

# Appendix A

## System Installation and Configuration

### A. Installing & Configuring MySQL

MySQL was downloaded free of charge, from <http://dev.mysql.com/downloads/> (MySQL 4.0) under the heading Windows downloads. After downloading the file .it has been unzipped it and ran the setup.exe program contained there in [Mys06].

### B. Installing & Configuring PHP

The next step is to install PHP. PHP has been downloaded free from <http://www.php.net/downloads> (php 5.x zip under Windows Binaries) PHP was designed to run as plug-in for existing Web server software such as Apache .To test dynamic Web pages with PHP.

1. The file you downloaded from the PHP Website has unzipped into a directory C:\PHP.
2. The file called php5ts.dll in the PHP folder has copied to C:\WINDOWS\system32.
3. The file called php.ini.dist in the PHP folder has copied to Windows folder and renamed it to php.ini.
4. Opened the php.ini file and setting it so that it points to the ext subfolder of your PHP folder: `extension_dir = "C:\PHP\ext"`, and removed the semicolon from the start of the `php_mysql.dll` line: `extension = php_mysql.dll`, and set the line that start with

session.save\_path and set it to your Windows TEMP folder: session.save\_path =  
“C:\WINDOWS\Temp”, and remove the semicolon from the start of  
“extension=php\_mysql.dll” to configure MySQL database.

## **C. Installing & Configuring Apache**

First we downloaded and installed Apache according to the instructions included with it; and we opened <http://localhost/> in the Web browser, to make sure the Apache was working properly. After that we have been Checked the documentation and making sure Apache is running properly before we install PHP.

The Apache configuration has been modified to indicate the correct path to the PHP implementation and the “.php” file extension .this is the case when installing PHP as an Apache module by making these steps:

1. On the Start Menu, we have been chosen Programs >Apache HTTP Server > Configure Apache Server >Edit the Apache httpd.conf Configuration File. This will open the httpd.conf.
2. Add the following lines to the very bottom of the file: (Apache 2.0)  
LoadModule php5\_module c:/php/php5apache2.dll  
AddModule mod\_php5.c  
AddType application /x-httpd-php .php  
AddType application/x-httpd-php-source .phps

# Appendix B

## PHP Functions for Working with MySQL

PHP provides a vast library of built-in functions that let you to perform all sorts of tasks. Obtaining detailed information about a function is as simple as opening your browser and typing

<http://www.php.net/functionname>

This list of functions and their definitions are current as of PHP4.0.

```
<?php
$link = mysql_connect('localhost', 'mysql_user', 'mysql_password');
if (!$link) {
    die('Could not connect: ' . mysql_error());
}
echo 'Connected successfully';
$sql = 'CREATE DATABASE my_db';
if (mysql_query($sql, $link)) {
    echo "Database my_db created successfully\n";
} else {
    echo 'Error creating database: ' . mysql_error() . "\n";
}
mysql_close($link);
?>
```

- **mysql\_connect** Open a connection to a MySQL Server and return a connection ID(which evaluates to true) that may be used in other MySQL-related functions.

### Description

```
mysql_connect ( [string server [, string username [, string password [,
bool new_link [, int client_flags]]]] )
```

Opens or reuses a connection to a MySQL server.

## Parameters

### *server*

The MySQL server. It can also include a port number. e.g. "hostname:port" or a path to a local socket e.g. ":/path/to/socket" for the localhost.

If the PHP directive [mysql.default\\_host](#) is undefined (default), then the default value is 'localhost:3306'

### *username*

The username. Default value is the name of the user that owns the server process.

### *password*

The password. Default value is an empty password.

### *new\_link*

If a second call is made to **mysql\_connect()** with the same arguments, no new link will be established, but instead, the link identifier of the already opened link will be returned. The *new\_link* parameter modifies this behavior and makes **mysql\_connect()** always open a new link, even if **mysql\_connect()** was called before with the same parameters.

- **mysql\_create\_db**: Create a MySQL database

### Description

```
mysql_create_db ( string database_name )
```

- **mysql\_close:** Close MySQL connection

**Description**

```
mysql_close([link_id])
```

- **mysql\_select\_db:** Selects the default database

**Description**

```
mysql_select_db ( string database_name [, resource link_identifier] )
```

# Chapter Five

## *Conclusions and Recommendations for Future Work*

# **Chapter Five**

## **Conclusions and Recommendations for Future Work**

In this chapter, the concluded remarks and the suggestions for future work are given:

### **5.1 Conclusions**

The main concluding remark that is drawn from the work:

- The established system offers a web fast search method to the end user to obtain about the materials of Iraqi universities Library.

