CHAPTER- 3

KnowledgeNET LEARNING SYSTEM AND CONTENT DEVELOPMENT USING AUTHORING TOOLS

3.1 INTRODUCTION

Educationists adopt the new technologies to fulfill the requirements of the students. Educational institutions are increasingly moving towards, delivery of courses, to provide students with the opportunities, to learn at their own pace, together with a minimum traditional lectures. As mentioned by Kemm R.E (2001) there is also a trend to provide access, to the courses via Internet or Intranet [47]. Recent developments in the field of Information and Communication Technology (ICT) help, the teachers to create and share high-quality contents through Intranet/Internet based learning system, where in collaborative learning takes place, between the teachers and the students.

The idea behind the developing Intranet learning system is to develop lecture content, by the teachers, to deliver materials to the students for the regular course work. There are many e-learning tools that are available in the market. However, a customized system will address the need of any educational institution.

The global aim, in developing an intranet online learning system is, to ensure, that a collaborative environment is developed between the teacher and the student. The online learning content can be generated by the faculty,
in-house, so that the students can study the material, required number of times to gain more knowledge.

The concept of KnowledgeNET is as follows:

1. Reduction of class room training.

2. User friendly interface.

3. Easy tools which include lectures, notes in the form of doc, PPT, PDF and so on.

4. Access to the online materials, pertaining to each semester by the student.

5. Discussion Forum.

6. Email – System.

7. Increase in student knowledge by accessing the online material, required number of times.

8. Exchange of ideas with peers on a particular topic, which increases the knowledge effectively.

9. Online test is conducted where the progress of the students are monitored at the end of every chapter.

10. Periodical online tests, increase the potential knowledge of the students.

11. Periodical assessments by the teaching staff.

KnowledgeNET learning system is a system, which offers support to the study by design and development by the application of Information and Communication Technology (ICT). One of the basic benefits of the learning
system is that the students are allowed to access, explore, analyze, construct and evaluate materials, within the subject domain. Learning systems are usually used as a supplement and improvement and not as a substitute for the traditional classes.

### 3.2 OPEN SOURCE SOFTWARE

Open Source Software (OSS) is the software that is made available, along with the source code at no cost. The freedom to use, study, redistribute and modify the software, to suit user’s needs, is available to the consumers. As per Siemens (2003) among other benefits, the following are the advantages of the open source model, “increased quality, greater stability, reduced costs, reliability and rapid fixation of bugs/problems” [31]. As observed by Olorunfemi & Oladipo (2005) that in contrast, the proprietary software is a licensed one and is available to the users, for a fee and the source code is usually, closely guarded one and is not made available to the public [7]. OSS is the software where the source code is published and is made available, thus enabling anyone to copy, modify and redistribute the source code, without paying the royalty or fees.

As per the idea of Tong(2004), the following are some of the benefits of using open source in the educational environment [59].

- **Cost.**
- **Reliability.**
- **Performance.**
- **Security.**
- **Learning from the source code.**
3.3 **HYPERTEXT PREPROCESSOR (PHP)**

PHP is the Web development language, written by web developers. PHP stands for the Hypertext PreProcessor. It is a robust, server-side and open source scripting language that is extremely flexible and very easy to learn. PHP is a cross platform which means that PHP scripts will run on UNIX, Linux, Windows family and Mac OS.

3.4 **MYSQL**

MySQL is one of the standard query languages, for interacting with databases. It is an open source database server, which is free and extremely fast. It is also a cross platform, having higher customer base for its flexible licensing terms, ease of use and high performance.

3.5 **APACHE**

As per Linux Web Solutions (2000) Apache is the most popular of all the web servers available because it has basic web server functionalities as found in [52].

3.6 **COMBINATION OF PHP AND MYSQL**

The combination of PHP and Mysql, form the most widely used open source scripting language and database on the web, today. It is the view of Merrall (2005) that they are the world’s best combination, for creating data-driven sites. The characteristics are as follows:

1. Easy to use.
2. HTML Embedded.
3. Flexible open source licensing.
4. Fast feature development[31].

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3.7 LITERATURE REVIEW

A number of learning systems have been reported in literature. Some of them address the learning by using commercial products that are proprietary in nature, while some others are based on free and open source software. It is recommended, that the use of open source is a vehicle for developing Intranet/Internet based learning system.

3.8 PROBLEM STATEMENT

Learning facilitates education, using communication networks. It has made the learning possible from anywhere, at anytime by using the Intranet/Internet. Notably, learning applications which have become centric to the learning process may be developed by using proprietary programming tools. Meanwhile, in the process of acquiring the proprietary programming tools, there is a need of license for using them to develop large software application. It is not only complex, but also huge sums of money has to be spent on the software purchase and license. A plausible solution to these problems is to utilize the highly flexible open source application that permits software engineers, developers and institutions, the right to reuse, study, distribute and localize the codes to satisfy the user’s requirements.

3.9 OBJECTIVES OF THE RESEARCH

The objectives of this research are as follows:

1. To introduce the members of the academics, to the concept of online learning based on OSS.

2. To develop a cost effective and efficient system, for disseminating educational resources between the Student and Teacher.
3.10 RESEARCH METHODS

The methodology adopted in developing the KnowledgeNET intranet learning system is:

1. The approach presented in this work regarding Intranet learning application, is derived by the adaptation of using PHP functions which is built in it. The advantage is that the OSS software is free and made available through the Web site. It reduces the cost and time.

2. This system is developed, using the tools such as: Dream Weaver, CSS and Flash.

3. Open Source tools for content developments are eXe and MOS solo.

4. The working environment was set up by the installation and configuration of Apache server, Mysql database system and PHP interpreter.

5. Using the PHP scripts, the connection is established in the KnowledgeNET platform with the Mysql database. It is created in the “Administrative Panel”. The relevant data entry forms were designed and implemented, making it possible to add, edit, erase and search data directly from the KnowledgeNET platform.
3.11 Introduction to KnowledgeNET LEARNING SYSTEM

KnowledgeNET learning system facilitates sharing of knowledge and ideas with peers. The advantage of using KnowledgeNET is as follows:

- Collaboratively work with each other sharing information and ideas.
- Collaboratively work on projects and assignments.
- Add information to the intranet web site at the click of a button.
- Reduce the reinvention of the wheel by the teachers, through the sharing of learning resources.

