Electronic library for the Universiti of Teknologi Petronas

by

Zintle Fikelepi

Disseratation submitted in partial fulfillment of

the requirements for the

Bachelor of Technology (Honors)

(Information Systems)

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Universiti Teknologi PETRONAS

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CERTIFICATION OF APPROVAL

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A Project dissertation submitted in partial fulfillment of

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Approved by,

_____
(Ms. Noreen Izza Arshad)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
December 2005

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this work. The original work is my own except in the reference and acknowledgements, and that the original work contain herein have not been undertaken or done by unspecified sources or persons.
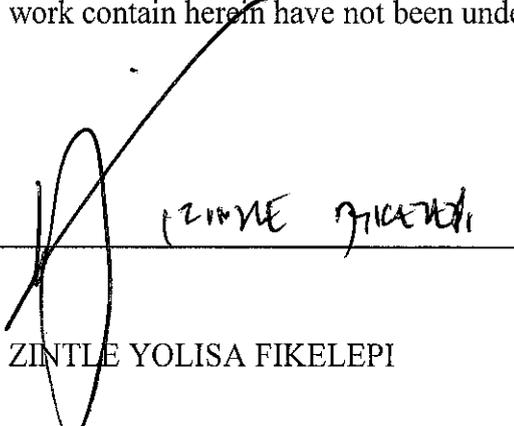
ZINTLE YOLISA FIKELEPI

ABSTRACT

Both corporate and academic institutions are required to be flexible and adaptable to the ever changing technological environment. Electronic or digital libraries are just one of the instruments through which academic institutions can adapt to the changing environment as well as meeting the demands of the student. The overall objective of the study is to identify important variables namely; knowledge management, information accessibility and digital libraries for consideration at the implementation phase, and thus enable successful implementation of a valid electronic library. The project methodology will follow a hybrid methodology composed of both the SDLC and Summit D methodologies. Analysis, requirements gathering, and other activities are some of the few tasks, enabling research and ultimately a working prototype. The final output of the paper will be a full scale implementation of an e-library for the Universiti Teknologi Petronas. Such an implementation will see the institution breaking new ground in information technologies and knowledge management. By its nature academic institutions impart knowledge, thus an implementation of an electronic library will seek to facilitate UTP in ensuring that knowledge, information are imparted to all stakeholders, in particular the students. Information, knowledge, will be made available and thus ensure proper utilization of these resources.

ACKNOWLEDGEMENTS

First and foremost I would like to thank the University for giving me an opportunity to learn and approach such a challenging task. I certainly have learnt a great deal during this project and continue to.

I would like to thank my supervisor Ms. Noreen Izza Arshad for her guidance, patience during the course of this project. I would also like to take the opportunity to thank my fellow colleagues who where instrumental during the course of the project. I would also like to thank the UTP library staff who instrumental in my research and all the assistance they offered.

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ABBREVIATIONS AND NOMECLATURES

UTP	University Teknologi Petronas
E-library	Electronic library
E-learning	Electronic learning
E- Journal	Electronic journal
UTP e-Lib	University Teknologi Petronas electronic library
SDLC	System Development Life Cycle
NYPL	New York Public Library
KM	Knowledge Management
OOAD	Object Oriented Analysis and Design
CoK	Communities of Knowledge
Kbase	Knowledge Base
ESI	Engineering Software Institute
XHTML	Extensible Hypertext Markup Language
IRC	Internet Relay Chat
CoP	Communities of practice
SKILL	Sharing Knowledge Information and Lessons Learnt
GUI	Graphical User Interface

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Undoubtedly, there are profound changes going on in the educational systems. These changes are needed because of ever growing pressure in the educational systems themselves, partly because society itself is changing into one in which knowledge becomes ever more important, and partly because of the very information and communication technologies which are transforming the economies.

Both of these factors evoke change and offer a solution to the problems with which the educational system struggles. As part of the solution to these growing changes, digital or electronic libraries can offer a multitude of opportunities in knowledge and information access.

According to Raj Reddy (1999) [13] Digital or electronic libraries can be termed as electronic information resources available within the library or remotely accessible but, which do not have a physical presence. Common characteristic of electronic libraries include the following:

- emphasis on access to digitized materials wherever they may be located, with digitization eliminating the need to own or store a physical item
- browsing based on hyperlinks, keyword,
- broadcast technology; users need not visit an electronic library except electronically; for them the library exists at any place they can access it, e.g., home, school, office, or in a car

The Universiti of Teknologi Petronas (UTP) currently houses a traditional library accessed by lecturers, postgraduate and undergraduate students. An opportunity exists to implement an electronic library for the university with the objective of enabling information and knowledge accessibility.

1.2 Problem Statement

1.2.1 Problem Identification

Quantity of available information resources

The existing library has a limited quantity of resources available for use by the user i.e. students, university staff and lecturers. The first come first serve basis is one that is employed. A total of 4 copies of a book may have to be shared among a pool of users estimated at four thousand. It is evident that the quantity available is not sufficient to match the demand for the resource material. An electronic library will then permit access of a book by multiple users.

Accessibility of information resources

Electronic libraries facilitate time and place independent information for students. Electronic libraries are already available 24 hours from anywhere in the world, offering flexible arrangements for students. The current traditional library at the university does offer accessibility to its users however the extent to which they can access this information is limited. Students may only access the information resources while at the library only, no access to electronic resources for example is granted outside the library time.

Knowledge management structure

The basic concept of any knowledge management system is to facilitate knowledge sharing within an organization. Owing to the nature of academic institutions, knowledge

sharing is an important variable in ensuring that knowledge, especially academic knowledge is imparted.

The faculty departments operate in silos and consequent to this, information is retained in those silos thus disabling any efforts to share knowledge among the respective departments. Not only is the knowledge confined in the departments, but also resides largely in the student population. The knowledge management structure therefore not only seeks to improve knowledge sharing among students and lecturers but also improve sharing and communication among the faculties of the university.

1.2.2 Significance of the Project

The theme for this paper may be termed as "Information driving knowledge enabling discovery". The utmost significance of this project is the immense need highlighted in the problem statement: to provide students with quality, current and relevant information resources. Additional to this need is also the recurring theme: the need for knowledge sharing at the university. The significance can be envisaged from 2 perspectives discussed below.

1.2.2.1 Learner Perspective

From the learners' perspective, access to a vast amount of information not only enhances ones learning but also facilitates knowledge creation. The implementation of an e-library will enable learners to access information and by using features available on the system be able to share their knowledge. Not only does this ensure knowledgeable students but also ensures students embrace innovation, discovery and a culture of learning as well as learning to share knowledge.

1.2.2.2 UTP Perspective

The trend in higher education is clearly toward increase use of electronic publications, especially in reference works. This offers great possibilities in lowering

costs and increase utility. Academic institutions are quickly developing the capability to deliver a growing number of electronic documents. UTP as a new player in the field can use this opportunity to leverage its effectiveness as a world leading institution of learning.

As the university's mission states, innovation and creativity are essential in the betterment of society. It is therefore essential that the university consider the electronic library as significant in their quest to satisfy its objectives and goals.

1.3 Objective and Scope of Study

1.3.1 Objectives

1. **Provide students with relevant and current information resources.** Through the provision of the electronic resources service in the e-library students are able to access information resources. Students should not only have access to reading material but should also be able to access media rich sources and resources.

2. **To introduce a culture of knowledge sharing** through collaboration among students and lecturers. Through a knowledge base service will be provided by the e-library thereby allowing those who want to share their knowledge via the knowledge base. Knowledge shared will include hints and tips as well as other information that may prove beneficial for other users.

3. **Collaboration among the university's departments.** The current structure employed by the university is such that the departments work in silos. There is obviously a lack of integration in such a structure in the knowledge management context. The e-library (electronic library) will enable communication amongst the respective departments. Project teams will each have to post lessons learnt as well as other relevant information such as project information and resources. This capability will be provided under knowledge services as the communities of knowledge service.

1.3.2 Scope of Study

By design, this study provides a presentation of some key concepts of an electronic library as well as introduces the knowledge management concept. The scope of the study will be contextualized within the boundaries of UTP i.e. the university's faculty departments and the library. The scope may be stated as follows:

1. To research on the concept of electronic libraries and the challenges and issues associated with the concept.
2. Define and analyze the current process of the traditional library at UTP with the aim of understanding the current business processes.
3. Conceptualize and design an electronic library for UTP. The new system will consider all aspects discussed in the objectives.
4. Design a collaboration framework to support knowledge sharing.

The issues identified in the problem statement are those that advocate improvements in with the existing system.

In view of the project's objectives and time frames allocated, the UTP electronic library (UTP e-Lib) prototype will be limited to core functionalities. Core functionalities include:

1. Access an online based system.
2. Access to reference material i.e. e-journals, e-catalogues databases and e-books.
3. Collaboration system for knowledge sharing
   - Develop a small scale knowledge base for use by all.
   - Develop a small scale Communities of Practice termed Communities of Knowledge (COK).
   - Develop a chat function enabling tutoring sessions with lectures only at specified times.

The time limits allocated will allow for initial work such as analysis, information gathering, all of which contribute to the final product. In the time span allocated, much of what will be achieved are research efforts as well as system development work.

CHAPTER 2

LITERATURE REVIEW AND THEORY

"This is a fascinating period in the history of libraries and electronic publishing. For the first time, it is possible to build large-scale services where collections of information are stored in digital formats and retrieved over networks. The materials are stored on computers. A network connects the computers to personal computers on the users' desks. In a completely digital library, nothing need ever reach paper." [10]

Libraries have a great deal to learn and adapt from innovations in digital library research. Apart from using digital library technologies in providing improved services using external information sources, libraries can play a key role by participating in national and international distributed digital library efforts and in using digital library technologies for publishing and managing internal content.

It is very important at the outset to appreciate the fact digital libraries are much more than technology - they are also about people and organizations - as users, producers and managers of information.

2.1 Overview

2.1.1 Discussion and Findings of Literature Review

The emerging field of digital libraries brings together participants from many existing areas of research. It is tempting for researchers to think that the field of digital libraries is a natural outgrowth of an already known field. The field of digital libraries may be seen from different perspectives.

- From a database or information retrieval perspective, digital libraries may be seen as a form of federated databases.

- From a hypertext perspective the field of digital libraries could seem like a particular application of hypertext technology.

- From a wide-area information service perspective, digital libraries could appear to be one use of the World Wide Web.

- From a library science perspective, digital libraries might be seen as continuing a trend toward library automation. From a knowledge management perspective the field could seem like a particular knowledge management application.

All perspectives support electronic libraries but no individual perspectives address the field as a whole. The field of digital libraries will be limited if viewed only as a subfield of prior research interests. Digital library research must both respect the existing tradition of our physical libraries and transcend current practice in developing a new, broader research agenda. With this particular study in mind important variables such as knowledge management and collaboration must be addressed in adequate detail.

Although different terminologies such as digital library have been used interchangeably with electronic library the definition holds true for both. What is interesting in the many definitions encountered in previous research efforts is the lack of support for knowledge management; a recurring theme in learning. Although it may seem electronic libraries are merely made for computerized access to digital material, collaboration and knowledge management are key elements that need to be supported. According to Taylor (1972); "The most important of societal and economic changes or discontinuities concerns knowledge, which, during the last few decades, has become the central capital, the cost center, and the crucial resource of the economy. This changes labor forces and work, teaching and learning, and the meaning of knowledge and its politics. It also raises the problem of the responsibilities of the new men of power, the men of knowledge." It is therefore important the knowledge management discipline be incorporated in such implementations.

