) Open courseware materials(optional, to be filled by those who have visited such sites) ___

iv) Library materials ___

3 How do you rate the quality of most of the notes and other contents provided by your lecturers in your university?(Refer to table for the scores) ___

4 What do you foresee as a limitation of OCW as learning tool in your university? (Tick all that apply)

i) Lack of awareness about the sites [ ]

ii) Internet connection [ ]

iii) Access to computers [ ]

iv) Relevance and quality of open courseware materials [ ]

v) Others (specify). [ ]

5 Do you agree that most of useful information has been put under restricted access?

i) Strongly agree [ ] ii) Agree [ ] iii) disagree [ ] iv) Strongly disagree. [ ]

SECTION F: Current university contents and publications:

1 How many times have you visited your universities website this semester?

None [ ] Once [ ] twice [ ] Thrice [ ] 4-6 times [ ] Uncountable times [ ]

2 How do you agree or disagree with the following statement.

My university provides online materials and useful links for research through web.

i) Strongly agree [ ] ii) Agree [ ] iii) Neutral iii) Disagree [ ] iii) strongly disagree [ ]

Thank you kindly for participating in this research.

Part II: This part is to be answered university lecturer

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

The main focus of the research is to find out the extent of use of OCW and assess the challenges that discourage adoptability by Kenyan universities with a view of developing a framework for implementing open courseware. The questions asked in this questionnaire will be geared towards that end.

The research is purely academic, confidential and will be solely used for that purpose. Your details or data provided will not be passed to any third party without prior permission. I wish to communicate information about the survey results to you should you be interested. Please attach your email address or any other contact if you wish to receive information in this way.

I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Kinotshi@yahoo.com)

Section A: Personal details

1. Name of the university_____
2. Designation of respondent_____
3. Your faculty and department_____
4. Email address(optional, if you need a copy of findings)?_____
5. Academic qualification attained

   Masters [ ] PHD [ ] Others (specify) [ ]

6. How long have you worked in the university in your current position?_____

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning for it provides the course materials taught at the university for free to anybody with Internet connection .Which means the materials are available under open licenses for use and adoption by other educators and learners. OCW does not grant degrees or any certification.

SECTION B: Preparedness in terms of Electronic contents development

1 Please indicate the percentage of your teaching material that is in following forms?

i) Hand written form _____

ii) Electronic form_____

2 For the materials that are in electronic form, in which format are they?

i) Word processed [ ] ii) Pdf format [ ]

ii) PowerPoint slide [ ] iv) Others(specify)_____ [ ]

vi) Have you attended any training on e-content development? Yes [ ] No [ ]

vii) Do you use any special software to develop your teaching contents? Yes [ ] No [ ]

If yes, specify which one_____

Are there any of your teaching materials that you have published on Internet or university intranet? Yes [ ] No [ ]

SECTION C: Copyright issues

1 Rate your willingness to contribute your own original academic work (e.g., lecture materials, paper or project) under open license terms which means you allow the end user to use, reuse, adapt and distribute for non commercial purpose?

Very willing [ ] willing [ ] neutral [ ] unwilling [ ] very unwilling [ ]

2 How regularly do you use materials from copyrighted sources in your instructions?

All the time [ ] frequently [ ] Neutral [ ] occasionally [ ] Never [ ]

3 Have you published any books which are already in circulation on the market or are you planning to publish in near future? Yes [ ] No [ ]

If your answer is yes.

i) How many books have you published which are in line with what you teach at your university?_____

ii) Do you provide notes to students which you directly obtain from the book you have authored?

Yes [ ] No [ ]

Copyright clearance is the process that ensures the open courseware publisher has the rights to make the materials available under open terms and that nothing in the materials infringes the copyright of other .It may involve getting approvals from authors whose contents have been copied and removing such contents.

4 How do you agree that copyright clearance by a third party on lecturer materials before publishing in Open Courseware site can help to solve the problem of publishing already copyrighted materials in open terms.

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

SECTION D: Motivation of instructors

1) I am comfortable openly sharing my teaching materials online.

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

2) Use table to answer the questions that follows.