A KnowledgeNET platform is an intranet system by which education can be carried out over the intranet, internet and other communication networks. The design of the learning platform mainly depends upon the different kinds of users, who can meet their requirement. The KnowledgeNET platform can handle two kinds of users. They are 1. The Student and 2 The Teacher.

The student module, offers the students a platform to register, study the course, communicate and share the knowledge with other peers. Students question the teacher through, either synchronous/asynchronous modes of communication.

The teacher module handles all the teaching issues such as developing the course content based on the curriculum and other needs of the student and uploads the learning content online.
The system’s interface is entirely intranet-based, and fully compatible with almost all well-known browsers. The student and the teacher applications are developed with a friendly user interface. They do not necessitate any technical skills for the potential users. Teachers can easily create the learning contents and quizzes. The system consists mainly of three independent components as shown in Figure 3.1, the client, the server, and Mysql. The main advantage of this architecture is its scalability with the possibility of moving the database to another workstation. Thus it establishes a connection with the Local Area Network. The teacher and student application is developed using HTML, PHP, CSS and Java script. It acts as a gateway between the database and the clients. The system is compatible with different platforms. The teacher’s application is used for uploading the customized learning content into the database. The server application carries
out some additional tasks to improve the performance of the whole system. For instance, it retrieves and prints the scores of the students in the online quiz.

The KnowledgeNET Learning system is based on client/server architecture as shown in Figure: 3.1. The communication media between the client and the server is connected through intranet. The clients configure student interface with the use of micro computer devices such as PC, Laptop etc., to communicate with the server. Once a student, successfully logs in, all the learning resources will be made available with a display of the name of the user who logged in.

3.13 HUMAN-COMPUTER INTERFACE

Computer and information technology plays an important role in education with fullest utilization of the learning environment with different computer based systems. For the learner’s needs and goals, efficient human-computer interactions must be designed. Our design and development of the learning system is based on Human- Computer Interface. Human Computer Interaction (HCI) is the study of the interaction between the users and the computers. The Association for Computing Machinery defines, HCI as "a discipline concerned with the design evaluation and implementation of interactive computing systems for human use with the study of major phenomena surrounding them." An important facet of HCI is the securing of user satisfaction. The basic goal of HCI is to improve the interactions between the users and the computers by making computers more usable and receptive to the user’s needs.
3.14 FEATURES OF KnowledgeNET LEARNING SYSTEM

The feature of KnowledgeNET an intranet learning system consists of student interface which is described below

Student Interface

- Login
- Registration Details
- Student Information Centre
- Student Corner
- Computer Fundamentals
- Presentation-Lecture
- C++ Tutorials
- Javascript Tutorial
- Javascript Chapters
- Javascript Dialog Box
- Javascript Lessons
- KnowledgeNET Forum
- Material Search
- Query Mail
- Query Mail-Reply
- Online Quiz
- Aptitude Questions
- Logout

Figure 3.2 Components of Student Interface
3.14.1 Student Login

Welcome to KnowledgeNET
Student Login Screen

![Student Login Screen]

Figure: 3.3 Student Login Screen

3.14.2 Registration Form

REGISTRATION FORM

REG NO: 1106659
AGE: 0

ADDRESS

STREET: No 5 Road Crop Flood
STATE: Tamil Nadu
TELEPHONE: 87783116

DEPARTMENT: CSE

NAME: K.Anthony

CITY: Salem
COUNTRY: India
EMAIL_ID: anthony@redmail.com

PASSWORD: ********

BRANCH: MCA
SEMESTER: 1
SECTION: no PARTITION
Exact: 2009

Insert your Picture Here [Picture/Photos/1.png] [Signature]

[Submit] [Reset]

Figure: 3.4 Registration Form Details
The students who log the system for the first time, has to register his details as shown in the above Figure 3.3 & Figure 3.4 with the necessary details like RegisterNumber, Name, Age, Gender, Street, City, State, Country, Telephone Number, Email-ID, Department, Password, Branch, Semester, Section, Batch and a photograph. The student profile is thus stored in the database. When he logs in for the next time, he has to give his Register Number and Password to browse to the main menu.

3.14.3 Student Information Center

![Student Information Center](image)

**Figure: 3.5 Student Information Center**

Student Information Center gives the information pertaining to the Register Number, Name, Batch, Department, Branch and Semester as shown in Figure 3.5.
3.14.4 Student Corner

Figure: 3.6 Student Corner

To optimize the student’s examination and the study performance, the student needs a good sleep, food, exercises, positive thinking, calm mind and morning walk. The above parameters are necessary to the student for good results in the examination as shown in Figure 3.6.
KnowledgeNET is an intranet based learning source for the students. It is intended to empower the students to take greater responsibility for their own learning strategy, to increase access to the learning resources. Computer Fundamentals is offered to the First Year Integrated (M.C.A) students on an experimental basis as shown in Figure 3.7.
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF-PCS-01</td>
<td>Computer Fundamentals and PC Software</td>
</tr>
</tbody>
</table>

Objectives:

The subject offers a general introduction to the world of computing with a particular emphasis on the Personal Computer (PC).

Aim:

1. Introduce the students to the basic components of a PC, so that they have a clear basic understanding of the main hardware units at the macro level.

2. Introduce the relationship between the information and the data and the way computers use binary codes to represent the data and instructions.

Programme Content and Learning Objectives

After completing the course, the student will be able to:

1. Describe the parts of a PC and how they are configured, using and explaining common terms and abbreviations.

2. Demonstrate awareness of the development of the Intel family of microprocessors and describe the architecture of a simple 8 bit microprocessor.
Computer Fundamentals and PC Software

Block 1 Computer Fundamentals: Hardware & Software.

Unit 1: Computer and Memory Systems.

Unit 2: Input Output Organization.

Unit 3: Software Concepts and Terminology.

Unit 4: Operating Systems Concepts.


Unit 1: Fundamentals of Data Communications.

Unit 2: Introduction to Computer Networks and emerging trends.