Today's student is much more demanding, students more and more are behaving like consumers who want to make informed choices, and demand more from the academic institution.

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2.1.2 Challenges facing e-libraries

Outlining the challenges facing e-libraries should be integral part of this study in order to understand a considerable aspect of the concept. Below are few of the challenges presented to e-libraries.

Paradigm shifts

If digital libraries are to become truly useful, they must assist users in making the transition from paper books to digital hypermedia.

Scalability

A major problem encountered in digital library development is scalability; the expansion of system capabilities by many orders of magnitude. For example, a Web site, even one with huge capacity, may be choked if many people access it at the same time. Therefore, technology that seems effectives when used on a small scale may become impossibly cumbersome when expanded.

Information reliability

It seems inevitable that the class of works available through digital libraries will include electronic-only publications, and un-reviewed materials and even fabricated or counterfeit matter. The ease of publishing on the Internet combined with the absence of traditional methods for evaluating reliability makes it likely that library users will be retrieving works of questionable authenticity and value. Issues concerning the Internet and digital materials include:

- Reliability. How can a user evaluate the reliability of digital materials? What information must be maintained about the source of the item and its creator to facilitate a decision?

- Version control. How can changes made to a document be tracked and the appropriate catalog entries updated?

- Archiving. What assurance can there be that the digital materials will be retained somehow in their original form for an indefinite period?

- Authenticity. How can the genuineness of materials be assured?

- Reviews. The system should allow the user to scan reviews of the retrieved work and then add their own reviews or comments to a database.

- Citations. How may a user readily learn which works have cited the retrieved work, either favorably or unfavorably?

2.1.3 Knowledge management in higher education

According to Dr. Yogesh Malhotra:

"Knowledge Management refers to the critical issues of organizational adaptation, survival and competence against discontinuous environmental change. Essentially it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings."

Successful organizations are knowledge-creating organizations, which create, disseminate and embody new knowledge in new products and services. Knowledge management enables organizations to improve efficiency and effectiveness mainly by decoding tacit knowledge into explicit information and disseminating using technology. The growing awareness of the value of the knowledge embedded in the experiences, skills and abilities of people is emerging as a significant challenge to improving organizations. The management of knowledge in the organization has to be adopted or adapted by organizations if they are to compete successfully in the twenty first century. Intellectual capital has therefore become one of the prime sources of a knowledge-based and knowledge-enabled organization

Knowledge management is an integral part of any organization, not only does it ensure organization competitiveness but it also empowers the people. This theme is central to the objectives of higher education: to educate and empower people. It is therefore without a doubt that knowledge management is vital for academic institutions. In its importance, knowledge management is not a new concept among academic institutions.

A university environment seems to be by its nature especially suitable for the application of knowledge management principles and methods. The main reasons are:

- universities usually posses a modern information infrastructure;
- to share their knowledge with others is very natural for professors and teachers in general
- to acquire knowledge from accessible sources as fast as possible is a natural desire of students;
- As modern universities are very much also business organizations with a lot of business activities on the "educational market", any method of increasing their competitive advantage

The main rationale for adopting knowledge management in this specific context is to enable people namely students, lecturers, and staff to share their knowledge. From a learner perspective, more knowledge not only decreases their learning spans but also prepares them for the diverse workplace, enables them to possess a more 'rounded' knowledge, as well as empower them. University staff is also empowered as well as becoming more knowledgeable of concepts outside their knowledge. When considering the lecturer perspective, knowledge management will improve the level of teaching, improve working relationships among lecture and students, and similarly empower them.

2.1.4 Electronic library system architecture

2.1.4.1 Overview

According to ESI (Engineering Software Institute) at Carnegie Mellon University system architecture may be described as a representation of a system in which there is a mapping of functionality onto hardware and software components, a mapping of the software architecture onto the hardware architecture, and human interaction with these components.

The architecture has been designed in order to accommodate the core functionalities of the proposed system. The architecture was as a result of discussions with the library staff as well as research. The resulting architecture is depicted in figure 1.

2.1.4.2 Discussion

A three tier system architecture will be used, the layers namely the user layer, middleware layer and the data tier, depicted in figure 1.The front-end client layer consists of application specific logic and the user interface. This single user layer handles the mass of user interaction and task specific local operations originated by the user.

The application server tier, supported by a multi-user environment, holds the shared parts of application and can be termed as the core of the system. Most of the data/information requested by the applications is accessed via this layer; data intensive computing operations should be executed here whenever possible. Application servers are responsible for coordinating transactions. The general role of the server is to provide intelligent agent services as in mapping a request to a number of different servers, collating the results, and returning a single response to the client. The task of the storage layer is to manage persistency of certain data/information and to execute the database transactions.

Communication between the user and the system is through the client and server processes. The client is a process (program) that sends a message to a server process

(program), requesting that the server perform a task (service). Passing requests will be achieved through a graphical user interface. The server process (program) fulfills the client request by performing the task requested. Server programs will receive requests from client programs, execute database retrieval and updates, manage data integrity and dispatch responses to client requests. The middleware layer will handle the applications, such as queries, retrievals and the like and may be aggregated as part of the server processes.

An important advantage of client-server systems is scalability. They can be scaled horizontally or vertically. Horizontal scaling means adding or removing client workstations with only a slight performance impact. Vertical scaling means migrating to a larger and faster server machine. This is especially important when considering that the number of users in an education institution will grow.

Client/ User layer

Student Village

Lecture Quaters

Remote PC

Middleware/ Application layer

Internet

Utp eLib server(portal)

Library server

Data Layer

Library database

Library Taxonomies

E-Lib Database

E-books table

Knowledge base table

E-journal table

Research guide table

User details table

Communities of Knowledge table
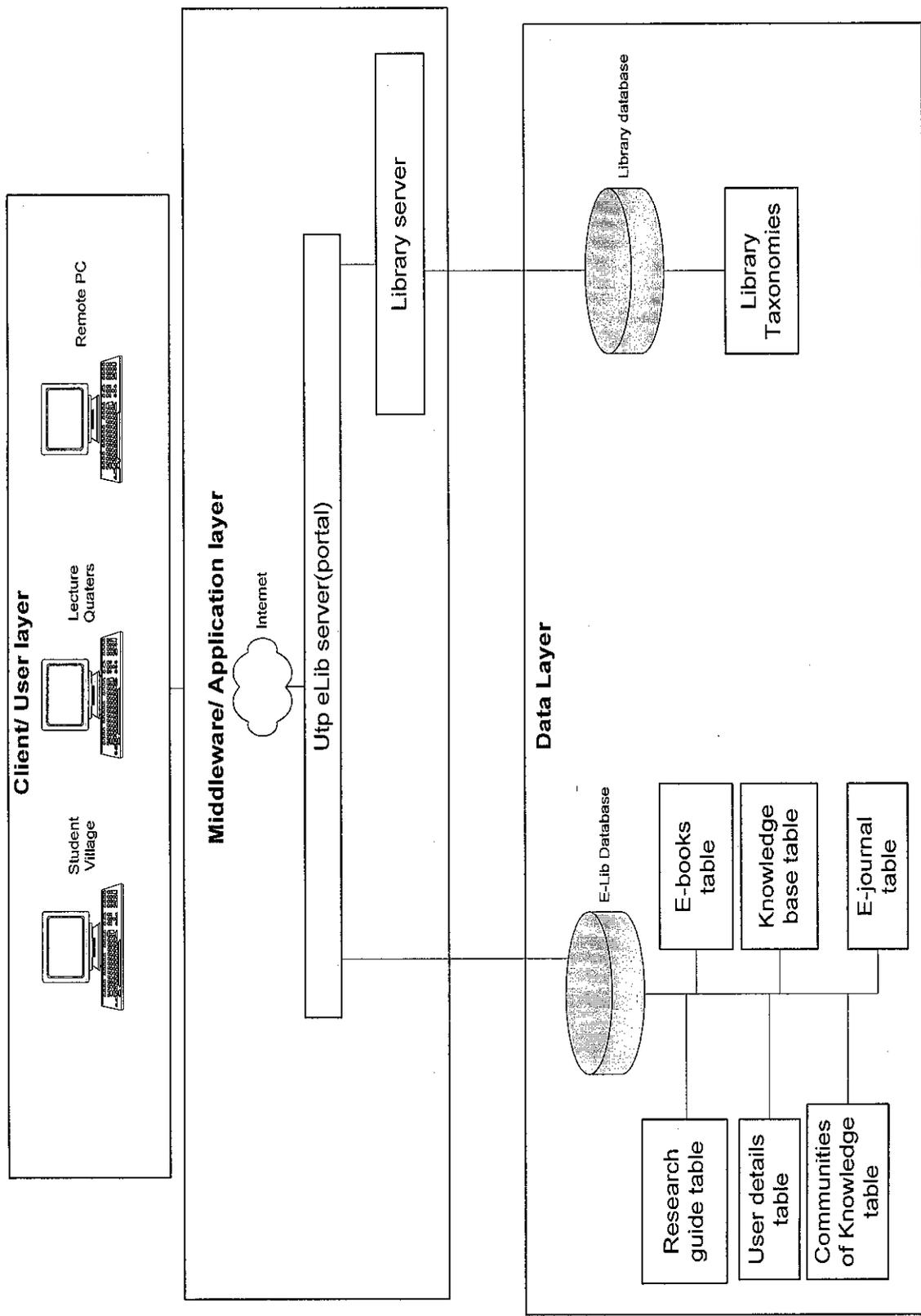
Figure 1: Proposed system architecture for UTP Elibrary

2.2 Conclusion

As the above material has highlighted an electronic library is an array of different but highly interrelated components working together.

In order to ensure effectiveness and efficiency of such an application key concepts must be considered and addressed in depth. The variables that have been identified from this exercise may be defined as those necessary in achieving an e-library that meets the standards. The key findings discussed above must be regarded as part of the problem solution.

In ensuring that the implementation meets the correct requirements, key challenges highlighted in the review should be tackled; the important variables such as knowledge management and collaboration should be dealt with in great detail.

In conclusion, no academic institutions can be complete without knowledge, information and enabling technologies. All three of these ingredients can be incorporated and utilized in addressing an opportunity.