### **5.2 Suggestions for Future Work**

The following are some recommendations suggested for future works:

1. Developing the present system by performing additional features of digital library like barrowing/lending library materials with possibly charging for barrowing.
2. Using another secure DB server can be used instead of MySQL database server such as Oracle database system.
3. Translate the data of Iraqi university libraries over the network.
4. Using distributed database.

## 4.2 Using the Network

When the database server (the computer which installed the library on it) has an IP address and connections with other computer which is run the library on another computer like any website at first we must have web browser and the IP address for the databases server, for Example:

If there is a database computer and it has this IP address 192.168.1.6, the client computer has connections with the server, so to run the library at first it must write into the address bar:

`http://192.168.1.6/project/source.php` , then the client computer will search into the network for this computer “192.168.1.6” (database server) then it will send http request for it , automatically the Apache Server will answer this request ,by viewing the result of your request, (the library).



Figure (4-1): Main Page



At Figure (4-1) there are two options:

- 1- Administrator
- 2- Library

Every time when we have any database we will have two or more level of users, in our example we have only two:

- 1- **The Admin of the system:** Admin is shortcut of Administrator, the person who has the full permeations to Add, Edit, and Remover any data from the database.
- 2- **The Normal user:** the person who has no permeations to control this system, he can retrieve information that the Admin gave it to him.

## 4.3 Library

When we click on the Library button another page will be load and it will be the Basic search page:

### A. Basic Search

**Basic Search**      [Advanced Search](#)

[Basic Search Help](#)

Search for title, author, and publisher date.  
Please enter your term and type before clicking Search.

Search the type: Choose a Search Type  
Choose a Search Type  
Author  
Title  
Subject  
Call Number  
Publisher Date

For the term:

10 record per page

Search      Clear Search

[Help](#)      Iraqi Digital Li

Figure (4-2): Basic Search

In this window there are two types of search, Basic and Advanced, one can choose the search type, the following are the basic search steps:

- 1- From the search type list choose one option.
- 2- The search options are:
  - a- Title
  - b- Author
  - c- Publisher date
  - d- Call Number
  - e- Subject
- 3- Then click on Submit search.

At this process the PHP code will put the entered data into the RAM and then make compare between it and all database records. If it found the result it will copy it with the data and print it in the Result table. If it can not, it will print no such data.

## **B. Advance Search**

To more limit search, for Example there are Author and the Title of the book, and to make the search easier and faster, by using the Advance search the following steps are followed:

- 1- From the main search page choose "Advance Search".
- 2- In the first "search for" box write the title of the book.
- 3- Choose from the first list of "As" Title option.
- 4- In the second "search for" box write the author of the book.
- 5- Choose from the second "As" list author option.

And then click on submit search button then the Program will send this request to the database and compare it with the data into the database if it

found the result it will copy it with such all data and print it in the Result table, if not it will print that no such data.

The screenshot shows the 'Advanced Search' page of the 'Iraqi Digital Library Online Catalog'. At the top, there is a banner with the Iraqi flag and the text 'Iraqi Digital Library'. Below the banner, the page title 'DATABASE: Iraqi Digital Library Online Catalog' is displayed. The 'Advanced Search' section includes a link to 'Advanced Search Help' and a list of instructions: 'Combine search words with boolean operators.', 'Search for title, author, and publisher date.', and 'Please enter your terms and type before clicking Search.' The search interface features two search boxes, each with a 'Search for' label and an 'As' dropdown menu. The first search box has a dropdown menu open showing 'Choose a Search Type', 'Author', and 'Title'. Between the search boxes are radio buttons for 'AND' (selected) and 'OR'. At the bottom, there is a '10 records per page' dropdown, a 'Submit Search' button, and a 'Clear Search' button. The 'Iraqi Digital' logo is visible in the bottom right corner.

Figure (4-3): Advanced Search

## 4.4 Case Study

There are some examples to illustrate how the Iraqi Digital Library system is implemented.