Rate U	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Reference i u	SA	A	N	D	SD

using references above please rate your agreement with the following statements

i) I am comfortable with audio recordings of my lectures, discussions, and classroom activities being shared openly online._____

ii) By publishing my materials in open courseware, it will boost my reputation in contents development_____

3) Assume you are called upon to publish your course materials on OCW. What are some of reasons why you may choose not to publish your course materials? (Please tick all that apply)

i) If there is no reward system for participation in place [ ]

ii) I do not understand the process by which OCW course materials are published. [ ]

iii). I do not have time to participate in OCW publication. [ ]

iv). My materials are not sufficiently polished and organized for publication [ ]

v) I obtain materials from many sources and this may interfere with copyrights of others [ ]

vii) Other. Please specify_____ [ ]

SECTION E: Personal Opinion about OCW

1 In your view, is OCW a resource for improving trainer's pedagogy? Yes [ ] No [ ]

Please explain your answer _____

_____

2 What do you see as the limitations of OCW as model of open sharing in Kenya? _____

Thank you kindly for participating in this research.

Part III: This part is to be answered by University administrator

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

The main focus of the research is to find out the extent of use of OCW and assess the challenges that discourage adoptability by Kenyan universities with a view of developing a framework for implementing open courseware. The questions asked in this questionnaire will be geared towards that end.

The research is purely academic, confidential and will be solely used for that purpose. Your details or data provided will not be passed to any third party without prior permission. I wish to communicate information about the survey results to you should you be interested. Please attach your email address or any other contact if you wish to receive information in this way.

I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Email : kinotshi@yahoo.com, Tel 0721300644)

Section A: Personal details

1. Name of the university_____
2. Designation of respondent_____
3. Your faculty and department_____
4. Email address(optional, if you need a copy of findings)_____
5. Highest academic qualification attained

   First degree [ ] Masters [ ] PHD [ ] others (specify) [ ]

6. How often do you use Internet?

   Once in a day [ ] Twice in a day [ ]

   Many times in a day [ ] occasionally [ ] Never [ ]

7. How long have you worked in the university at the current position

   Less than 1 year [ ] 1-3 Years [ ] More than 3 years [ ]

Section B: General information about your university

1 Select the range that best fits your university students' population this year.

0-10,000 [ ] 30,001-40,000 [ ] 10,001-20,000 [ ]

40,000-50,000[ ]

20,001-30,000 [ ] Above 50,000 [ ]

2 Does your university offer online learning? Yes [ ] No [ ]

3 How many students have enrolled in online learning program this year?_____

4 What is the number of faculties in your university?_____

5 Does your university have dedicated personnel or any department that deal with e-content development and management? Yes [ ] No [ ]

Section C: Awareness and use of OCW in your university

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning as it provides the course materials taught at the university for free to anybody with Internet connection .Which means the materials are available under open licenses for use and adoption by other educators and learners. OCW does not grant degrees or any certification.

1 Have you heard about open courseware before? Yes[ ] No [ ]

2 Does your university offer Open Courseware? Yes [ ] No [ ]

If yes, when was it started _____

Describe its current status_____ _____

_____

3 From the list provided below, select what your university has published for free access to the pubic.

All course contents taught at the university [ ]

Some few courses taught in the university [ ]

Reference E-books [ ]

Full text academic journals [ ]

Lists of academic journals and other publications by university lecturers and students [ ]

Syllabus and course outlines [ ]

Others (specify) [ ]

Section D: Open Courseware Concept support

1 Do you support the concept of providing free and open education resource by your institution?

Yes [ ] No[ ]

If your answer is No, please state why?

_____

_____

2 Does providing open and free contents align with your university mission?

Yes [ ] No [ ]

3 Is open courseware concept documented in university policies? Yes [ ] No [ ]

4 Below are some benefits of OCW. Tick where appropriate based on your agreement or disagreement with the statements.

	Some Benefits	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
a.	Open contents will extend quality education to the Kenyan public especially those who would not afford or others who do not meet university entry criteria.					
b.	Universities will strive to provide best quality materials in face of public scrutiny					
c.	The university will join other key players in the world in provision of OCW					
d.	OCW can contribute in strengthening the education infrastructure to offer distance education					
e	Other tertiary institutions in the country can benchmark with what your universities is offering					
F	OCW can will take advantage of recent government initiative such as laying of undersea fiber optic cables connecting Kenya and the rest of the world and setting up of digital villages					
g	Others(specify)					

Section E: Issues surrounding adoptability of OCW

1 How would you rate the following issues in terms of high or low based on the contributions in discouraging open courseware (OCW) in Kenya? (Tick how you rate the issue in the box provided)