CHAPTER 3

METHODOLOGY

3.1 System Development Approaches

The aim of system development approaches is to provide a framework against which development is advocated. The traditional System Development Life Cycle or 'Waterfall Approach' has been the most commonly used in systems development. This approach as on that follows a sequential route from problem and requirements analysis, functional specification, design, implementation and testing (Royce, 1970), see Figure 1. The SDLC breaks down the whole process to clearly define stages in the development process and deliberately separates data and processes. This clear identification of each stage, its inputs, competencies and outputs facilitates efficient project management and systems development.
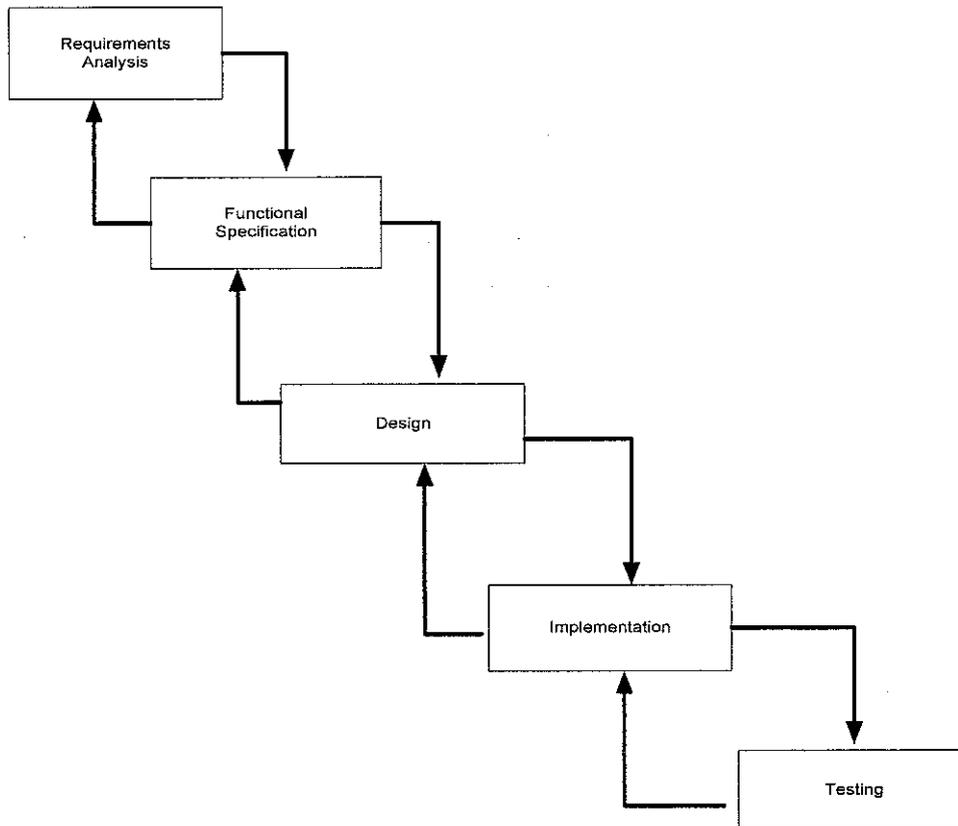
Figure 2: Royce's (1970) Traditional SDLC or "Waterfall Method"

The traditional SDLC shall be used as supplementing framework to systems development coupled with the chosen methodology, to be discussed below.

3.2 Chosen Methodology

The chosen methodology for the study and implementation of the e-library will be coupling the Summit-D methodology together with the traditional SDLC. The justification of this methodology is such that the traditional steps in systems development are still adhered to, as well as introducing new methods and techniques in systems development such as those used in Summit D. Figure 2, depicts the Summit-D phases as well as the corresponding SDLC phases. It was considered important to enhance the SDLC framework with that of the Summit-D framework for consistency, validation and ensuring a good deliverable.

this context the library on a top-down based approach and detail the business area of interest based on the scope.

3.2.1 Structure and terminology

Summit- D is structured into phases and modules. The phase structure implies the basic sequence of the five standard Summit-D phases. See Figure 3. Phases exist for several reasons:

1. It establishes a set of formal deliverables that should be produced before formally proceeding to the next phase.

2. The end of each phase requires a formal decision by the "Project Sponsor" to accept the conclusions that have been reached.

3. The major phase deliverable represents a controlling document that can be used to define the scope and functions of the system for subsequent phases. This provides a basis for change control that keeps the project focused on achieving a successful conclusion.

Summit-D phases are further structured into modules that are used to construct a project work plan. A module is a cohesive group of tasks and activities that are performed to produce a specific set of project deliverables.

SUMMIT D

Phases	Modules

REQUIRMENTS ANALYSIS

SOLUTION DEFINITION

DESIGN

BUILD AND TEST

TRANSITION

REQUIRMENTS ANALYSIS   OBJECT ORIENTED DELIVERY

SYSTEM DELIVERY SPECIFICATIONS

TECHNICAL SYSTEM DESIGN

TECHNICAL PROCEDURE DEVELOPMENT   USER PROCEDURE DEVELOPMENT

SYSTEM AND ACCEPTANCE TESTING

TRANSITION
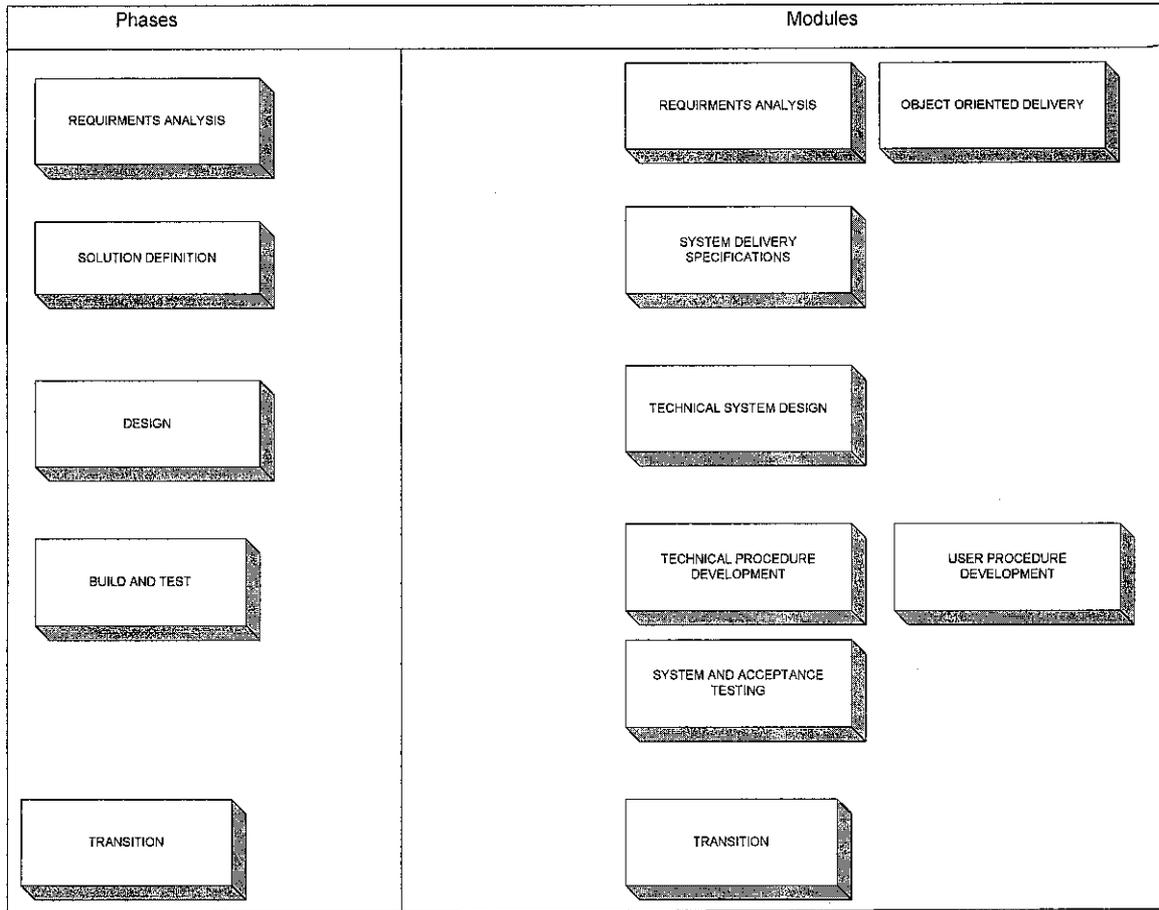
Figure 4: Summit-D Methodology and applicable modules

3.2.2 Overview of phases and modules

Requirement Analysis Phase

The purpose of this phase is to document the scope, business objectives and requirements of the system. Based upon this input alternative approaches can be used to solve the problem. This phase produces three basic deliverables:

1. The Statement of Scope is produced early in the phase and establishes a common understanding of what is intended to be in an out of scope of the system.

2. Statement of requirements is produced as documenting the business objectives and the key functional requirements of the system.

3. The System Prospectus is the major phase end deliverable. It combines the Statement of Scope, Statement of Requirements, and the information produced in the alternative analysis, to present a recommended solution.

The object oriented delivery module shall be employed in the development of the e-library. This module will be invoked at the Requirements Analysis phase.

Phase Tasks

The initial stage of the systems development will involve collecting user requirements. The user constitutes students, UTP staff and UTP lecturers, and all requirements will be gathered from these users. Group workshops will be held with all the users in order to elicit the necessary requirements. Group session as well as individual sessions will be held with users, mainly students to gather information. Other critical information such as the library information will be gathered from the librarians during interview sessions.

Adjunct to the requirements gathering a questionnaire will be administered to all users, in order to ascertain the need for the electronic library. Deliverables highlighted above will be produced from the information gathered from the users as well as additional research material that may prove useful.
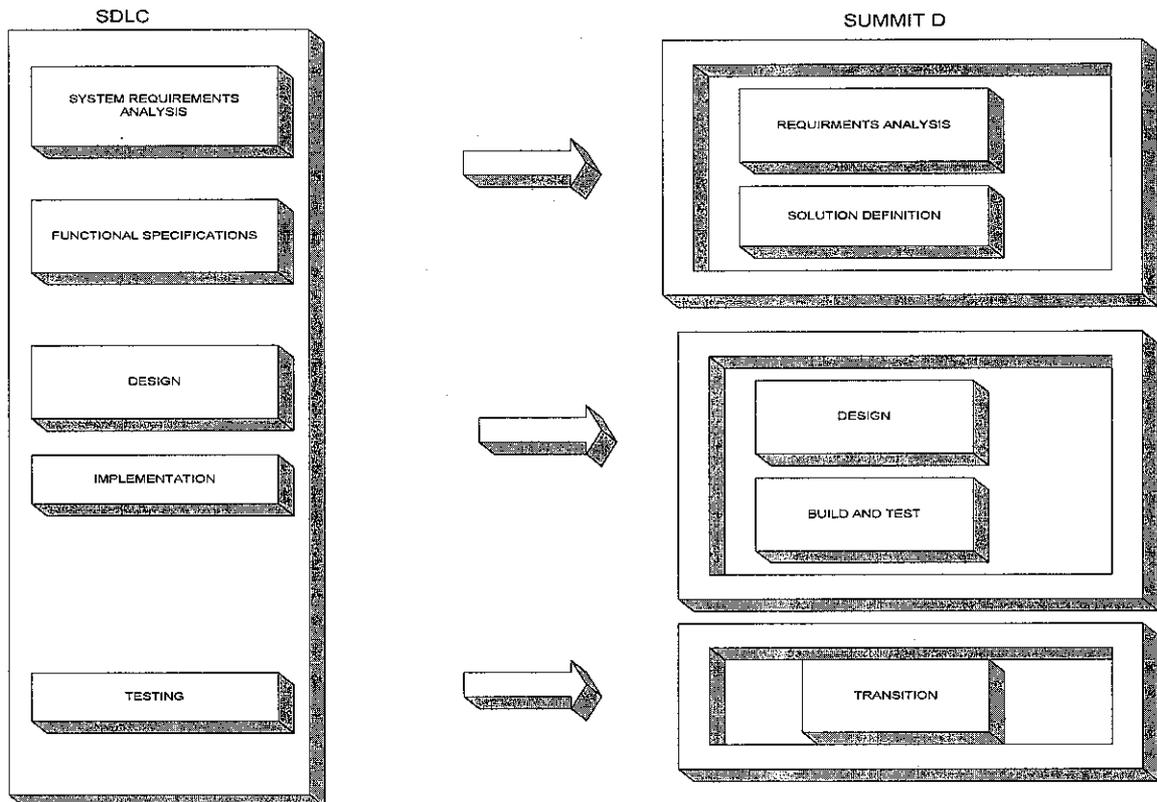
Figure 3: SDLC and Summit-D Methodology

Summit-D is a flexible methodology intended to allow the project manager to select those modules, tasks, techniques and tools that meet the specific needs of a project, without the methodology enforcing an overhead or structure that is not appropriate.