Unit 3: Computer Virus.
3.14.6 Presentation-Lecture Notes

![Lecture Notes Table](image-url)

**Figure: 3.8 Lecture Presentation in different file formats.**

Figure 3.8 displays different presentation materials that are uploaded by the teacher for the different subjects which is available in different file formats such as doc, PDF, HTML extensions, so that the student can download the content offline and read the material, number of times. For instance C++ course material in HTML format is offered to II\textsuperscript{nd} Year M.C.A students on an experimental basis.
3.14.7 Presentation C++ Tutorials for Beginners

C++ Tutorial. For Beginners

This usage-oriented online C++ tutorial is intended to help you get your C++ experience on the right foot. Using some Macromedia Flash animations where needed, you will find here all the required information to get efficiently started on your usage of C++ language, independently of the platform you are planning to use it on. After a short introduction aimed at getting you started with the required tools to write and build C++ code, source into executable binaries, you will get thrown into the basics of C++ and its control structures, as an algorithm starting point. Still, oriented on the usability, you will be pointed, along with detailed explanations, to the C++ style standard functions that can be used in your C++ source code to easiest usual tasks. The tutorial will then lead you into the Object-Oriented paradigm on C++ language, which will be a must-have in order to understand all the STL (Standard Template Library) related info that you will find in the last part of this tutorial.

After having followed this tutorial, you will be perfectly able to develop and understand Command-line applications written in C++.

1. My first C++ Program - Create your first C++ program and learn about its structure: the main() function and the statements
2. How to compile and run C++ programs - Learn how to write and compile C++ programs using different IDEs
3. Dev C++ Tutorial - Dev C++ Tutorial
4. Visual C++ Tutorial - Visual C++ Tutorial (Flash animation explain how to create and compile console C++ programs under Microsoft Visual Studio)

Figure 3.9 C++ Tutorials for Beginners

The course is divided into Units, Chapters and Sub-Chapters which ensure the achievement of learning objectives. Educational activity is a fundamental characteristic of the didactical method. It is an activity carried out by the learner, by using the learning resources. Each learning activity is characterized by:

- Learning.
- Assessment and evaluation of knowledge, skills and abilities.

"C++ Tutorial for Beginners" is offered to II\textsuperscript{nd} year M.C.A students on an experimental basis as displayed in Figure 3.9.

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3.14.8  JavaScript- Tutorial

![Figure 3.10 JavaScript Course Lecture](image)

3.14.9  JavaScript- Chapters

![Figure 3.11: JavaScript Chapters](image)
3.14.10 JavaScript - Dialog Box

Figure 3.12: JavaScript – Dialog Box

A computer tutorial is an interactive software program, created as a learning process. Tutorials help people to learn new skills by using a step-by-step process that ensure that the students understand the learning material. For instance, Figure 3.10 describes the tutorials, which are developed for M.C.A II\textsuperscript{nd} year students. Figure 3.11 describes the tutorials, where the student can learn the material required number of times and thus gain more knowledge and skill in programming techniques. Figure 3.12 shows an example of “JavaScript Dialog Box” which guides the student wherein he/she can copy the code in the notepad and execute it in the browser. Once the student is equipped with the knowledge to create, a simulated working atmosphere in programming, the JavaScript tutorial guides the student with other features, such as, “if statement”, “if-else statement” etc. After completing the entire tutorial sessions, the student will be able to develop a fully functional web page using JavaScript.
3.14.11 JavaScript - Lessons

A lesson is an exercise that the teacher prepares and the student learns. It involves both the teacher and the student. The student learns the lesson taught by the teacher. Thus in a broader sense, it involves the teacher, to diligently prepare the subject, that means, a lesson which is shown in Figure 3.13. The teacher understands the subject and through his analysis, prepares the lessons and teaches the same to the student in an electronic format. Now the student has to understand the lesson, question the teacher in an asynchronous mode of communication, clear his doubts and then understands the same. Thus the student's knowledge is improved progressively.
3.14.12 Learning Activities and Path’s in KnowledgeNET

Educational activity is a fundamental characteristic of the didactical method. Educational activity is an activity, carried out by the learner or the teacher by using learning resources. The learning activity ensures achievement of learning objectives. Each learning activity is characterized by:

- Learning.
- Assessment and evaluation of knowledge, skills and abilities[109].

3.14.13 Student Activities

- Learning activities.
- Self-paced work, with the learning material- reading, working with simulations, using the multimedia materials and tutorials.
- Listening/watching the audio/video lecture.
- Solving the problem through simulation or application software.
- Working on the individual and collaborative assignment[109].

3.14.14 Assessment and evaluation activities:

- Passing the test.
- Problem solving.
- Assignment.
- Participating in discussions[109].
3.14.15 Teacher’s activities:

- Evaluate in digital and verbal form, the students achievements during the activities for his/her knowledge and skills.

3.14.16 Learning unit – It is an abstract representation of a course, lesson, workshop, or any other formal or informal learning or teaching event. In this way a learning unit can be a module and chapter according to the accepted hierarchy of learning methodology. The properties of learning unit are as follows:

- Learning path for guidance / moving through a learning unit.

- Learning unit can be aggregated with other learning units or learning activities and related learning resources[109].

3.14.17 Learning Path

Learning path defines the sequence of learning activities that is carried out by the student by going through the learning units in the learning system. Learning path depends on various conditions, such as personal characteristics, pedagogical knowledge and the student interactions over the period of time with the intention to increase the success criteria.

Learning path defines the sequence of learning activity (linear or non-linear) that is carried out by the student, going through the learning unit.
Learning path can be classified as:

**Step 1:** Generic path with free sequencing throughout the learning activities in the learning unit.

**Step 2:** Generic path defined by the teacher with static sequence of activities and fixed place of the assessment and evaluation which are presented in the linear sequences.

**Step 3:** The adaptive learning path is to suit the student's personalized needs. It can provide the relationship of learning content of the student and his learning style[109].

Now the Step 2 is followed in KnowledgeNET Intranet System.

### 3.14.18 KnowledgeNET Forum – Bulletin Board

![KnowledgeNET Forum](image)

**Figure 3.14: Knowledge NET Forum**

KnowledgeNET forum referred in Figure 3.14 lays the foundation for the collaborative learning, where the social interaction takes place among learning community. This gives them an opportunity to expand their network by building a trust and eventually helps them with their career growth. Organizations and academic institutions have realized that the key to
successful learning program is, to integrate collaborative learning tools with learner interaction. Knowledge sharing tools such as Wikis, Shared Videos and Message Boards initiates learning process which is more engaging and appealing to the learners. A message board is an online discussion, wherein, people can hold conversations in the form of posted messages. They differ from chat rooms in which the forms of messages are temporarily archived.