	Issues	Very High	High	Medium	Low	Very Low
I	Lack of awareness					
Ii	Conflicts with intellectual property rights such copyrights of authors					
Iii	Set up and maintenance cost					
Iv	No direct income to university					
V	University policies do not provide for open courseware					
Vi	Available Internet infrastructure					
Vii	OCW can interfere with the existing academic programs of the university					
Viii	Lack of certification					
Ix	OCW is a foreign idea which is not applicable for Kenyan situation.					
X	Any other concern (specify)					

2 Considering the cost of implementing open courseware. Tick all models that in your opinion are appropriate for Kenyan universities

i. University meets the cost open courseware implementation from university enterprise funds [ ]

ii. Public Universities in Kenya provide the open courseware in collaborative mode [ ]

iii. Government to fund the project. [ ]

iv. Seek nongovernmental sponsor [ ]

v.Universities to solicit support from international OCW movements. [ ]

vi.University to device innovative modalities of meeting costs of running OCW such as merging online learning and open courseware, using cheap infrastructure provided by open source software's. [ ]

3 Is your university a member or have any links with international or any regional open community such as FOSS(Free open source systems),OCW consortium ,Open Education resource movements or other related?

Yes [ ] No [ ]

If your answer is yes, explain the relationships_____

4 Give a brief summary of how university can face the challenges presented by Open courseware. *(You can use an extra paper if space is not sufficient)*

_____

_____

_____

Section F: Your personal comments on this evaluation

1 Include any other personal comments that you may wish to make about open courseware

_____

Thank you kindly for participating in this research.

Part IV : This part is to be answered by university ICT technical personnel or Manager

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

The main focus of the research is to find out the extent of use of OCW and assess the challenges that discourage adoptability by Kenyan universities with a view of developing a framework for implementing open courseware. The questions asked in this questionnaire will be geared towards that end.

The research is purely academic, confidential and will be solely used for that purpose. Your details or data provided will not be passed to any third party without prior permission. I wish to communicate information about the survey results to you should you be interested. Please attach your email address or any other contact if you wish to receive information in this way.

I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me.

Section A: Personal details

1. Name of the university_____
2. Designation of respondent_____
3. Your department_____
4. Email address(optional, if you need a copy of findings)_____
5. How long have you worked in the university in your current position_____
6 Please indicate your professional qualification in ICT_____

SECTION B: University ICT infrastructure

1 What is the average speed/bandwidth of universities Internet connection? _____

2 Does your university have at least one data server dedicated as education digital content repository?

Yes [ ] No [ ]

i) If yes, please state the average storage space available on the servers_____

3 Does your university enterprise network sufficiently connect all campus premises including all faculties, offices and buildings? Yes [ ] No [ ]

4 Do you have any curriculum for training university lecturers in e-content development?

Yes [ ] No [ ]

If yes, what does the course entail?_____

_____

SECTION C: Existing online learning and open learning facilities.

1 Does your university offer online learning? Yes [ ] No [ ]

If you ticked yes, proceed to answer all questions in this section and if you ticked No move to the next section

2 When was online learning started at your university?

i) Less than a year ago [ ] 1 to 3 years ago [ ] More than 3 years [ ]

3 How many courses offered at the university are available for online learning?_____

4 What is the name of e-learning content management system which is implemented by your university (i.e moodle, web ct,)? _____

5 In which category is your e-learning management system?

- Proprietary software [ ]
- Open source software [ ]
- Others (specify)

6 Rate the existing online learning system in your university in terms of the following design issues. (Tick appropriately)

Design issues	**Very High**	**High**	**Medium**	**Low**	**Very low**
Scalability(score high if it accommodate a lot of contents)					
Flexibility(Score high if it is easy to update)					
Usability(Score high if users can easily accomplish tasks e.g searching contents)					
Reliability(Score high if error rate is low)					
Interoperability(Score high if support many different tools e.g authoring)					
Security(Score high if the system is secure)					

7 Which of the following describes your university's online learning management (tick all that apply).

i) Course authors produce the materials for online learning using templates in specific format [ ]

ii) Online technical team assist in collecting and preparation of contents for uploading to online system [ ]

iii) Course authors can directly access and update their course contents any time using course authoring tools available on learning management system [ ]

iv) Online technical team manages the online learning contents [ ]

8 In which form is your university online contents (Tick all that apply)

Textual [ ] Audio [ ] Video [ ] others (specify) [ ]

9 Have included any site access tracking mechanism to check on how much your online site is visited by students? Yes [ ] No [ ]

If yes, please briefly describe the mechanism_____

10 What do you think is the weakness of your online learning infrastructure?

SECTION D: OCW publishing implementation models

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning for it provides the course materials taught at the university for free to anybody with Internet connection .Which means the materials are available under open licenses for use and adoption by other educators and learners. OCW does not grant degrees or any certification.