Since each project has different needs, Summit-D allows a great deal of uniqueness in structuring the project plan and modules without compromising its discipline. Summit-D is the application delivery component of the SUMMIT family of integrated methodologies dealing with information technology. Summit-D is used to guide and direct, analysis, design and implementation activities which result in quality information systems.

The methodology incorporates the most current data and process modeling techniques. It supports the concept of information engineering by analyzing needs of the enterprise, in

Solution Definition Phase

Solution Definition is the second phase of the project. The objective of this phase is to present the functional description of the new system for user approval. This is documented in the System Delivery Specification which includes:

1. User interfaces, including the format and content of screens and reports
2. Definition of functional subsystem processes
3. Data content of the system.

As the project will be using an Object Oriented Delivery approach, the Object Oriented Delivery module will also be invoked in the phase.

Phase Tasks

Once the requirements gathering phase has been satisfied a solution definition will be started. Work and activities will include studying the human computer interaction aspect, determining the look and feel of the interface. The storyboard will however be done at the requirements gathering phase. However it will form part and parcel of this phase. Activities will include session with the librarian at UTP to gather information on the concept of cataloging.

Design Phase

The Design phase of the project consists of the tasks necessary to describe how the proposed system is to be built. This information is developed in the Technical System Design module to produce the deign specification for the system.

Phase Tasks

Project design will involve building the total system from the deliverables completed from the previous phases. At this point, the conceptual and logical design will have to be done. This will include mapping the process using Magic Draw case tool and other tools such as Visio to map the conceptual and technical designs.

Build and Tests Phase

The objective of this phase consists of three modules which provide the tasks necessary to construct and test the final system solution:

1. Technical Procedure Development to construct the working system, including software, operations and procedures.

2. System Acceptance testing to verify that the system meets the functional requirements.

Phase Tasks

At this stage, activities will focus on building the system and testing it. A user acceptance testing will be conducted with the user in order to determine if their requirements have been fulfill. Once again a questionnaire will be administered in order to ascertain requirements satisfaction. Testing of the system will also be conducted, ensuring it works according to expectations.

3.3 Tools required

Hardware

1. Desktop computers (Pentium 4 2.4 GHz, 256 RAM, 50 GB hard disk)
2. Internet connection

Software

1. Windows XP Professional Edition
2. Web design tools – Macromedia Dream weaver, HTML, XML, JavaScript, Xara Webstyle.
3. Microsoft Internet Information Server
4. Modeling tools: Magic Draw, MS Visio
5. Analysis tools : Ms Excel
6. MS Project 2003 for project planning.

CHAPTER 4

RESULT AND FINDINGS

As of this time, much information and insight has been gathered, this section will detail examine the activities during which all the findings where gathered. The information gathering was the main activity of the research study. The section will basically seek to answer the question "HOW" the collection methods were conducted as well as the findings following the data gathered and the future work to be completed.

4.1 Requirement Analysis

4.1.1   Survey Results

As part of the requirement of any research study collecting data and make a due analysis of the data gathered is necessary. The information collected was from four sources namely, a questionnaire, reference material, a seminar and internet resources. The questionnaire was to be administered among a sample of 35 of the potential users of the electronic library. The population was further stratified into 3 categories all computer literate, namely the;

- Student (30)
- Lecturer (2)
- Staff (3)

Due to time constraints the questionnaire was only administered to the student user. A population of 30 students where chosen.

4.1.1.1 Result Findings

The results of the questionnaire proved beneficial in the overall study at this juncture. According to the results polled, the general use of the library involved using the reference material housed at the library. The results reflected that books where the most used source of material consulted for general or specific uses such as learning new topics. This

information will prove beneficial for this study as the one of the project objectives is to provide students with electronic books. See figure 4.

GENERAL LIBRARY USE

6%
STUDYING AND WATCHING
DISCOVERY CHANNEL

6%
USING REFERENCE MATERIAL
AND THE INTERNTET

12%
REFERENCE MATERIAL AND
STUDYING

76%
BOOKS
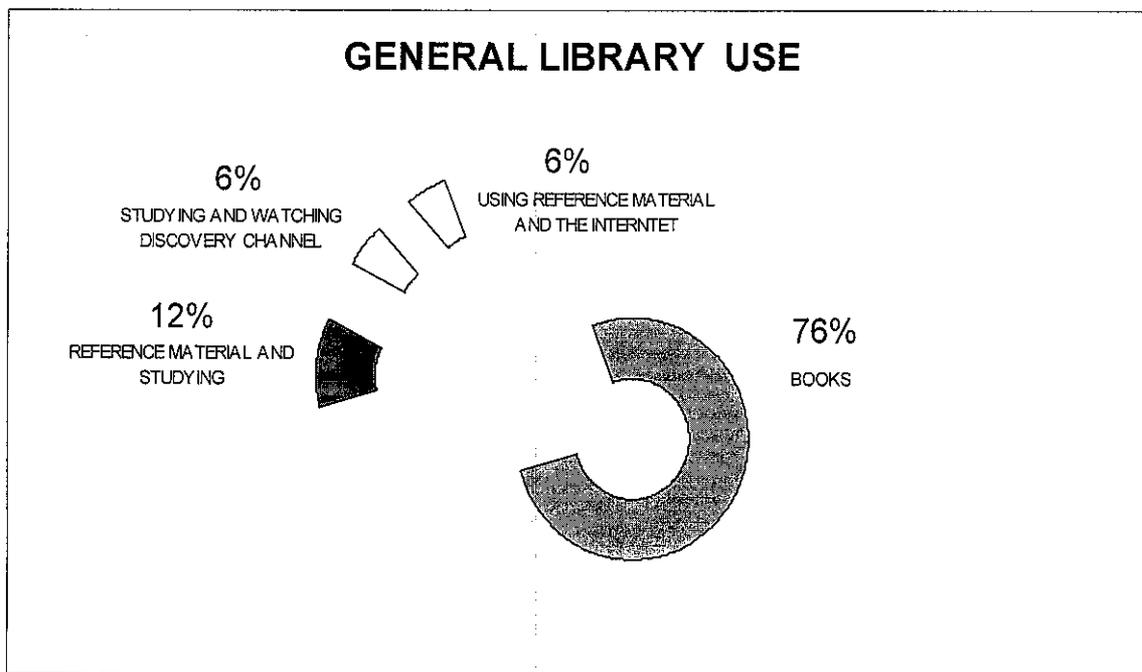
Figure 5: General Library usage

The results also reflected good use of other reference material such as online databases and dissertations being sources of information for students. Other findings included:

- Of the 30 respondents 35 percent utilized the library material 50 % of the time.

- 40% of the respondents used the library material in learning new topics 50 % of the time.

- The respondents also cited books as the most frequently used material for learning new topics. Others sources such as dissertations and journal where consulted. See Figure 5.

A quick and dirty analysis of the information suggests that more reference text namely books are used. It would be for the benefit of the student at large to offer this frequently used material online.

LIBRARY MATERIAL USED FOR LEARNING
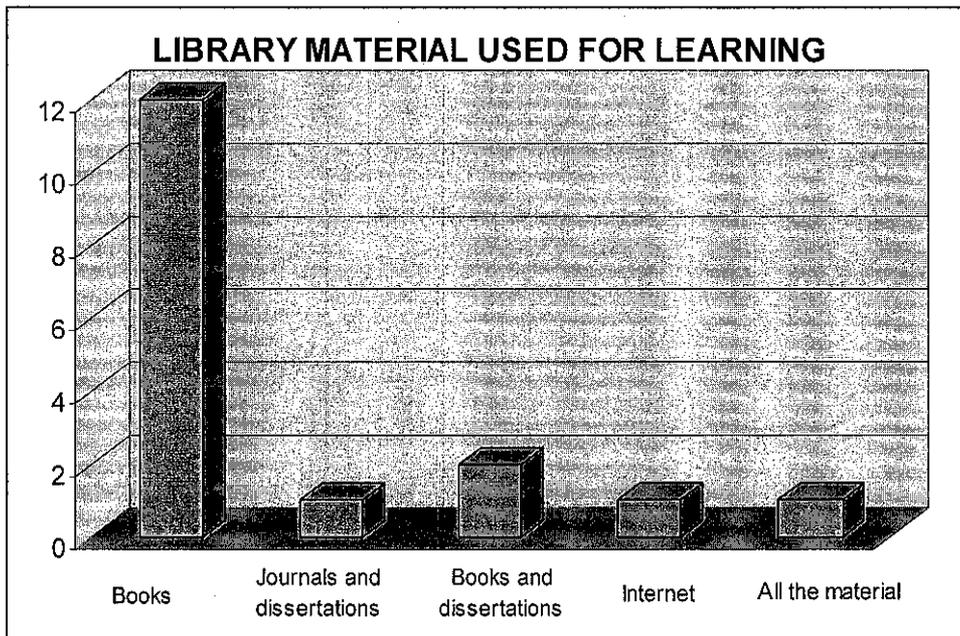
Figure 6: Library material used for learning new topics

What also proved interesting is that students not only used the most available sources of information such as bought reference text they also consulted library material, the internet and their peers. This information is relevant to this study as this outlines the much needed knowledge management framework. As part of the objectives, a knowledge management structure will enable information sharing, especially in the context of learning new topics. As the questionnaire results reflected, knowledge sharing is vital both on a general and personal level. A good percentage 65 % of the respondents maintained that knowledge sharing is vital among students and lecturers as well as vital in their daily activities. Of the tools or means used in communicating or sharing knowledge dialogue was the most frequently use means of sharing knowledge. The Internet Relay Chat (IRC) was also frequently used. See figure 5. Although the internet was not the most used, it can be used to leverage knowledge sharing. The e-library will be a web enabled system, thereby allowing access anywhere, as well as enabling knowledge sharing in the most remote of areas.

MOST COMMON TOOLS FOR KNOWLEDGE SHARING

DIALOGUE
58%

VARIATION OF TOOLS
5%

MIRC
32%

EMAIL
5%
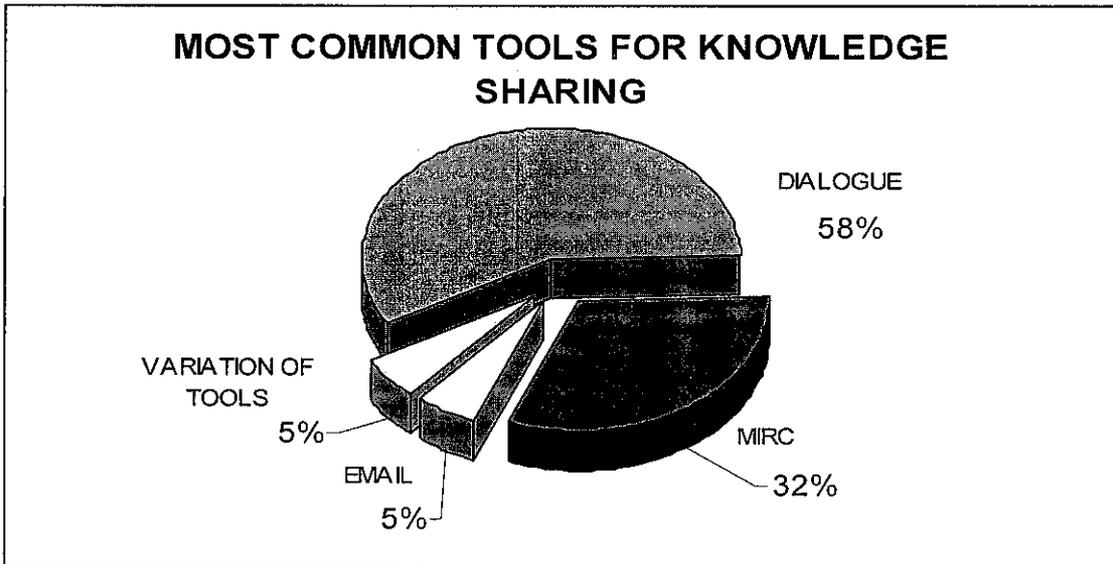
Figure 7: Tools for knowledge sharing.