### Example 1:

#### Basic Search (a)

- 1- Enter the box “Library” in (IDL Home Page) as shown in Figure (4-1).
- 2- Select Basic Search as shown in Figure (4-2).
- 3- Enter the search type ‘title’.
- 4- Enter the term ‘heat’ or ‘Heat’.
- 5- Select “Submit Search” box or press Enter.
- 6- The final result of the search is shown in Figure (4-4 a) with full bibliographic information data on this title of library material with the name of the university which this material exist in.

**DATABASE : Iraqi Digital Library Online Catalogue**  
**You Searched :Title =Heat**

Title	The Heat resistance of plants, its determination and variability.
Classification_No	721.603.645
Publication	1965
NO of Pages	p. 399-405illus.
Material Type	Book
Author	Lange, O.L.
University name	Baghdad

Title	The Heat, water and carbon dioxide budget of plant cover: methods and measurements.
Classification_No	721.603.645
Publication	1965
NO of Pages	p. 495-512illus.
Material Type	Book
Author	Baumgartner, Albert.
University name	Baghdad

Figure (4-4 a): Result of the ‘Heat’ search term  
 For the ‘title’ search type

#### Basic Search (b)

- 1- Enter the box “Library” in (IDL Home Page) as shown in Figure (4-1).
- 2- Select Basic Search as shown in Figure (4-2).
- 3- Enter the search type ‘Author’.
- 4- Enter the term ‘Bosian , G.’ or ‘Bosian’.

- 5- Select “Submit Search” box or press Enter.
- 6- The final result of the search is shown in Figure (4-4 b) with full bibliographic information data on this title of library material with the name of the university which this material exist in.

<b>DATABASE : Iraqi Digital Library Online Cataloge</b>	
<b>You Searched :Author =bosian</b>	
Title	The Controlled climate in the plant chamber and its influence upon assimilation and transpiration.
Author	Bosian, G.
Classification_No	876.645.244
Publication	1965
NO of Pages	p. 225-232illus.
Material Type	Book
University name	Baghdad

Title	Control of conditions in the plant chamber: fully automatic regulation of wind velocity, temperature and relative humidity to conform to microclimatic field conditions.
Author	Bosian, G.
Classification_No	603.209.262
Publication	1965
NO of Pages	p. 233-238 illus.
Material Type	Book

Figure (4-4 b): Result of the ‘Bosian , G.’ search term  
For the ‘Author’ search type

#### Basic Search (c)

- 1- Enter the box “Library” in (IDL Home Page) as shown in Figure (4-1).
- 2- Select Basic Search as shown in Figure (4-2).
- 3- Enter the search type ‘Publisher Date’.
- 4- Enter the term ‘1966’.
- 5- Select “Submit Search” box or press Enter.
- 6- The final result of the search is shown in Figure (4-4 c) with full bibliographic information data on this title of library material with the name of the university which this material exist in.

<b>DATABASE : Iraqi Digital Library Online Cataloge</b>	
<b>You Searched :Date =1966</b>	
Title	Sur les caract,ristiques texturales et min,ralogiques des s,diments r,cents et des sols alluviaux dans delta du Mangoky, sud-ouest de Madagascar.
Classification_No	721.603.645
Publication	1966
NO of Pages	p. 73-82illus., maps
Material Type	Book
Author	Hervieu, J.
University name	Baghdad
Title	Apercu sur la v,g,tation occupant les alluvions r,centes.
Classification_No	721.603.645
Publication	1966
NO of Pages	p. 73-82illus., maps
Material Type	Book
Author	Schmid, Maurice.
University name	Baghdad

Figure (4-4 c): Result of the '1966' search term  
For the 'Publisher Date' search type

#### Basic Search (d)

- 1- Enter the box "Library" in (IDL Home Page) as shown in Figure (4-1).
- 2- Select Basic Search as shown in Figure (4-2).
- 3- Enter the search type 'Call Number'.
- 4- Enter the term '721.603.'.
- 5- Select "Submit Search" box or press Enter.
- 6- The final result of the search is shown in Figure (4-4 d) with full bibliographic information data on this title of library material with the name of the university which this material exist in.