3.14.19 Material Search

![Material Search]

Figure 3.15: Material Search

A keyword search referred in Figure 3.15 looks for, words anywhere in the record. Keyword searches are a good substitute for a subject search, when we do not know the authorized subject heading form. Keyword
may also be used as a substitute for a title. To search by the keyword, we type
the word, we wish to search. The resultant output is shown in Figure 3.16.

![Figure 3.16: Keyword Search- According to Title](image)

3.14.20 Query Mail

![Figure 3.17: Query Mail – about subject by student](image)

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In a traditional classroom lecture model, the teacher and the students interact face to face when the teacher delivers his lecture. Here, whatever the teacher speaks, every student hears. Similarly, if a student asks a query to the teacher, every student hears the query as well as the teacher's response to it, as referred in Figure 3.17. Hence, the probability of the same query being asked by someone else is very low. The only case of repetition may be when a student is not present during the session. The teacher may get queries from the student which may have already been discussed during the session and the teacher has to repeat his explanation for the same. These drawbacks are non-existent in the online learning model, where the mode of communication between the students and the teacher is via email. Email encourages, shy students to come out of their shells and ask their queries. Thus the mode of communication is one to one.

3.14.21 Query Mail - Reply

![Query Mail Image]

Figure 3.18: Faculty answer the query to the student Subject to Discussion – C++ Programming

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Figure 3.18 represents teacher’s response, with answers to the query raised by the student. The teacher’s response to the weak student can be elaborate, while it is short and precise to the bright student. This mode also gives the faculty the needed time, to refer to the other materials to answer the queries.

3.14.22 Online Quiz

![Figure 3.19: Online Quiz](image)

3.14.23 Aptitude Test Questions

![Figure 3.20: Random Questions Generation](image)
In order to simulate and maintain student's interest, we developed an online quiz as referred in Figure 3.19 named “Brain Twister”. The online technology, is used in order to provide students with flexible access to self paced environment in the form of online quizzes. These quizzes were also aimed at providing students with a learning style and a mechanism to improve their skills and knowledge for the better jobs in the society. In our system, the student can interact with the interface and select the options like “subject”, “number of questions “ and “time duration”. Based on the above parameters the questions will be generated in a random manner as referred in Figure 3.20. After completing the online quiz the marks will be displayed and the students find it encouraging and their confidence and knowledge levels are increased. They are mentally prepared to take up an online quiz again.

3.14.24 Cumulative Scores

![Online Quiz](image)

**Figure 3.21: Cumulative Score in Percentage**

At the end of the quiz, the result is shown in Figure 3.21 in the form of cumulative percentage of marks of the student and the student is asked to give his suggestions as the student’s feedback. The sample feedback are shown in Table:3.1.
### Table 3.1: Sample questions on Online Quiz

<table>
<thead>
<tr>
<th>Questions</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much time you take in answering the question</td>
<td>1. 30 Min 2. 20 Min 3. 10 Min 4. 1 Min</td>
</tr>
<tr>
<td>What you think about whether questions to be separated by topic or mixed form</td>
<td>1. Yes 2. No</td>
</tr>
<tr>
<td>Whether the given time is enough to solve the answers</td>
<td>1. Yes 2. No</td>
</tr>
<tr>
<td>When do you like to be told your score</td>
<td>1. At the end 2. later</td>
</tr>
<tr>
<td>Do you believe and trust online evaluation system</td>
<td>1. Yes 2. No</td>
</tr>
</tbody>
</table>
Figure 3.22 Components of Teacher Interface
3.15.1 Faculty Login

![Image of Welcome to KnowledgeNET login screen]

**Figure 3.23: Teacher Login**

3.15.2 Faculty Registration Form

![Image of Faculty Registration Form]

**Faculty Registration Form**

<table>
<thead>
<tr>
<th>Faculty ID</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>46</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td>Address 1</td>
<td>No.5, Ind Cross Road</td>
</tr>
<tr>
<td>Address 2</td>
<td>Chitlapakkam</td>
</tr>
<tr>
<td>Telephone</td>
<td>2223567</td>
</tr>
<tr>
<td>Email-ID</td>
<td><a href="mailto:fremand@gmail.com">fremand@gmail.com</a></td>
</tr>
<tr>
<td>Designation</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>Mobile No.</td>
<td>9898676531</td>
</tr>
<tr>
<td>Department</td>
<td>Computer Science &amp; Applications</td>
</tr>
<tr>
<td>Enter LoginID</td>
<td>Ananth</td>
</tr>
<tr>
<td>Enter Password</td>
<td>********</td>
</tr>
</tbody>
</table>

**Figure 3.24: Teacher Registration Form**

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The faculty who logs the system for the first time, has to register his/her details as shown in the above Figures 3.23 & 3.24 with necessary details like Faculty-ID, Name, Age, Gender, Address1, Address2, Address3, Telephone, Department, Designation, Email-ID, LoginID, Password, Mobile Number.

3.15.3 Course Allocation Entry

![Course Allocation Entry](image)

**Figure 3.25: Course Allocation – Computer Technology**

The faculty profile is saved in the database. When he/she logs in for the next time he/she has to give his loginID and password to browse the main menu. The Figure 3.25 which is described above represents the course allocation entry. All the courses are divided into semesters. For each semester the courses are allocated to each faculty. Based on the course allocation, the faculty has to prepare the customized learning content for the students. For instance as in Figure 3.25 Semester – I, Course-“Computer Technology”, Branch-“M.C.A”, Faculty-“Ananth”. The faculty has to prepare the customized course material for the 1st Year M.C.A students.
3.15.4 Quiz – Data Entry Screen

![Quiz Data Entry Screen](image)

**Figure 3.26: Quiz Data Entry Screen Subject to Discussion – C Questions**

Figure 3.26 depicts the Data Entry Screen where the faculty can develop customized content for any subjects. The faculty can design the customized content, based on the knowledge level of the student like Beginner, Intermediate and Expert. Questions can be inserted at any point of time.
3.15.5 Question Paper Setting

![Image of Question Paper](image)

Figure 3.27 Question Paper Subject to Discussion - Java Programming

Figure 3.27 shown above is running in an experimental basis for preparing question paper wherein the teacher can generate the questions in the random manner by clicking the submit button.
3.15.6 Personal Details-I

![Educational Qualification & Experience](image)

Figure 3.28: Educational Qualification & Experience

3.15.7 Personal Details -II

![Area of Specialization](image)

Figure 3.29: Area of Specialization
3.15.8 Personal Details-III

Figure 3.30: Area of Research

The Figures 3.28, 3.29, 3.30 depicts the personal profile of the faculty wherein he/she can enter the details and update as, and when necessary.