Although the respondents have little knowledge about the concept of electronic or digital libraries the overall reaction towards an implementation of the system is fair. The most desirable features which the respondents are shown in figure 6.

ELIBRARY MOST DESIRABLE FEATURES

23%
ACCES TO ONLINE DATABASES

ACCESS TO OPAC

26%

23%
ONLINE BOOK RESERVATION

ACCESS TO ONLINE JOURNALS

28%
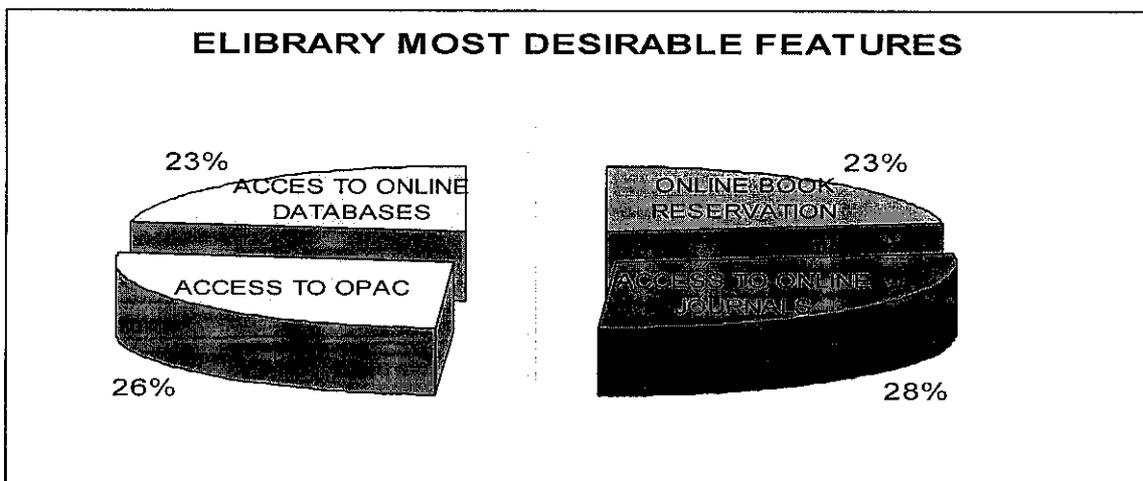
Figure 8: Electronic library most desirable features.

The most favorable feature is access to online journals. Electronic journals were found to be among the most frequently used material by the students. As the current state of affairs stands, these journals are only accessible at the brick library. The electronic library will facilitate in bringing the journals at the users disposal.

4.1.1.2 Conclusion of Findings

The survey has clearly indicated that users will indeed like to see more information being provided by the brick and mortar library. This deficit can be implemented as part of the library. Although some felt the material currently offered is adequate, more could be done in terms of automating some of the library process. As an intervention the electronic library will offer access to online books as well as enable online book reservation. Additional, is the information and knowledge sources the library will offer to its users, in particular the student user.

4.1.2   Knowledge management

One of the project's objectives is to deliver a system that not only enables access to reference material but also facilitates learning and knowledge sharing. Knowledge management applies systematic approaches to find, understand, and use knowledge to create value. It is also the formalization of and access to experience, knowledge, and expertise that create new capabilities, enable superior performance, encourage innovation]. Recently, various organizations started to introduce at least some pieces of the big palette of knowledge management principles, methods, or tools. This is very much true with the large corporations. Higher education institutions like UTP are compelled owing to the changing environment as well as student demands: to provide more information. According to a survey conducted by Knowledge Management magazine and International Data Corporation (IDC) about the state of KM (Dyer and McDonough, 2001), the primary business uses or domains of KM are to:

- Capture and share best practices (77.7%)
- Provide training, corporate learning (62.4%)
- Manage customer relationships (58.0%)
- Deliver competitive intelligence (55.7%)
- Provide project workspace (31.4%)

- Manage legal, intellectual property (31.4%)
- Enhance web publishing (29.9%)
- Enhance supply chain management (20.1%)
- Other (5.5%)

E-learning is one of the most important KM practices, something which one would expect higher education institutions to have as an advantage. Yet in the context of UTP it is not utilized to its fullest potential. According to the survey conducted respondents used other forms of knowledge sharing, such as dialogue and IRC. The introduction of the electronic library will possibly ensure some of the domains highlighted above are considered and implemented at the university.

4.1.3 Higher education as learning organizations

The scholarly definition of a learning organization is the ability of the organization to transform itself by acquiring new knowledge, skills and behaviors among all its staff members. A learning organization searches for new ideas, problems and opportunities for learning to succeed in a competitive environment. The ability to learn faster than other organizations may be the only competitive advantage an organization has. Whilst higher education may be viewed as merely bodies for instituting learning, they can also be viewed as learning organizations. With the adoption of knowledge management, UTP can be viewed as a learning organization.

Organizations that comply with the learning organization definition do so by design. An analysis of distinctive policies and practices characterizes these organizations. They include the following:

1. **Attitude Learning** only occurs in an accessible environment. The approach should be that there are always new things to learn and that learning is an essential, continuous part of growth and survival. Through the provision of knowledge base services and communities of knowledge, an attitude of learning can be adopted.

2. **Shared vision with a greater uncertainty about the future,** the need for a shared vision, mission and direction becomes more important. A shared vision provides the focus and energy for knowledge sharing. Management on its own may not always be sufficient to provide the vision and energy to stimulate and sustain effective KM practices. It has also been argued by a few that collective thinking helps to create a shared thinking of the future which will foster commitment.

3. **Systems thinking.** This concept refers to viewing the whole rather than the parts. Many organizations suffer from 'learning disabilities' because of their lack of an integrated thinking. By collaboration of all the knowledge from the different departments system thinking is achieved.

4. **Personal mastery** The building block of the learning organization is the self-developing individual. Organizations cannot learn without individuals who are in a continuous process of learning and questioning. In learning organizations the purpose is for each individual to become self-managing and self-developing in a flexible, adaptive.

5. **Learning from past experience** Organizations have continuously to review their successes and failures openly and systematically. Through the knowledge services, lessons learnt may be available for project teams.

6. **Learning from others.** An individual's experience is not the only source of learning. Other techniques such as training, feedback are other techniques can be used for learning. The implementation of the e-library will enable users to learn from each other. Posting information such as hints and tips will be possible for use by others.

7. **Transferring knowledge.** Transferring knowledge is a vital feature of a learning organization because knowledge has to spread efficiently and quickly through an organization. Education and training are powerful means to transfer knowledge. Other techniques include the use of technology, meetings, conferences, written projects.. Feedback circulation between departments, teams and individuals need to be commonplace. Teams play a crucial role in creating knowledge because they provide a shared context where individuals can interact and engage in dialogue. A

common technique used in knowledge creation is the use of teams. These are also the fundamental building blocks of a learning organization

The learning organization's concepts focus mostly on the way in which knowledge is created. Higher education has been concerned about creating a learning environment in which staff and learners learn through their experience in teaching and learning, coupled with exposure to research and other means. The culture in higher education should therefore be appreciative of the creation of a learning organization.

It is obvious that although higher education institutions have not defined themselves as learning organizations they could definitely fit the profile by applying concepts of knowledge management.

4.1.4 Seminar Findings

A seminar attended at KLCC, Petronas Carigali provided some insight into the concept of knowledge management and collaboration. "Knowledge Sharing is power" was the theme of the seminar. Petronas Carigali considers knowledge management to be one of the most integral initiatives in the organizations. Much effort has been devoted to the company's knowledge management system. Due to the fact that KM is a driving force in business it's important that it's implemented properly and its value measured. The organization has developed frameworks which could be applied in the context of this project.

Due to the loss of knowledge from a number of factors such as the brain drain it is important that the scarce knowledge be captured. In the UTP context not only do we want to capture the expertise from students, and lecturers in particular but we also want to empower people with knowledge. Petronas Carigali has developed frameworks and procedures to facilitate learning, for the benefit of the electronic library, 2 concepts will be applied in the implementation of the collaboration and knowledge management structures. The company uses a number of tools such as Communities of practice (CoP) and SKILL (Sharing Knowledge Information and Lessons Learnt), which as has been mentioned will be adopted by the implementation of the electronic library. The library will house both these concepts as part of the knowledge management requirement. CoP

shall be termed as communities of knowledge and these shall constitute all the expertise gathered, lessons learnt by a particular project group. Students completing projects will be required to detail lessons learnt, knowledge gained, heuristics and the like, these lessons will be accessible and viewable by all users. See appendix: storyboard.

4.1.5 Conclusion

The resulting information has been aggregated in the initial findings of the research paper. The system architecture was produced from discussion mainly with the library staff. The system architecture has been discussed in the earlier chapters. User requirements are stated as follows:

- Allow for browsing and accessing e-books
- Allow for chatting feature in the electronic library
- Allow for e-news browsing and access
- Access to online journals and databases
- Access to OPAC
- Allow for access to a knowledge management base

4.2 Solution Definition

4.2.1 Initial storyboard findings

As a project requirement initial system work was required, this was translated into the initial system story board. See appendix: story board. This activity also provided into insight into the functional aspects of the system. From a number of digital libraries consulted such as the New York Public Library (NYPL) and University of Hong Kong Open library the overall system functionality was derived. The overall aim of consulting was not only to identify current practices but also elicit the uniqueness of each digital library consulted. The majority of the libraries seemed to offer the general functionality such as electronic journal access, online book reservation as well as access to external libraries. The implementation of the UTP electronic will cater for the basic functionalities[*A]; however the focus is on a more integrated approach with knowledge

management. The knowledge management functionalities will be implemented as depicted in Figure 9 to Figure 11.

It was decided that a knowledge base and communities be offered to the user as part of ensuring that knowledge management is indeed catered for. Not only does the provision of these two functionalities provide for knowledge management but more especially allows for collaboration among the university's departments. Users may post information in the knowledge base as well as the communities of knowledge which provide expertise in a number of fields. See figure 8.

This activity was vital for the work that will follow in the future, with the framework identified, prototyping, human computer interactions and the like can be considered.

*A
the full story board is provided in the appendices.