**DATABASE : Iraqi Digital Library Online Cataloge**  
**You Searched :Call Number =721.603**

Title	Review of Orthopaedics
Classification_No	721.603.645
Publication	1992
NO of Pages	p. 703
Material Type	Book
Author	Mark D.Miller,MD
University name	Baghdad

Title	Colorimetric determination of CO2 exchange in field and laboratory.
Classification_No	721.603.645
Publication	1965
NO of Pages	p. 291-298illus.
Material Type	Book
Author	Slavjk, B.
University name	Baghdad

Figure (4-4 d): Result of the '721.603' search term  
 For the 'Classification No.' search type.

### Example 2:

#### Advanced Search

- 1- Enter the box "Library" in (IDL Home Page) as shown in Figure (4-1).
- 2- Select Advanced Search as shown in Figure (4-3).
- 3- Enter the first search type 'Title'.
- 4- Enter the first term 'heat' or 'plant'.
- 5- Select the Boolean operand 'AND'.
- 6- Enter the second search type 'Author'.
- 7- Enter the second term 'Bosian, G.' or 'Bosian'.
- 8- Select "Submit Search" box or press Enter.
- 9- The final result of the search is shown in Figure (4-5) with full bibliographic information data on this title of library material with the name of the university which this material exist in.

<b>DATABASE :Library of Iraqi Universities Cataloge</b>	
<b>You Searched :Title =(plant AND bosian)</b>	
Title	The Controlled climate in the plant chamber and its influence upon assimilation and transpiration.
Classification_No	876.645.244
Publication	1965
NO of Pages	p. 225-232illus.
Material Type	Book
Author	bosian
University Name	Baghdad
Title	Control of conditions in the plant chamber: fully automatic regulation of wind velocity, temperature relative humidity to conform to microclimatic field conditions.
Classification_No	603.209.262
Publication	1965
NO of Pages	p. 233-238 illus.
Material Type	Book
Author	bosian
University Name	Baghdad

Figure (4-5): Result of the 'plant' title, and 'Bosian'

Author



# Chapter Four

## *Digital Library Results*

# **Chapter Four**

## **Digital Library Results**

To run the Digital Library there are two ways:

- 1- Run it from the same computer that we install the database on it
- 2- Run it from another computer has connections (TCP/IP) with the database server computer.

### **4.1 Local Computer**

First if the host computer has been a web browser so if Internet Explorer is used, it can be tested that properly installed and configured the library by typing "http://localhost/project/source.php" or its IP address "http://127.0.0.1/project/source.php" into the location bar of the browser. It should be mentioned that the default page installed by the Library installer on the hard disk. It is located in "C:\Program Files\Apache Group\Apache2\htdocs\project".

Being able to communicate with one's local machine as though it were a remote machine is useful for the purposes of testing, and also to contact services (such as Databases servers) located on one's own machine.

A digital library is a library consisting of digital materials and services. Digital materials are items are stored, processed and transferred via digital (binary) devices and networks. Digital services are services that are delivered digitally over computer networks. It maintains all, or a substantial part, of its collection in computer-accessible form as alternative, supplements, or complement to the conventional printed and microform materials that currently dominates library collections. The terms such as ‘electronic library’, ‘digital library’, ‘virtual library’, ‘web-library’, or ‘on-line library’ have been used synonymously to represent the same concept.

The service of digital library is to enable the user to access the information required for knowledge enhancement. Digital library services include information about all the services, collections, digital resources. The specific services of digital library include providing remote access library resources-both printed and non-printed, service deliveries and generation information on library [Vin06].

## **1.2 Digital Library advantages**

The digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain them. As such, the cost of maintaining a digital library is much lower than that of a traditional library. A traditional library must spend large sums of money paying for staff .Book maintenance, rent, and additional books. Digital libraries advantages are: [Dig06]

1. **No physical boundary:** The user of a digital library need not to go to the library physically, people from all over the world can gain access to the same information, as an Internet connection is available.

2. **Round the clock availability:** A major advantage of digital libraries is that people from all over the world can gain access to the information at any time, as long as an Internet connection is available.
3. **Multiple accesses:** The same resources can be used at the same time by a number of users.
4. **Structured approach:** Digital library provides access to much richer content in a more structured manner, i.e. we can easily move from the catalog to the particular book then to a particular chapter and so on.
5. **Information retrieval:** The user is able to use any search term bellowing to the word or phrase of the entire collection. Digital library can provide very user friendly interfaces, giving click able access to it resources.
6. **Preservation and conservation:** An exact copy of the original can be made any number of times without any degradation in quality.
7. **Space:** Whereas traditional libraries are limited by storage space, digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain them. When the library had no space for extension digitization is the only solution.
8. **Networking:** A particular digital library can provide the link to any other resources of other digital library very easily thus a seamlessly integrated resources sharing can be achieved.
9. **Cost:** In theory, the cost of maintaining a digital library is lower than that of a traditional library. A traditional library must spend large sums of money paying for staff, book maintains, rent, and additional books. Although digital libraries do away with these fees, it has since been found that digital libraries can be no less expensive in their own way to operate. Digital libraries can and do incur large costs for the conversion of print