3.15.9 Publication Entry

Figure 3.31: Publication Entry

Figure 3.31 shows publication entry by the faculty. To be implemented in future.
3.15.10 Course Entry

![Course Entry Image]

Figure 3.32: Course Entry- Subject to Discussion Microprocessor & Applications

The faculty can enter the details like Course ID, Course Name, No of Units, Semester, Lecture, Theory, Practical and Branch. All the six semester details can be entered into the database as in Figure 3.32.
3.15.11 Message Board

![Message Board Image](image)

**Figure 3.33: Message Board -.NET Club**

A message board as in Figure 3.33 is an online discussion site, where the teacher can hold conversations in the form of posted messages. Depending on the access level of a user of the forum set-up, a posted message has to be approved by a moderator before it becomes visible. A single conversation is called a 'thread'. A thread (sometimes is called a topic) is a collection of posts, usually displayed from the oldest to latest.
3.15.12 Query Reply

![Query Reply screenshot](image)

**Figure 3.34: Query Reply – Polymorphism in C++**

The student naturally has his/her doubts about the subject. He puts query to the teacher who in his/her turn prepares the answer that is referred in Figure 3.34.

3.15.13 Online Chat

![Online Chat screenshot](image)

**Figure 3.35: Online Forum- Discussion on the Difference between C and C++**
Online chat which is shown above in Figure 3.35 can refer to a kind of communication over the Intranet/Internet. Chatrooms are rapid real-time conferencing which allow users to interact with whoever happens to coexist in cyberspace. These virtual interactions involve in 'talking' more freely and more widely than ever before. Chatrooms are replacing face-to-face conversations.

3.15.14 Assignment Entry

![Welcome Ananth]

![Distribute Assignment For Student]

**Figure 3.36: Assignment on Fundamentals of Object Oriented Programming**

Figure 3.36 shows the assignment entry wherein the faculty can upload the assignment for a particular subject. This is will be displayed in the student menu when he/she logs in. This is under experimental stage.
3.15.15 Faculty Publication Entry

Figure: 3.37 Publication Entry

The faculty submits the paper after completion of the paper presentation held in various colleges in different cities which is shown in Figure 3.37, so that the students can download the paper to enrich their knowledge on the particular domain.

3.15.16 Information Entry

Figure 3.38: Information Board
Figure 3.38 gives information about day to day activities for the student. For instance Internal Test in “C Programming on 12.03.2011 for M.C.A students, Faculty N.R.Ananthanarayanan, which is not yet implemented. It also shows the information about internal test, assignment which will be displayed in the student interface.

3.16 CURRICULUM OF LEARNING OBJECTS (COLOS)

![Curriculum of Learning Objects Design](image_url)

Figure 3.39 Curriculum of Learning Objects Design

Figure 3.39 depicts the Curriculum of Learning Objects (COLOS), design which used to build, assemble and publish the learning content.
Actors involved in developing the learning content:

1. Subject Matter Expert (SME) / Author.
2. Graphical Designer.
3. Web Developer.
4. Instructional Designer.

3.16.1 Subject Matter Expert (SME)/Author

Subject Matter Expert (SME) as shown in Figure 3.39 is one who communicates his knowledge, on a topic, to other professionals within the organization. They often act as consultants to the institutions/companies for the production of educational courses and publishing training materials. Companies which develop educational software can often rely on the subject matter expert who in turn guides and directs the programmers and the engineers for the development of the educational products. The subject matter expert may also work with technical writers, to ensure that the product manuals are accurate and usable. The companies who offer educational materials, particularly those offering vocational training, may also make considerable use of the subject matter experts. Another significant role for subject matter experts is, in the area of test development. He may work with psychologists, to develop professional licensing examinations by making sure that the appropriate subject matter is covered and the answer key is correct. SME is also responsible for ensuring that the content of the online course is an appropriate alternative, to the lecture content normally in a traditional course. Other tasks of subject matter expert are as follows:

- Identifying textbooks and other related resources.
- Ensuring pedagogical match among the course objective in relation to the contents, examinations and assignments.
- Identifying materials that require copyright clearance and providing the instructional designer with necessary information.

- Providing other team members with a legible copy of any written material.

3.16.2 Graphical Designer

Graphical designer is a person who creates all graphical elements in the educational material as shown in Figure 3.39. The person creates buttons and background pictures which are not explicitly textual. Sometimes the graphical designer and the developer may be the same person. There are reasons why graphical design is very important in the training materials.

3.16.2.1 Communication Tools

Workbook, handouts, job aids and instructor guides are communication tools. The purpose of all the above is to communicate the ideas and information effectively, so that the people can learn what they need. Good graphical design helps, to achieve this goal and it motivates the people to read and use the materials and also it makes them remember more of what they learnt.

3.16.2.2 Well Designed Materials

Attractive and well designed pages are most important. The student and the one who completes the course workbook at home or a group of peers seated at the conference or college forms an impression that the material is attractive and readable.
Course materials could be enhanced for education by including technical drawings, illustrations, graphics and photography to interpret the course content. It includes the development and creation of generic or customized templates, navigational icons or images to enhance the learning content.

The visuals will help the students especially, those who are new to the online learning, to encounter the online course, which can often set the tone for their learning experience.