UTP ELIB

Elearning	UTP webisite	Search	

Homepage > Knowledge Services

Electronic Resources

Knowledge Services

ADD Lessons Learnt

ADD Lecturer Lessons

Reserve collection

Research Guides

Knowledge Base

1. Effective programming: Lecture and student tutorials , hints and tips

2. ABAP programming: Syarifahs hints and tips.

Communities of Knowledge

Communities of knowledge is a portal consisting of lessons learnt from projects implemented by students. Information available has been compiled by both project teams and the respective lecturers

Enter

Figure 9: UTP eLib Knowledge Services

UTP ELIB

Elearning	UTP webisite	Search	

Homepage > Knowledge Services> Knowledge base -
Effective programming view

Electronic Resources

Knowledge Services

Reserve collection

Research Guides

Knowledge Base

**1. Effective programming: Lecture and   student tutorials ,
hints and tips**
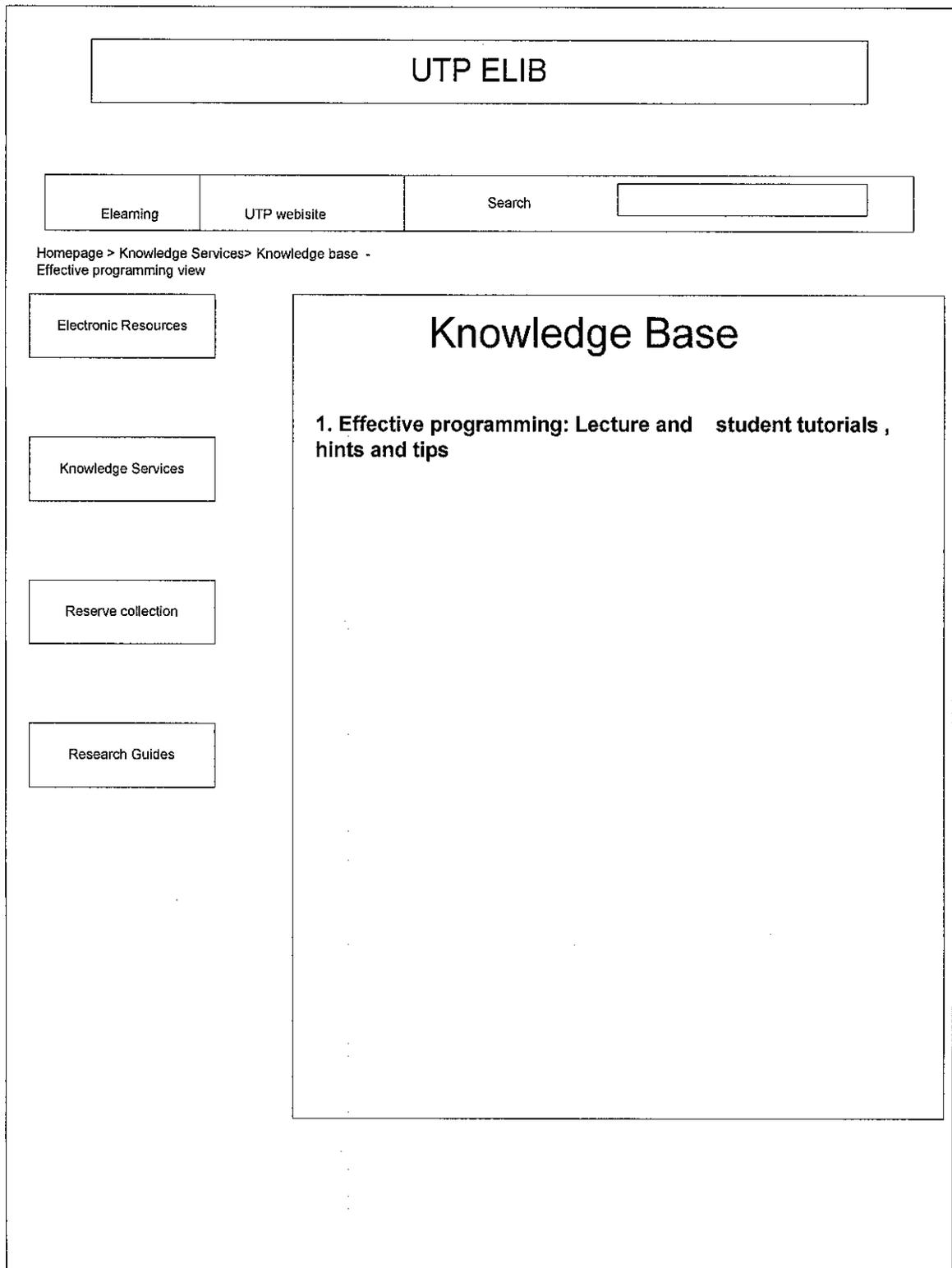
Figure 10: Knowledge base provision

UTP ELIB

Homepage > Knowledge Services > Communities of Knowledge

Elearning	UTP webisite	Search	

Electronic Resources

Knowledge Services

Reserve collection

Research Guides

Communities of Knowldge

Communities of knowledge is a portal consisting of lessons learnt from projects implemented by students. Information available has been compiled by both project teams and the respective lecturers

LESSONS LEARNT

1. CPM Project : Group 5 (2005) - Project Management Review

2. DSP Project Group 2 (2003) - Voice Recognition System

3. Quantitative Methods - A simplified approach (Dr. Wan Fatimah)

Figure 11: Communities of Knowledge provision

4.3 Design

The Design phase of the project consists of the tasks necessary to describe how the proposed system is to be built. This information is developed in the Technical System Design module to produce the deign specification for the system. In order to understand and visualize the manner in which the proposed system is to be built using Object Oriented Analysis and Design (OOAD). The models identified as crucial in the system implementation are the Use Case and the Class Diagram.

- Use Case diagrams may be described as abstractions and boundaries; they are responsible for defining the "bigger picture. The diagram is a description of the systems behavior from a users' viewpoint. Figure 12 depicts the service offerings of the UTP eLib as well as the user hierarchy. Users can be divided into three users namely: the student, lecturer and UTP staff. Service offerings are made available to the general user; however certain functionalities are limited to lectures and students. See Figure 12.

The student and lecturer actors are part and parcel of the general user; however they also play additional roles with regards to the system. Lecturers are permitted the following:

- Post lecture lessons in the Communities of Knowledge
- Conduct chat sessions.

The following use case description, describes the use cases of the system:

USE CASE DESCRIPTION	
USE CASE	LOGIN
SHORT DESCRIPTION	The user logon into the system
ACTORS	User
PRE-CONDITIONS	System operational
POST-CONDITIONS	User has successfully logged in
USE CASE	View E-learning
SHORT DESCRIPTION	User can link to E-learning site
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	Link authorized

USE CASE DESCRIPTION	
USE CASE	View UTP website
SHORT DESCRIPTION	User can link to UTP website
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	Link request authorized
USE CASE	View e-Resources
SHORT DESCRIPTION	View e-Resources
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User request to e-resources authorized
USE CASE	View Reserve collection
SHORT DESCRIPTION	User can search the reserve collection
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User logged in , User view of reserve collection
USE CASE	View Knowledge resources
SHORT DESCRIPTION	User can view knowledge resources
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User request to view authorized
USE CASE	View Research guide
SHORT DESCRIPTION	User able to view research guide
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User request to research guide authorized
USE CASE	View knowledge Base
SHORT DESCRIPTION	User can view the knowledge base
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User request for view authorized
USE CASE	Post knowledge
SHORT DESCRIPTION	User permitted to post knowledge entries
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User request to post authorized, enter entries via forms
USE CASE	View Communities of Knowledge
SHORT DESCRIPTION	User permitted to view CoK database
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User permitted to view CoK, can search and view

USE CASE	Post Lessons Learnt to CoK
SHORT DESCRIPTION	Student permitted to post lessons to CoK
ACTORS	Student
PRE-CONDITIONS	Student to be logged in
POST-CONDITIONS	Student can enter entries via forms
USE CASE	Post Lecturer lessons
SHORT DESCRIPTION	Lecturer can post lesson learnt to CoK
ACTORS	Lecturer
PRE-CONDITIONS	Lecture to be logged in
POST-CONDITIONS	Request to enter data authorized , via form
USE CASE	View e-news
SHORT DESCRIPTION	User can view e-news and related links
ACTORS	User
PRE-CONDITIONS	User to be logged in , authorize access to e-resources
POST-CONDITIONS	User permitted to view news online
USE CASE	View e-books
SHORT DESCRIPTION	User can view and load e-books
ACTORS	User
PRE-CONDITIONS	User to be logged into system, Access to e-resources authorize
POST-CONDITIONS	User can view and load e-books
USE CASE	View e-journals
SHORT DESCRIPTION	User can view journals online
ACTORS	User
PRE-CONDITIONS	User to be logged in, e-resource access authorized
POST-CONDITIONS	User request to view journals authorized
USE CASE	View sponsored links
SHORT DESCRIPTION	User can view sponsored links e.g. SpringerLink
ACTORS	User
PRE-CONDITIONS	User to be logged in , e-resource authorization granted
POST-CONDITIONS	User permitted to view sponsored links
USE CASE	Search reserve collection
SHORT DESCRIPTION	User can search reserve collection (OPAC)
ACTORS	User
PRE-CONDITIONS	User to be logged in
POST-CONDITIONS	User can search reserve collection

USE CASE DESCRIPTION	
USE CASE	**Request chat system**
SHORT DESCRIPTION	Student can request a chat session with lecturer
ACTORS	Student
PRE-CONDITIONS	User to be logged in , chat system operational
POST-CONDITIONS	User can request session with lecturer
USE CASE	**Conduct chat session**
SHORT DESCRIPTION	Lecturer can conduct a chat session with a student
ACTORS	Lecturer
PRE-CONDITIONS	Lecturer to be logged in, chat system to be operational
POST-CONDITIONS	Lecturer can conduct session