materials into digital format, for the technical skills of staff to maintain them, and for the costs of maintaining online access (i.e. servers, bandwidth costs, etc). Also the information in a digital library must often be "migrated" every few years to the latest digital media. This process can incur very large costs in hardware and skilled personnel.

## 1.3 Literature Survey

In the following some research approaches concerned with digital libraries are summarized:

1. **[Edw98]**: Had established the China ETD digital library system that is centralized metadata and distributed digital object, share the ETD resource among the universities and provide the wider access to ETD, where help the member universities establish the submission and retrieval system that is compatible, design and develop the ETD workflow module, centrally manage and preserve the PDF files.
2. **[Edw99]**: A project that enhancing a prototype of digital library system called MARIAN system, with the aim of making it more flexible, scalable, and reliable.
3. **[Nap01]**: A high performance web-based digital library system, called TerraFly, for special data access was introduced. This system utilizes a database engine, web technology, dynamic mosaic of digital images, and a multithread server design developed by a group at NASA Regional Application Center (NASA RAC) in High Performance Database Research Center (HPDRC) at Florida International University (FIU).
4. **[Ram01]**: A digital library initiatives taken by India's largest one of the six medical universities.

5. **[Hes04]:** A digital library architecture that supports storage, search, retrieval, publishing and management of 3D models was introduced. The design also support advanced services such as hierarchical browsing and progressive retrieval, to enhance the experience of browsing and retrieving 3D models.
6. **[Tys06]:** A project shows dynamic web sites that differ from the static web sites in that, their appearance changes on it's or database that related with it. Depending upon what information is in the database and these changes are continuous with the work on those sites.

## 1.4 Aim of the Thesis

The aim of the thesis is to implement a web-based system that is capable of executing search functions of digital libraries. The bibliographic information is stored in a centralized database which can be accessed through web site. The contents of the database are collected manually from the different library systems that already exist in Iraqi universities.

## 1.5 Thesis Layout

- **Chapter two**

This chapter focuses on web based implementation of digital library, digital library architecture, and related topics of network, and databases in the implementation of digital libraries.

- **Chapter three**

A detailed description of the system modules, with their related algorithms are presented.

- **Chapter four**

This chapter shows System Interfaces and sample results of the established system.

- **Chapter five**

This chapter discusses the conclusion of this work together with some recommendations for future work.

## 3.2 System features

1. Collect the libraries materials of Iraqi universities in one library system.
2. Provide a union centralized database.
3. Provide web-based search facility (basic and advanced).
4. Administrator side (update, add and delete) the library materials.
5. Database backup.

## 3.3 System Structure

The main structure of the established system is shown in Figure (3-1).