3.16.3 Web Developer

Web developer is a person who develops web-based content as shown in Figure 3.39. Web designer conceptualizes and visualizes the requirement of the institutions/companies and creates a web design, which is attractive, useful and easy to handle. The developer is involved in the program writing, for the transaction and information processing and providing links to the other sites. The developer also develops interfaces and provides connectivity to the databases. The developer plays a role of an architect and an interior designer of the website. Web Developer must have an adequate knowledge of HTML, JavaScript, SQL and other programming related technologies. He/She must be well-versed in Dream weaver, Flash and other development tools to create the learning content. In some cases web developer interacts with the instructional designer to build the learning content till the end of the project. The developer must pay more attention to the fact of, how a page looks like. The developer designs and develops simulations and other interactive components which are identified by the content developer. The contents and the graphics are reviewed again. When the learning object development is complete the technologist creates the metadata file, using keywords provided by the content developer and packs the learning content to conform to the scorm guidelines. After completion of the project, the web
developer can show the teacher, the example of, online materials which illustrate various kinds of learning content and its interactive options which are made available to them. It should then describe the teacher, how the courses can be produced, using a consistent organizational template. It can provide students with knowledge for achieving the learning objective that describes the outline of the content, assignments, evaluation, information resources and its links and FAQ (Frequently Asked Questions).

3.16.4 Instructional Designer

The main job of an instructional designer is to select, sequence, synthesize and summarize the content for instructional purposes as shown in Figure 3.39. Instructional designers tend to be, process-oriented individuals as they can apply instructional design principles to a wide range of content areas. As stated by Reiser & Dempsey (2007) Instructional Design is defined "as a systematic process that is employed to develop education and training programs in a consistent and reliable fashion"[90]. In addition, Instructional Design models or theories may be thought of as frameworks, for developing modules or lessons that

1) Increase and/or enhance the possibility of learning

2) Encourage and engage learners so that they can learn faster and gain deeper levels of understanding.

As per the idea of Van Merriënboer (1997) Instructional Design (ID) models differ from Instructional System Design (ISD) models[108]. The ISD models have a broad scope and typically divide the instructions into five phases.
1. Analysis.
2. Design.
3. Development.
4. Implementation or Delivery.
5. Evaluation.

ID models are not broader in nature and mostly focus on the analysis and design. They normally go into, much more details, especially in the design portion. ID models are normally employed in conjunction with ISD models. The ISD process keeps the entire training, development, or educational process on the correct path or objective.

As stated by Reigeluth (1983) there are two types of strategies in Instruction Design theories as follows[48]:

3.16.4.1 Organizational strategies

They are strategies by which the learning contents are broken down into micro or macro level and deal with the way in which a lesson is arranged and sequenced.

3.16.4.2 Delivery strategies

They are concerned with the delivery of learning contents that affect the way in which information is carried to the student, particularly the selection of instructional media.
Figure 3.40 Instructional System Design Model

The Figure 3.40 as shown is Instructional System Design Model which uses the ADDIE model (Analysis, Design, Develop, Implement and Evaluation). It is perhaps the best known instructional design model and provides a solid framework for learning.

3.16.4.3 ADDIE Model

Instructional System Design (ISD) is sometimes referred to as ADDIE (Analysis, Design, Development, Implement and Evaluation) or SAT (System Approach to Training). Although there are minor differences among the various ISD models, most systematic learning design models follow an approach similar to the ADDIE models which are as follows:

- **Analysis Phase**: In the analysis phase, the instructional problem is clarified. The instructional goals and objectives are established and the learning environment and learner's existing knowledge and skills are identified.
• **Design Phase:** The design phase deals with the learning objectives, learning content, assessment and exercise. The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the project goal. The steps involved in design phase:

1. Documenting the instructional project into visual and technical design.
2. Designing user interface.

• **Development Phase:** The development phase is where instructional designers and developers create and assemble the learning content assets that were blue printed in the design phase. In this phase, storyboards and graphics are designed. If learning is involved, programmers develop and/or integrate technologies. Testers perform debugging procedures. The project is reviewed and revised according to the feedback received.

• **Implementation Phase:** During the implementation phase, a procedure for training is given to learners / students. The training should cover the course curriculum, learning outcomes, method of delivery and testing procedures. Preparation of the learners /students, include training them on new tools either software or hardware. This is where the project manager ensures that the books, hands-on equipment, tools, CD-ROMs and software are in place, and that the learning application is functional [68].
 Evaluation Phase: The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific, criterion-related referenced items and providing opportunities for the feedback from the learners/students.

3.17 STRUCTURING AND ACQUISITION OF LEARNING CONTENT

After careful investigation and analysis, the methods of development of learning content can be achieved through learning objects. They are reusable components which can be recombined in multiple ways to produce new learning content. The methodology of developing the learning content is by acquisition and structuring.

Step 1: Acquisition: Eminent teachers, who are handling the courses for the post graduates, find the student’s potentiality and develop learning content from the novice to the expert level. As suggested by Kerres (2001) a major challenge is to acquire appropriate learning content from each individual professor[48]. Most of the professors have an opportunity to restructure the learning content. The methods are given below

1. Collecting the learning content by interviewing the teacher, using the following method:

   ❖ The view of the teacher about the importance of the subject to the students.

   ❖ The scope of the topic.

   ❖ Type of situations that a topic could apply.
Rough order of the collected learning contents.

The teacher’s review of the ordered learning content, for removal of irrelevant or redundant parts.

Categorizing the learning content, according to the type of knowledge concerned.

Collection of the learning content.

Order of sequence of the learning content.

Review and removal of the unnecessary portions of the learning content.

Step 2: Structuring

The learning contents are to be made in a sequential order, so that the students can be able to understand the concept easily and thereafter the learning content will be a problem specific.

Partition the learning content into smaller units or chapters.

Redefine the chapter classifications.

Choose an optimal overall form, for assigning chunks into the chapters.

Teachers to review the chapters / units, for upholding the quality and consistency of the learning content [11]
3.18 LEARNING OBJECT MODEL

As stated by L’Allier (1997) NETg was one of the first, to use the Learning Object (LO) concept for IT courses [48]. It has an hierarchy of four levels which contains Course, Unit, Lesson and Topic. A course contains the independent units. A unit contains independent lessons and a lesson contains independent topics. A topic represents an independent learning object that contains a learning objective and has a corresponding activity and assessment.

![NETg Learning Object Model](image)

**Figure 3.41: NETg Learning Object Model**

The above model is not flexible, because of the tight coupling of some of the components within a topic. Topic is a collection of components which essentially surround a single and specific learning objective.