Student actor is permitted to request a chat session with lecturers. This use case invokes the use case performed by the lecturer actor. The resulting class diagram is also depicted in Figure13. The product of the OOAD produced an initial GUI screen as depicted in Figure 14. The interface as depicted offers the use case depicted in the use case diagram. The class diagram will be utilized in describing the data items in the database.
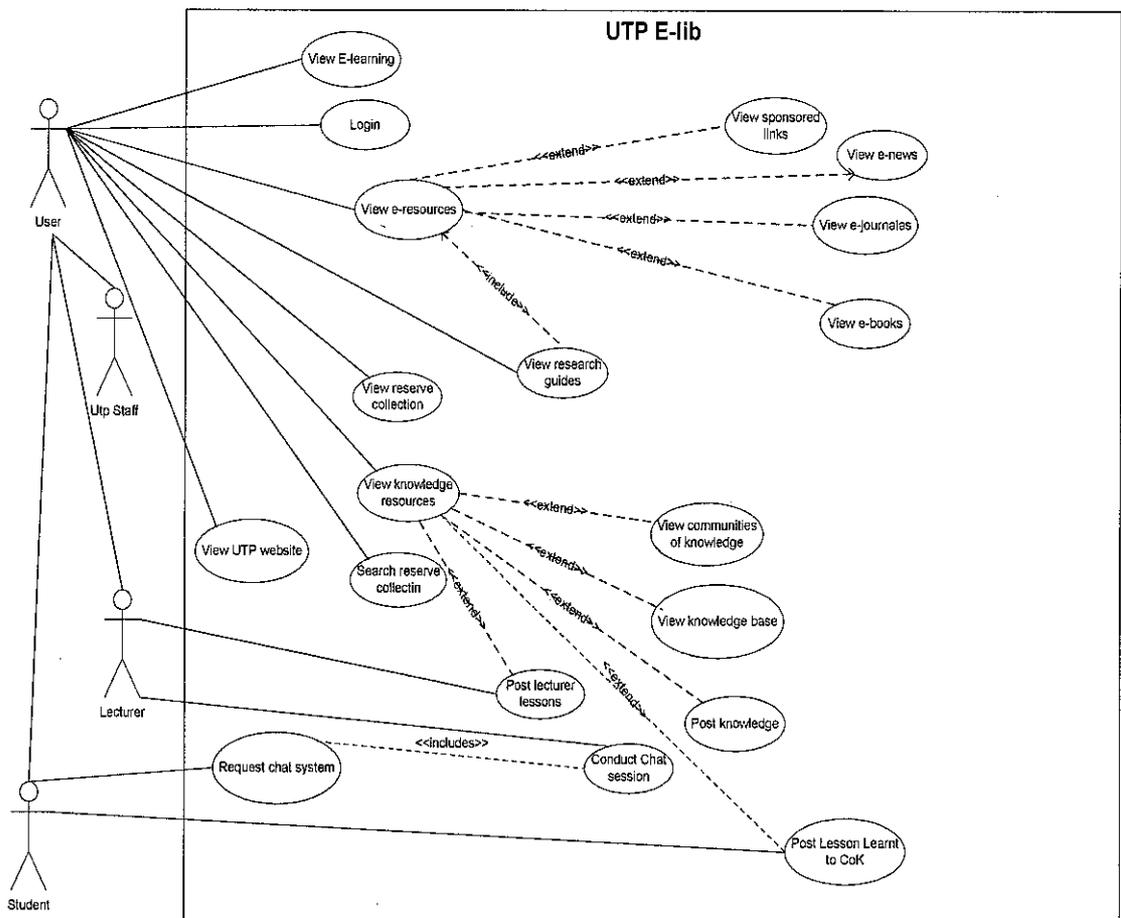
Figure 12: Use Case Diagram for UTP eLib
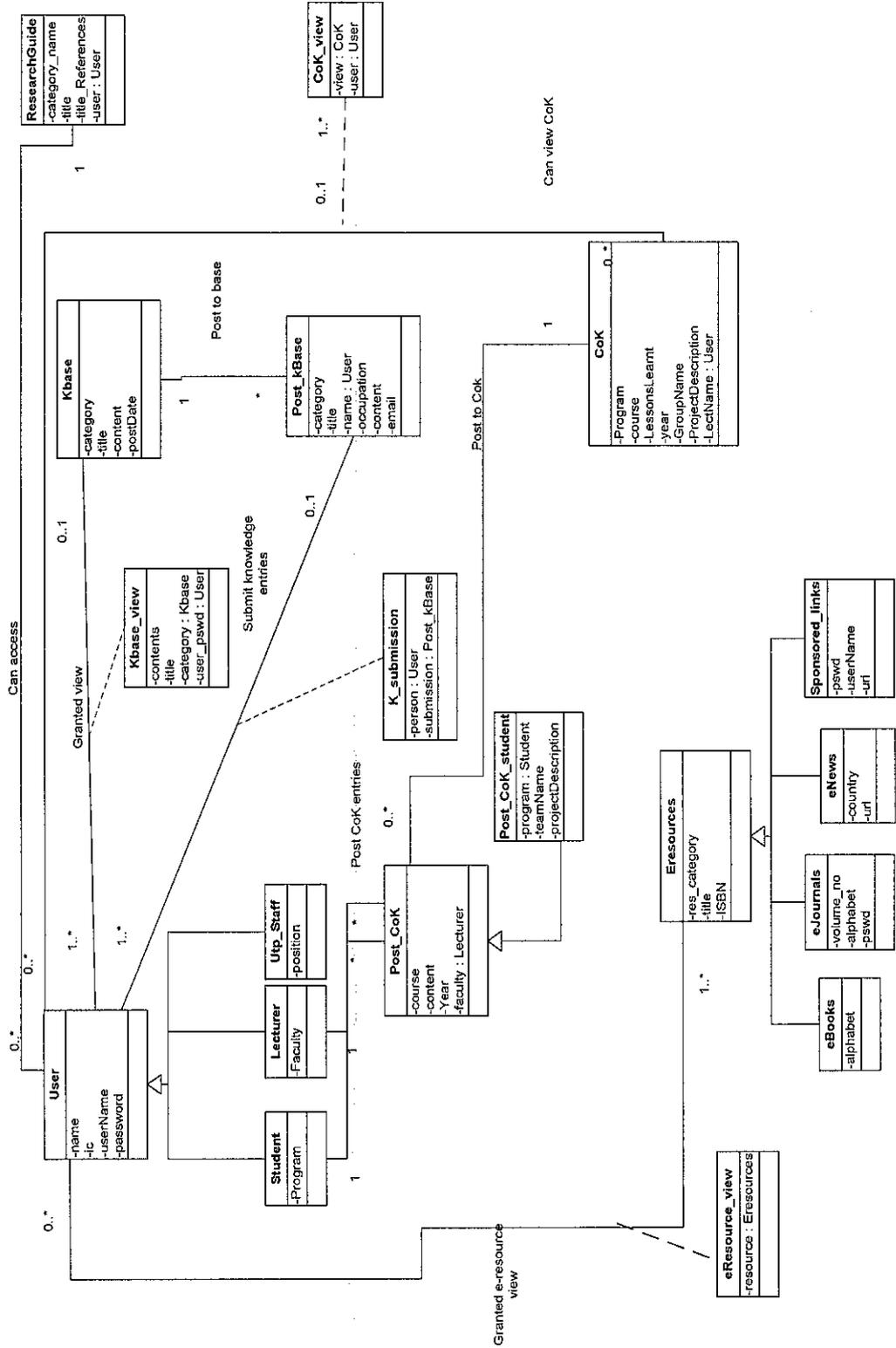
Figure 13: Class Diagram for UTP eLib
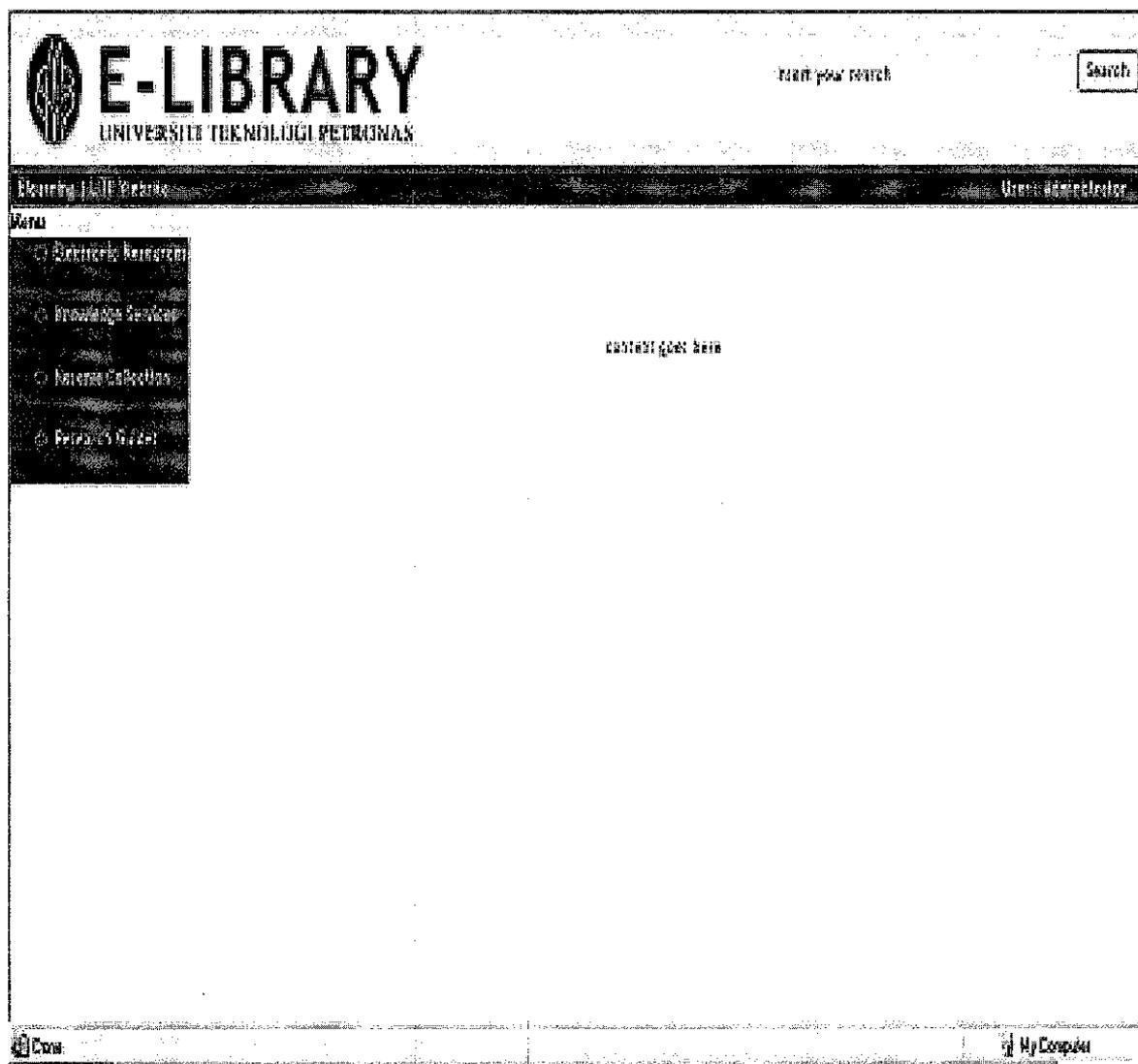
Figure 14: Resulting GUI screen for UTP eLib

4.4 Build and Tests

4.4.1 Test plan

As the methodology has stated, the system will have to undergo 2 tests namely functional testing for validation and user testing for verification purposes.   The test plan will follow the stated course:

1. Determine verification and validation criteria
2. Prepare test cases
3. Prepare user questionnaire
4. Forces fail testing
5. User testing
6. System Rework
7. User testing
8. User acceptance

The test plan will be considered in the project plan as it results in the final acceptance of the system.

4.5 Project constraints

Time constraints can be stated as the only challenges during the course of the progress. Due to illness the project work was greatly constrained especially the realization of the systems was impacted. As the research area being investigated consisted of a large domain the problem itself had to be narrowed. Narrowing the scope involved selecting the most relevant of concept to the research.

CHAPTER 5

CONCLUSION

5.1 Conclusion

The ever changing technology environment requires organizations and academic institutions alike to take upon the opportunities presented. The electronic library has been described as an information gateway for its users and it presents good prospects for academic institution such as the Universiti Teknologi Petronas.

At the initial stages of the study, very little was understood about digital libraries and knowledge management. Some of the crucial activities that were outlined in the results and findings proved instrumental to the overall concept comprehension. Not only where these activities informative but have been a basis for the future work. It will be possible to cater for all the objectives highlighted in the earlier chapters through the following e-library services:

- **E-resources**

Users will be afforded the ability to access e-books, e-journals, e-news and access to online databases such as Springer Link. Reading material and information sources such as e-journals will be accessible any time any where. Thus it can be said that the objective to provide students with information resources can be satisfied with this feature.

- **Knowledge services**

Users will be able to view information from others through either the knowledge base or the communities of knowledge service offering. This service will also ensure that collaboration among the university departments is possible. Information and knowledge amongst the departments can be collaborated and shared through the communities of knowledge service. All the bodies of knowledge from the departments can be collaborated into the community of services service. The small scale knowledge base will also ensure other knowledge is made available to users. This feature will ensure that; students are provided with relevant and current information resources; the culture of

knowledge sharing is introduced as well facilitate collaboration among the university's departments.