1 State some of the challenges you anticipate if OCW is implemented on your university's available ICT infrastructure_____

_____

_____

_____

2 How do we address some of the challenges that you have stated?

3 Use table below to question that follow.

Rate	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Reference	SA	A	N	D	SD

Do you agree or disagree with the following statements about implementing OCW content management system using open source software architecture. (Enter references on space provided)

i) Open source software architecture can reduce open courseware implementation cost significantly_____

ii) Open source software architecture can easily be transformed as technology change_____

iii) Open source software architectures are readily available_____

iv) Open source software architecture components can easily be integrated_____

Thank you kindly for participating in this research.

APPENDIX III: Questionnaire for validating Framework.

Part I: This part is to be answered by Students

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

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I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Email: kinotshi@yahoo.com)

Section A: Personal details

1. Name of the university_____
2. Your faculty and department_____
3. Email address(optional, if you need a copy of findings)_____
4. Your gender Male [ ] Female [ ]
5. Which course are you taking at the university?_____
6. Indicate the year of study_____

Section B: ICT Preparedness

1 Have you had any training on computers?

Yes [ ] No [ ]

2 How do you rate your skills in working with computers?

Excellent [ ] Good [ ] Fair [ ] Poor [ ] very poor [ ]

Section C: Internet access and use in education

1 How often do you use Internet?

[ ] Daily [ ] 5-6 days a week [ ] 3-4 days a week

[ ] 1-2 days a week [ ] less than 3 days a month

2 Rate your satisfaction with the Internet connection at your university.

Very Satisfied [ ] Satisfied [ ] Unsatisfied [ ] Very Unsatisfied [ ] I don't know [ ]

3 How many times have you bought books such as books and software online or paid subscription fee for electronic contents site?

None [ ] Once [ ] 2-5 times [ ] 6-10 times [ ] More than 10 times [ ]

4 How many times have you researched using free contents available on Internet this semester?

None [ ] Once [ ] 2-5 times [ ] 6-10 times [ ] Uncountable times [ ]

Section D: Awareness of OCW in public universities

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning as it provides the course materials taught at the university for free to anybody with Internet connection. Which means the materials are available under open licenses for use and adoption by other educators and learners? ***OCW does not grant degrees or any certification.***

1 Are you aware that some universities such as Massachusetts university technology (MIT) offer all or some of their course materials for free through Internet. Yes [ ] No [ ]

If your answer is yes, please answer question (i) and (ii) below.

i) How many times have you visited such OCW sites?

I only visited once [ ] twice [ ]

3-6 times [ ] 6-10 times [ ] Uncountable times [ ]

iii) How do you rate your satisfaction with your visit to the website?

Very satisfied [ ] Satisfied [ ] neutral [ ] unsatisfied [ ] Very satisfied [ ]

Section E: Relevance of Open courseware

1 If what is taught at my university was to be published in OCW site, the materials would be appropriate for other students to use in the country.

Strongly agree [ ] Agree [ ] Neutral Disagree [ ] strongly disagree [ ]

2 How do you rate the quality of most of the notes and other contents provided by your lecturers in your university?

Very good [ ] Good [ ] Fair [ ] Poor [ ] Very poor [ ]

Section F: Utilization of open courseware

1 State your agreement or disagreement with the following statements.

I would like my university to offer open courseware.

Strongly agree [ ] Agree [ ] Neutral Disagree [ ] strongly disagree [ ]

2 State your agreement with the following statement. If free online University course materials from my universities are available online I would utilize them for self study or research?

Strongly agree [ ] Agree [ ] Neutral Disagree [ ] strongly disagree [ ]

Thank you kindly for participating in this research.

Part II: This part is to be answered university lecturer

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

The main focus of the research is to find out the extent of use of OCW and assess the challenges that discourage adoptability by Kenyan universities with a view of developing a framework for implementing open courseware. The questions asked in this questionnaire will be geared towards that end.

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I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Kinotshi@yahoo.com)

Section A: Personal details

1. Name of the university_____
2. Designation of respondent_____
3. Your faculty and department_____
4. Email address(optional, if you need a copy of findings)?_____
5. Academic qualification attained
   a. Masters [ ] PHD [ ] Others (specify) [ ]
6. How long have you worked in the university in your current position? _____

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning for it provides the course materials taught at the university for free to anybody with Internet connection .Which means the materials are available under open licenses for use and adoption by other educators and learners. OCW does not grant degrees or any certification.