![Proposed Model of KnowledgeNET](image)

**Figure 3.42: Proposed Model of KnowledgeNET**
We proposed a model as in Figure 3.42 which accounts for the reusability. For instance, a given assessment surrounding a particular concept can be reused with another topic surrounding the same concept, as many numbers of times as possible.

3.19 LEARNING OBJECT CONTENT MODEL (LOCM)

![Diagram](image)

Figure 3.43: Learning Object Content

3.19.1 Learning Objective:

A learning objective is simply, a list of the topics to be covered in the course. For each individual, a learning objective should support the goal of the course as in Figure 3.43.

3.19.2 Enabling Objectives:

Enabling Objectives (EO) is the concise statements of the teacher's expectations of student performance and might be considered as the steps in accomplishing the Terminal Learning Objective (TLO). The Enabling Objective (EO) is written from the perspective of the student as to what he/she must do to accomplish the Terminal Learning Objective (TLO). For
instance to spell check the document, using the spell checker. No spelling mistakes are permitted.

3.19.3 Terminal Learning Objective:

The Terminal Learning Objectives (TLO) is a statement of the teacher's expectations of student performance, at the end of a specific lesson or unit. For instance to create a two-page document, that is correctly formatted with no spelling mistakes.

3.19.4 Example:

Goal: Train the student to instruct other students, in microcomputer applications.

Task: Conduct training and educational programs, in specialized applications of microcomputer systems.

Performance Measure: The students must be trained, to the required performance standard, listed in the training outline, within the allotted time. Non-performers must be identified and given reinforcement training.

Learning Steps:

1. Receive attendance register from the department.

2. Obtaining necessary training documentation in the form of lesson plan, course management plan and supply learner guides, slides, overhead transparencies for conducting the class.

3. Distribute student’s guides, prior to the beginning of the class.

4. Check the computer laboratory prior to the beginning of the class to ensure that all the instructional items and equipments are available and in working condition.
5. Arrange for the delivery of any needed audio-visual equipment.

6. Start the class on schedule.

7. Present material listed in the lesson plan to follow the general outline.

8. Facilitate, direct and guide the students, towards finding the correct answers to their questions, rather than being an answering tool.

9. Provide coaching to the students.

10. Demonstrate the new or difficult material, in a manner that may be seen and understood by the students.

11. Evaluate the student’s assessment.

12. Complete all the learning activities and other required functions during the allotted period.

3.19.5 Learning objects and Metadata

Metadata is information about a data source or data about data. In the digital world, metadata is the information about the resources such as images, videos, web pages, animations, online courses and lessons. Metadata is stored in a database or repository. Learning objects can also be stored in the same or a separate database or repository. Metadata can be included within the resource as in the header of a Web page. The single most important reason for creating metadata is to facilitate the discovery of learning resources or learning objects. Although the Web search engines are becoming more efficient at finding resources, according to specific criteria, the process of web searching is still frustrating. Search engines are also often not aware of, or do not have access to, educational resources that are stored in databases. A search by using Google just won’t find them. International initiatives amongst
educational communities are for building metadata and learning object databases and providing powerful search tools, related to the metadata for locating the resources. The following is an example of the advanced search capability found at the Multimedia Educational Resource for Learning and Online Teaching (MERLOT) Web site.

3.19.6 Content Fragments:

Content fragments are atomic learning content elements. They can be regarded as raw digital resources, discrete (graphic, text, image, etc.) and continuous (audio, video, simulation, etc.) which is referred in Figure 3.44.

![Figure 3.44 Content Fragments](image)

3.19.7 Content Objects

Content objects aggregate with content fragments with navigational facility. A content object (e.g., title, paragraph, and body) can also include other content objects as shown in Figure 3.44.
Content Object contains the core content of the subject. The learning object has two levels, the first being the topic level, the second the chapter level. The topic level is formed with the combination of assets such as a learning objective, explanatory notes, examples and topic exercises at the end. A chapter level is considered to have aggregation of topics and some chapter exercises. It is considered to be a domain independent, highly sharable and reusable. For instance the purpose and description of the content object at the chapter level includes chapter number, respective subject code, level of education, chapter title, learning objectives and aggregation of topics to accomplish the respective learning objective. This gives the freedom to the students, while accessing the learning content, giving the possibility to choose either the whole chapter or just to go in for a certain sections of their need, in the chapter. The assessment object can be represented in two forms of exercise either at the end of the chapter or at the end of the topic exercise [51].

3.19.8 Content Aggregation

The scorm content aggregation model as per Dodds (2001) contains the following components [48]: Assets, Sharable Content Objects (SCO) and
Content Aggregations. Assets are an electronic representation of media, text, images, audio, web pages or other data that can be presented in a web client. A Sharable Object (SCO) represents a collection of one or more assets. To improve the reusability, a SCO should be independent of its learning context. A SCO can, for example, be reused in different learning experiences to fulfill different learning objectives. SCO’s are meant to be small units, where the reusability is feasible in more learning objectives. A Content Aggregation is a map (content structure) that can be used to aggregate learning resources in a well integrated unit of education (for example course, chapter and module) as in Figure 3.46 [78].

![Figure: 3.46 Content Aggregation](image)

3.20 XERTE – LEARNING OBJECT EDITOR FOR CREATING LEARNING CONTENT USING LEARNING OBJECTS

Xerte is an XML editor and a run time engine, that makes it easy, to create and deploy interactive learning objects that are highly accessible and scorm compliant. It helps the designer to focus on the interactive design by providing tools that are fit for the purpose and easy to use. Learning Objects created with the Xerte tools and templates has built in user selectable font resizing, color contrast options and keyboard accessible controls. The content
and navigation is also perceivable to the screen readers. The tools that supports the needs of different types of users, is an effective team-based development process. By using this tool the time required to produce high quality interactive learning material is available with no charges to the practitioners working in the education sector.

3.20.1 Xerte Engine

The University of Nottingham have developed an XML-based file format (.rlo) that can describe the complex interactive content, a flash-based run time engine which is based on XML. It is an intuitive, visual editor for creating and maintaining the XML files quickly and easily. The above elements allow the application logic, to be completely separated from the data. Content developers can create standard-compliant interactive content with minimum scripting, and the code is easily reused.