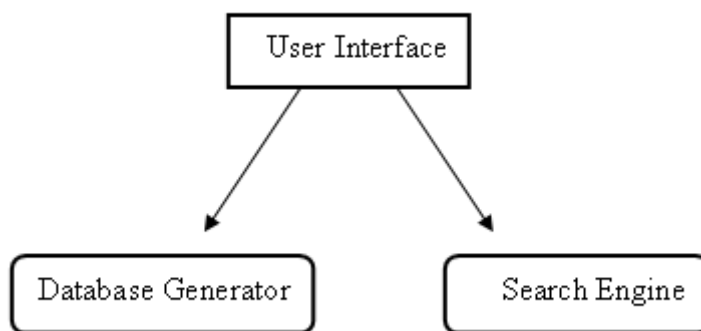


Figure (3-1.A): The main structure

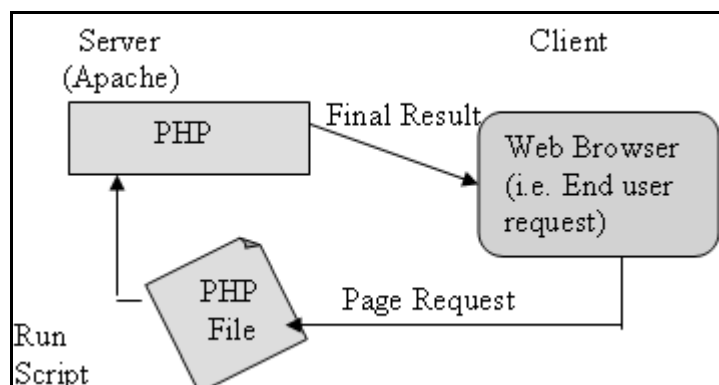


Figure (3-1.B): Search Engine



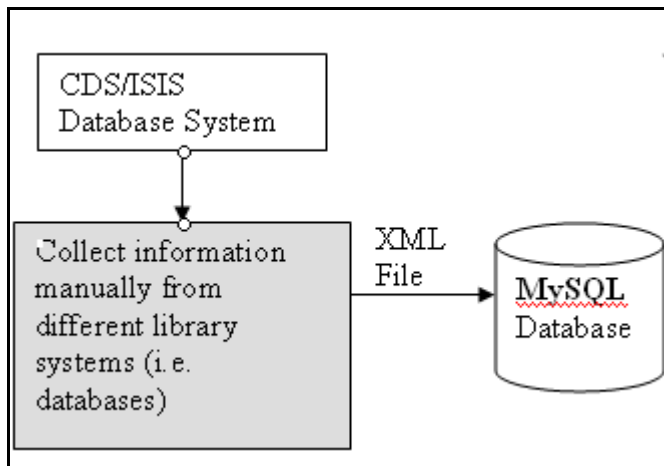


Figure (3-1.C): Database Generator

### 3.3.1 Collection of Information from different library systems

It should be mentioned that the Iraqi universities like (Al-Nahrain University, Baghdad University, Al-Mustansryia University, University of Technology and others Iraqi universities) adopted CDS/ISIS system for DOS/WINDOWS operating systems in their libraries.

First the data are collected from different databases of Iraqi universities and then inserted into MySQL database.

Figure (3-2) shows a sample of the CDS/ISIS for windows. This system contains a bibliographic information (title, author(s) name, publication date, publisher name, number of pages, series name, keywords) for different library material (books, journals ...etc). MFN is the Master File Number for each of the materials in the database, MAX is the maximum number of existing materials (i.e. MFN for the last one of library materials), main tool bar and tool icons.

#### **The main CDS/ISIS features:** [Une06]

1. CDS/ISIS is a generalized Information **Storage** and **Retrieval** System.

2. Unlike Dbase or MS-Access, CDS/ISIS **is not** a relational database system, although it provides some relational facilities.
3. CDS/ISIS allows the user to design the record structure of each database of his own.
4. CDS/ISIS can keep many different databases each in a different structure in your computer, for many different applications.
5. Define data bases containing the required data elements.
6. Enter new records into a given data base.
7. Can Export/Import the database data, which can export the data to an XML file as shown in Figure (3-3).