Section B: Capacity Building

1 Are you computer literate? Yes [ ] No [ ]

2 Have you attended any training on e-content development?

Yes [ ] No [ ]

3 Please indicate the percentage of your teaching material that is in following forms?

a. Hand written form _____

b. Electronic form_____

4 For the materials that are in electronic form, in which format are they?

a. Word processed [ ] ii) PDF format [ ]

iii) PowerPoint slide [ ] iv) Others(specify)_____ [ ]

5 Do you use any special software to develop your teaching contents? Yes [ ] No [ ]

If yes, specify which one_____

Are there any of your teaching materials that you have published on Internet or university intranet? Yes [ ] No [ ]

SECTION C: Copyright issues

1 How regularly do you use materials from copyrighted sources in your instructions?

All the time [ ] frequently [ ] Neutral [ ] occasionally [ ] Never [ ]

2 Have you published any books which are already in circulation on the market or are you planning to publish in near future? Yes [ ] No [ ]

If your answer is yes

i) Do you provide notes to students which you directly obtain from the book that you have authored?

Yes [ ] No [ ]

3 Rate your willingness to contribute your own original academic work (e.g., lecture materials, paper or project) under open license terms which means you allow the end user to use, reuse, adapt and distribute for non commercial purpose?

Very willing [ ] willing [ ] neutral [ ] unwilling [ ] very unwilling [ ]

Copyright clearance is the process that ensures the open courseware publisher has the rights to make the materials available under open terms and that nothing in the materials infringes the copyright of other .It may involve getting approvals from authors whose contents have been copied and removing such contents.

4 How do you agree that copyright clearance by a third party on lecturer materials before publishing in Open Courseware site can help to solve the problem of publishing already copyrighted materials in open terms.

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Section D: Attitudes of Developers

Rate your agreement or disagreement with the following statements

a. I am comfortable openly sharing my teaching materials online.
Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

b. I am comfortable with audio recordings of my lectures, discussions, and classroom activities being shared openly online.
Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

c. By publishing my materials in open courseware, it will boost my reputation as contents developer.
Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Section E: Motivation of instructors

Rate your agreement or disagreement with the following statements

1. I cannot participate in open courseware if there is no reward system in place.
Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

ii) I cannot participate in OCW if I do not understand the process by which OCW course materials are published

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

iii) I do not have time to participate in OCW publication.

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Section F: Quality of materials

1) My materials are not sufficiently polished and organized for publication

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

ii. The quality of my materials may destroy my reputation in face of public scrutiny.
Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Section G: Creation of open courseware materials

1) State your agreement or disagreement with following statement.

I am well prepared and willing to create materials for sharing through open courseware.

Strongly agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Section H: Personal Opinion about OCW

1 In your view, is OCW a resource for improving trainer's pedagogy? Yes [ ] No [ ]

Please explain your answer

_____

_____

2 What do you see as the limitations of OCW as model of open sharing in Kenya?

_____

Thank you kindly for participating in this research.

Part III: This part is to be answered by University administrator

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

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I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me. (Email : kinotshi@yahoo.com, Tel 0721300644)

Section A: Personal details

1 Name of the university_____

2 Designation of respondent_____

3 Your faculty and department_____

4 Email address (optional, if you need a copy of findings)_____

5 Highest academic qualification attained

First degree [ ] Masters [ ] PHD [ ] Others (specify) [ ]

6 How often do you use Internet?

Once in a day [ ] Twice in a day [ ] Many times in a day [ ]

occasionally [ ] Never [ ]

7 How long have you worked in the university at the current position

Less than 1 year [ ] 1-3 Years [ ] More than 3 years [ ]

Section B: General information about your university

1 Select the range that best fits your university students' population this year.

0-10,000 [ ] 30,001-40,000 [ ] 10,001-20,000 [ ] 40,000-50,000[ ]

20,001-30,000 [ ] Above 50,000 [ ]

2 Does your university offer online learning? Yes [ ] No [ ]

3 How many students have enrolled in online learning program this year?_____

4 What is the number of faculties in your university?_____

5 Does your university have dedicated personnel or any department that deal with e-content development and management? Yes [ ] No [ ]

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Section C: OCW Institutional development

1 Do you support the concept of providing free and open education resource by your institution?

Yes [ ] No[ ]