3.20.2 Xerte Features

- The Flash-based engine contains high quality, proven code that provides all the core functionality, removing the need to duplicate code with each new subject

- The editor allows the snippets of XML to be saved as ‘models’, allowing chunks of learning content to be easily shared between different people and different projects amongst the teams of collaborating developers.

- Wizard-driven templates allow developers to create data-driven learning objects that are easily changed and repurposed through a friendly wizard.
Scorm standards allow learning content to be reused across different platforms, and positioned in different contexts.

Xerte provides a quick way for the teachers, to create the learning objects with built in colour and font size, by keyboard navigation. It enables the teacher to import any image (jpg or png), audio (mp3), video (flv), animation (fla) and flash (swf) directly into the learning object and arrange these items and texts on the page as they prefer. The software automatically keeps these items together in a folder for each project.

Extensibility has been built into the design of Xerte and much of the code is made available and the other designers, can add their own tools to the editor through an extensible interface.

3.20.3 Accessible Learning Object Interface

3.20.3.1 Creating a new learning object

When a user wishes to create a new learning object, they simply open the template file. This prompts the user to create a folder, to house the new project, and opens the template wizard. The left hand side of the wizard displays the navigation tree, showing the titles of any page created within the object. The right hand side of the wizard shows dialog boxes and prompts, relating to the content of each page. Initially the ‘presentation’ title (i.e. the title of the learning object) will be shown in the tree, with a dialogue box on the right, into which the user can either insert a desired title and also import a logo if they wish to ‘brand’ the object as in Figure 3.46.

3.20.3.2 Text Input

On each page, the user has the opportunity to type directly into the dialogue box or to import it from another text document, using ‘Copy and
Paste' methods. Advanced text editing features like Bold, Italic, hyperlinks, Bulleted list are also available.

3.20.3.3 Media Input

User can insert images, sound clips, video or animations. Accessibility prompts are included in the template, so that if the user inserts an image but does not include any other alternative text for that image, in the preview of the learning object, a message appears asking the user if they need to insert any alternative text for that image.

3.20.3.4 Navigational Options

Different sub-navigation options can be utilized, for ‘stacking’ a sequence of pages on a single page of the learning object by using a tab function. These sub navigation options, can also be used to build subsets of pages within a single page.

3.20.3.5 Interactivity Input

The interactivity function enables the user to create questions. ‘Simple’ questions for the student to consider analyze and provide feedback. It is also possible to create multiple choice questions and hotspot images.

3.20.3.6 Publishing the Learning Object

The content object is ready for the student to use. The content developer can publish the accessible learning object content with two options:

1. To Publish->Publish which creates a web ready version of the object.

2. To Publish->Package which creates a scorm-compliant zipped file for distribution.
Figure: 3.47 Screen shot of Xerte Interface and its elements

Figure: 3.48 Introductory Sessions about the Professor

The sample creation of a learning object which is developed by Xerte is shown in Figure: 3.47 & Figure 3.48.
MIS FOR CONTENT EFFECTIVENESS

MIS (Management Information Systems) is a general term for the computer systems in an enterprise that provide information about its business operations to the top management. It is also used to refer to the team who manage these systems. MIS department refers to a central coordinated system of computer expertise of mainframe systems. The applications are being developed which provide managers with information about other related data that would help in effective decision making and managing the enterprise.

Now we are going to see the creation of built-in information system known as Management Information System (MIS). The concept of MIS is to process data from the department and present it in the form of reports or graphs at regular intervals. The idea behind MIS which could help us to obtain timely feedback that would encourage us to continuously fine tune and upgrade the content as well as methodology. The tools that we are planning to use here are Student Information System (SIS) which give us the details of Register Number, Name, Address, City, Pin code, Course, Subject, Semester, Fee Amount etc., Learner Information System (LIS) which gives the details of the number of topics the student has learnt in a given period of time. The number of times he has referred to the virtual faculty and number of link references made. This information could be of course, suitably formatted as per the requirements of the top management of the institution offering such e-learning courses. Hence a specific format is not being prescribed here at this stage. However for a convenient understanding of what MIS could do to the institution we devised sample format and used it for doing a beta sample with a smaller number was conducted and the results were categorized and provided as shown in Table 3.2.
Table 3.2 Course Feedback – Subject to Discussion – Object Oriented Programming in C++

<table>
<thead>
<tr>
<th>Course Feedback</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course has encouraged me to learn more about this subject</td>
<td></td>
<td></td>
<td>3</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Material covered in this course corresponds to my current course syllabus</td>
<td></td>
<td>2</td>
<td>1</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Overall quality of this course was good</td>
<td></td>
<td></td>
<td>4</td>
<td>11</td>
<td>18</td>
</tr>
</tbody>
</table>

Though there is a trend visible in the result, there is no necessity that the trend should match with the actual result, because of variance in size and other demographic factors to measure the effectiveness of the content. However the sample data is provided to indicate the direction in which the research could be done. MIS could be provided to the management at any point of time. The sample questionnaire form is given in the Appendix-B. The above methodologies would be sharpened and used for extensive research as the part of the future work in this regard.
3.22 RESULTS AND DISCUSSION

![Chart showing student feedback on course]

Figure 3.49: Course Feedback

To improve the progress of the students of programming language, learning objects are used as a learning material for students who have different study backgrounds. Some students are theoretical and some of them have good programming skills. The focus is concentrated on 1st Year students of M.C.A course on the Object Oriented Programming in C++. The study was organized for the students who have an idea on programming knowledge. The survey questionnaire for a feedback was distributed among the students and the students were asked about the material coverage, the syllabus and overall quality of the course as shown in Figure 3.49. It is quite clear that the students believe that the learning objects are most useful for them as novice programming. More number of introductory sessions and better integration of learning objects are needed to encourage students to use them more frequently as a normal part of programming study. Learning material must be easy enough to learn for the students rather than the extensive learning material study outside the class room.
3.23 LIMITATIONS OF KNOWLEDGENET LEARNING SYSTEM

1. Static content display.

2. Dynamic Learning content assembling is restricted.

3. Learner's personalization is restricted.

4. Maintaining large numbers of static pages as files is impractical without automated tools.