- **Research Guides**

The research guide will ensure information is readily available for users, thereby ensuring variety of information resources.

Through the application of these services by students in particular, creativity and innovation can be achieved. The synergistic combination of information, knowledge as well as the human capability will ensure students have access to rich information and knowledge sources.

5.2 Recommendation

As the conclusion has highlighted, the most crucial of activities is have been completed and efforts should be devoted on the full scale implementation of the electronic library. Additional functionalities such as personalization, customization are potential additions for the system upgrade. Ideally, the eLib should assist in tasks such as book updates, fine updates and the like. However due to time constraints the implementation is constrained to the system scope.

6 References

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    Available: http:// www. Iskme.org

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    Available: www.nypl.org

16. Hong Kong Open library

    Available: www.uohk.hk

Appendices

ID	Task Name	Work	Duration	Start	Finish
1	UTP eLibrary	0 hrs	132 days	Fri 1/21/05	Mon 7/25/05
2	Project Initiation	0 hrs	28 days	Fri 1/21/05	Tue 3/1/05
3	Research project titles	0 hrs	3 days	Fri 1/21/05	Tue 1/25/05
4	Select project title	0 hrs	1 day	Mon 2/28/05	Mon 2/28/05
5	Propose project	0 hrs	1 day	Tue 3/1/05	Tue 3/1/05
6	Form 1 and form 2 submission	0 hrs	1 day	Tue 3/1/05	Tue 3/1/05
7	Project planning	0 hrs	1 day	Wed 2/23/05	Wed 2/23/05
8	Develop project plan	0 hrs	1 day	Wed 2/23/05	Wed 2/23/05
9	Preliminary research	0 hrs	56 days	Thu 2/24/05	Thu 5/12/05
10	Preliminary data gathering	0 hrs	5 days	Thu 2/24/05	Wed 3/2/05
11	Detail title research	0 hrs	27 days	Thu 3/3/05	Fri 4/8/05
12	Online site visits	0 hrs	13 days	Thu 3/3/05	Mon 3/21/05
13	Data collection	0 hrs	8 days	Tue 3/22/05	Thu 3/31/05
14	Journal collection	0 hrs	6 days	Fri 4/1/05	Fri 4/8/05
15	Research analysis	0 hrs	24 days	Mon 4/11/05	Thu 5/12/05
16	Data analysis	0 hrs	22 days	Mon 4/11/05	Tue 5/10/05
17	Analysis report	0 hrs	2 days	Wed 5/11/05	Thu 5/12/05
18	Initial Prototyping	0 hrs	15 days	Fri 5/13/05	Thu 6/2/05
19	Mock screen design	0 hrs	15 days	Fri 5/13/05	Thu 6/2/05
20	Preliminary report compilation	0 hrs	10 days	Fri 6/3/05	Thu 6/16/05
21	Supplementary research and analysis	0 hrs	5 days	Fri 6/3/05	Thu 6/9/05
22	Report compilation	0 hrs	5 days	Fri 6/10/05	Thu 6/16/05
23	Preliminary report submission	0 hrs	1 day	Fri 6/17/05	Fri 6/17/05
24	Progress Report compilation	0 hrs	3 days	Mon 6/20/05	Wed 6/22/05
25	Progress Report submission	0 hrs	1 day	Thu 6/23/05	Thu 6/23/05
26	Final Dissertation compilation	0 hrs	17 days	Fri 6/24/05	Mon 7/18/05
27	Supplementary research and analysis	0 hrs	5 days	Fri 6/24/05	Thu 6/30/05
28	Dissertation compilation	0 hrs	12 days	Fri 7/1/05	Mon 7/18/05
29	Final Dissertation submission	0 hrs	1 day	Tue 7/19/05	Tue 7/19/05
30	Oral presentation	0 hrs	3 days	Wed 7/20/05	Fri 7/22/05
31	Presentation preparation	0 hrs	3 days	Wed 7/20/05	Fri 7/22/05
32	Project Dissertation submission	0 hrs	1 day	Mon 7/25/05	Mon 7/25/05

ID		Task Name	Duration	Start	Finish	Pred.
1		UTP E-LIBRARY(PART2)	65 days	Mon 7/25/05	Wed 12/7/05	
2		Analysis and Design	65 days	Mon 7/25/05	Wed 12/7/05	
3		System Requirments Analysis	8 days	Mon 7/25/05	Tue 8/9/05	
4		Identify Functional and Non-Functional Requirements	3 days	Mon 7/25/05	Fri 7/29/05	4
5		Design system architecuture	2 days	Fri 7/29/05	Wed 8/3/05	5
6		Confirm Requirements and architecture and dissertation update	1 day	Wed 8/3/05	Thu 8/4/05	6
7		Dissertation rework	2 days	Fri 8/5/05	Tue 8/9/05	
8		Object Oriented Delivery	4 days	Wed 8/10/05	Wed 8/17/05	3
9		Design UML Diagrams	4 days	Wed 8/10/05	Wed 8/17/05	
10		Technical Design	24 days	Thu 8/18/05	Thu 10/6/05	8
11		Preliminary report submission	1 day	Thu 8/18/05	Fri 8/19/05	11
12		User interface design	5 days	Fri 8/19/05	Tue 8/30/05	12
13		Database implementation	10 days	Wed 8/31/05	Tue 9/20/05	13
14		Develop Database-Link	5 days	Wed 9/21/05	Fri 9/30/05	14
15		Test database & rework dissertation	3 days	Fri 9/30/05	Thu 10/6/05	
16		Progress Report Submission	1 day	Thu 8/18/05	Fri 8/19/05	
17		System Delivery Specifications	8 days	Fri 10/7/05	Mon 10/24/05	10
18		Produce Preliminary prototype	8 days	Fri 10/7/05	Mon 10/24/05	
19		Specify forms	2 days	Fri 10/7/05	Tue 10/11/05	
20		Establish error handling procedures	3 days	Wed 10/12/05	Tue 10/18/05	19
21		Review consistency and completeness	2 days	Tue 10/18/05	Fri 10/21/05	20
22		Prepare test plan & rework dissertation	1 day	Fri 10/21/05	Mon 10/24/05	21
23		Final Draft Submission 1	2 days	Fri 10/7/05	Tue 10/11/05	
24		Technical Procedure Development	11 days	Tue 10/25/05	Wed 11/16/05	17
25		Develop test plans	1 day	Tue 10/25/05	Wed 10/26/05	
26		Integrate system	10 days	Wed 10/26/05	Wed 11/16/05	25
27		Final Draft Submission 2	1 day	Tue 10/25/05	Wed 10/26/05	
28		System and Acceptance Testing	10 days	Wed 11/16/05	Wed 12/7/05	24
29		User Interface Test	1 day	Wed 11/16/05	Thu 11/17/05	
30		Database Test	2 days	Fri 11/18/05	Tue 11/22/05	29
31		Database Link Test	2 days	Wed 11/23/05	Fri 11/25/05	30
32		Integrated testing	4 days	Mon 11/28/05	Mon 12/5/05	31
33		Oral Presentation	0.67 days	Mon 12/5/05	Mon 12/5/05	2,1,32
34		User Acceptance	1 day	Tue 12/6/05	Wed 12/7/05	32
35		Final Dissertation Submission	0 days	Wed 12/7/05	Wed 12/7/05	34

1. **What is your gender?**
   - Male
   - Female

2. **What program are you taking?**
   - Mechanical Engineering
   - Civil Engineering
   - Electrical and Electronics Engineering
   - Chemical Engineering
   - Information Technology
   - Information Systems

3. **What do you normally use the library for?**
   - Watching discovery channel
   - Collecting or using reference material
   - Internet
   - Studying
   - Do not go to the library

4. **What library material do you consult?**
   - Books
   - Journals
   - Dissertations
   - Internet

5. **At what Frequency do you use the material?**

- 0-25%
- 50%
- 75%
- 100%

6. **At what Frequency do you use the material for learning new topics?**

- 0-25%
- 50%
- 75%
- 100%

7. **What material do you consult when learning new topics?**
- Bought textbooks
- Internet
- Lecture notes
- Consult other students or lecturers
- Library material

8. **In conducting project- or research- based assignments, how much of the library facilities (books, online databases etc) are used (Please Specify)?**

9. **How often do you use the internet for research or assignments?**

Not at all	Sometimes	Most of the time	always
1	2	3	4

10. Do you think adequate material is provided by the UTP library?

- Yes
- No

11. What do you understand about an electronic library? Please specify

12. Do you think more can be done in terms of automating some of the library process e.g. accessing books online? Please specify

13. Whether or not you know about the UTP electronic Library, how favorable is your overall reaction? Tick the most relevant to you.

- Poor
- Fair
- Good
- Very good
- Excellent

14. Below is a list of features that are part of the electronic library. How important is each feature to you?

	1 Not At All Important	2	3	4	5 Extremely Important
Access to online databases	[]	[]	[]	[]	[]
Access to electronic material e.g. ejournals	[]	[]	[]	[]	[]
Access to OPAC	[]	[]	[]	[]	[]
Online book reservation	[]	[]	[]	[]	[]

15. Do you think knowledge sharing among students and lecturers is important? Please tick one.

- Not important
- May be necessary
- Fairly important
- Very important

16. How important to you is knowledge sharing in you daily activities?

- Not important
- May be necessary
- Fairly important
- Very important

IF you do share knowledge with others what methods do you use frequently?

- Dialogue
- Email
- IRC
- Do not share knowledge

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Username

Password

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Knowledge Services

Reserve collection

Research Guides

Library information

ANNOUNCEMENTS

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Research Guides

Library information

E-journal
E-news
E-books

UTP ELIB

Elearning	UTP webisite	Search	

Electronic Resources	# Knowledge Base
Knowledge Services	1. Effective programming: Lecture and student tutorials , hints and tips
Reserve collection	2. ABAP programming: Syarifahs hints and tips.
Lets collaborate	
Research Guides	# Communities of Knowledge
	Communities of knowledge is a portal consisting of lessons learnt from projects implemented by students. Information available has been compiled by both project teams and the respective lecturers
	1. Electrical engineering
	2. Systems development
Library information	Submit

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Research Guides

Library information

Research Guides are guides to researching particular subject areas in science and business. Quick Guides contain brief introductions to the subject.

Business Planning

Market Research

Electronic Research

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Research Guide :Business Planning Information at UTP elib

Accounting services: Journal of accounting

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- Knowledge Services
- Reserve collection
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- Research Guides
- Library information

Library vision and mission

Library staff

Library resource informaiton

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New Strait times
IOL
Sudanese Daily
Star New
New York Times

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Browse by: Title

A&G monthly journal

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Browse by: Subject

E-commerce
Marketing

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A B C D E F G H I
J K L M N O P Q R
S T U V W X Y Z
Others

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Browse by: Alphabet : A

1. Alpha Medical Journal
   A full text medical e-journal

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Browse by: Subject : e-commerce

1. Alpha Medical Journal
   A full text medical e-journal

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Browse by: Title

1. A&G Journal
   A full text medical e-journal

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Browse by: Title

Digital libraries : opportunities and trends.

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Browse by: Alphabet : A

1. Agoraphobia
A full text e-book

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Browse by: Marketing

1. Principles of marketing