If your answer is No, please state why?_____

2 Does providing open and free contents align with your university mission?

Yes [ ] No [ ]

3 Is open courseware (OCW) concept documented in university policies? Yes [ ] No [ ]

Section D: Sustainability of OCW project

1 Considering the cost of implementing open courseware. Tick all models that in your opinion are appropriate for Kenyan universities

i. University meets the cost open courseware implementation from university enterprise funds [ ]

ii. Public Universities in Kenya provide the open courseware in collaborative mode [ ]

iii. Government to fund the project. [ ]

iv. Seek nongovernmental sponsor [ ]

v. Universities to solicit support from international OCW movements. [ ]

vi. University to device innovative modalities of meeting costs of running OCW such as merging online learning and open courseware, using cheap infrastructure provided by open source software's. [ ]

Section E: personal opinion about open courseware

1. In you own opinion, what is the greatest challenge that may hinder implementation of OCW in your university.(*You can use an extra paper or back page if space is not sufficient)*

_____

Part IV : This pat is to be answered by university ICT technical personnel or Manager

My name is Kinoti Patrick, a student at the University of Nairobi School of computing and informatics. I am carrying out a research for my Masters of Science degree in Information Systems on open courseware entitled: Towards the Development of a Framework for Open Courseware for Public Universities of Kenya.

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I would like you to take a few moments of your time to answer the following questions regarding your university. I will appreciate very much your frank and critical response to this questionnaire. Should you need any clarification, please don't hesitate to contact me.

Section A: Personal details

1 Name of the university_____

2 Designation of respondent_____

3 Your department_____

4 Email address (optional, if you need a copy of findings)_____

5 How long have you worked in the university in your current position_____

6 Please indicate your professional qualification in ICT_____

Section B: Internet connectivity

1 What is the average speed/bandwidth of universities Internet connection? _____

2 Does your university enterprise network sufficiently connect all campus premises including all faculties. offices and buildings? Yes [ ] No [ ]

Section C: Contents repository

1 Does your university have at least one data server dedicated as education digital content repository?
Yes [ ] No [ ]

i) If yes, please state the average storage space available on the servers_____

2 What kind of content is stored in those data servers?(tick all that apply)

I) textual contents [ ] ii) Video [ ] audio [ ] others(specify) _____

SECTION C: Existing online learning and open learning facilities.

1 Does your university offer online learning? Yes [ ] No [ ]

If you ticked yes, proceed to answer all questions that follow.

2 When was online learning started at your university?

i) Less than a year ago [ ] 1 to 3 years ago [ ] More than 3 years [ ]

3 How many courses offered at the university are available for online learning?_____

Section D: Content management

1 What is the name of e-learning content management system which is implemented by your university (i.e moodle, web ct,)? _____

2 In which category is your e-learning management system?

Proprietary software [ ] Open source software [ ]

3 Rate the existing online learning system in your university in terms of the following design issues. (Tick appropriately)

Design issues	**Very High**	**High**	**Medium**	**Low**	**Very low**
Scalability(score high if it accommodate a lot of contents)					
Flexibility(Score high if it is easy to update)					
Usability(Score high if users can easily accomplish tasks e.g searching contents)					
Reliability(Score high if error rate is low)					
Interoperability(Score high if support many different tools e.g authoring)					
Security(Score high if the system is secure)					
Others(specify)					

4 Which of the following describes your university's online learning management (tick all that apply).

i) Course authors produce the materials for online learning using templates in specific format [ ]

ii) Online technical team assist in preparation of contents for uploading to online system [ ]

iii) Course authors can directly access and update their course contents any time using course authoring tools available on learning management system [ ]

iv) Online technical team manages the online learning contents [ ]

5 What do you think is the weakness of your online learning infrastructure? _____

_____

Section E: Delivery Methods for Remote and Local Access

1 Do your university have interactive website? Yes [ ] No [ ]

2 Have you established any mirror servers in other regions in the country such as remote towns?
Yes [ ] No [ ]

SECTION F: Technical opinion about Open courseware in Kenya.

OCW stands for open courseware. It is a digital publication of university course materials shared for free on the web. OCW differs from other web based education including online learning or distance learning for it provides the course materials taught at the university for free to anybody with Internet connection .Which means the materials are available under open licenses for use and adoption by other educators and learners. OCW does not grant degrees or any certification.

3 State some of the challenges you anticipate if OCW is implemented on your university's available ICT infrastructure

_____

_____

4 How do we address some of the challenges that you have stated?

_____

Thank you kindly for participating in this research.