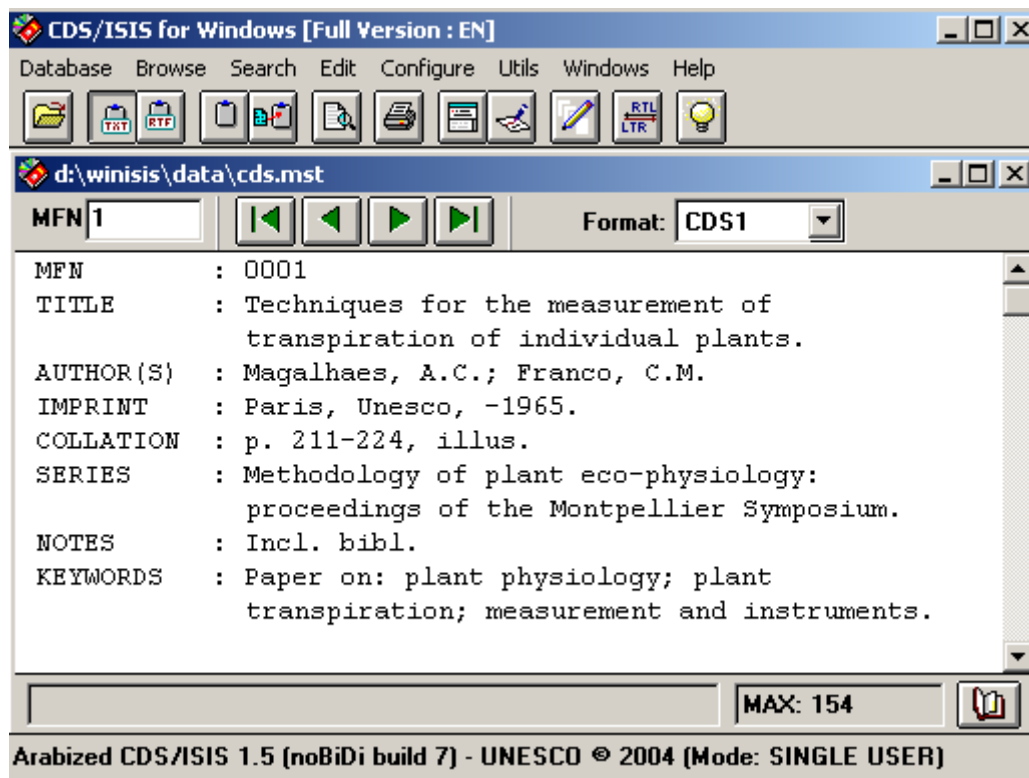


Figure (3-2): CDS/ISIS for Windows

```

<?xml version="1.0" encoding="ISO-8859-1" ?>
<DATABASE_CDS>
- <RECORD>
  <Mfn>1</Mfn>
  <Tag_24>Techniques for the measurement of transpiration of individual plants.</Tag_24>
- <Tag_26>
  <Tag_26_a>Paris</Tag_26_a>
  <Tag_26_b>Unesco</Tag_26_b>
  <Tag_26_c>-1965</Tag_26_c>
  </Tag_26>
- <Tag_30>
  <Tag_30_a>p. 211-224</Tag_30_a>
  <Tag_30_b>illus.</Tag_30_b>
  </Tag_30>
  <Tag_44>Methodology of plant eco-physiology: proceedings of the Montpellier
    Symposium.</Tag_44>
  <Tag_50>Incl. bibl.</Tag_50>
  <Tag_69>Paper on: plant physiology; plant transpiration; measurement and
    instruments.</Tag_69>

```

Figure (3-3): XML file contain the CDS/ISIS data

The Algorithm (3.1) below describes the conversion method of bibliographic data from CDS/ISIS system for library database materials of Iraqi universities to the MySQL database tables and makes some methodological ways on it.

The data in XML file can be converted to MySQL database by using PHP parsing file. In this system it has been used a PHP parsing program to reading the data from XML file and put it in MySQL database.

**Algorithm 3.1: Convert the bibliographic data from CDS/ISIS system to MySQL database**

**Input:** The bibliographic data of CDS/ISIS system.

**Output:** MySQL database contain the bibliographic data.

**Step 1:** Export all the bibliographic data to XML file.

**Step 2:** Read the data of XML file.

**Step 3:** For each RECORD in XML file

A. Read the data between tags.

B. Convert this data to MySQL Database tables.

**Step 4:** Remove the duplication from author table.

**Step 5:** Insert the ID's of both books and authors into book-author table (i.e. "ID" of some book take the "id" of its author

name).

**Step 6:** Stop.

### 3.3.2 Database Structure

MySQL is a program that can store large amounts of information in an organized format that's easily accessible through scripting languages like PHP. MySQL database contains the collected data (i.e. bibliographic information of library materials) from the different Iraqi university.

The structure of the database is shown in Table (3.1), Table (3.2) and Table (3.3).

Table (3-1): "Book" table

ID	Title	Call Number	Publisher Name	Publisher Date	Publisher Place	Pages No.	Material Type	University Name
Int	Text	Int	Text	Int	Text	Int	Text	Text
PRI	Null	Null	Null	Null	Null	Null	Null	Null

Table (3-2): "Author" table

Author_ID	Author_Name
Int	Text
PRI	Null

Table (3-3): "Book\_Author" mapping table

Author_ID	Book_ID
Int	Int
Null	Null

Book table contains all bibliographic information about library materials books, journals...etc. This information may be the (main title, classification number, publisher name and place, number of pages, subject or keywords,

and series). It is worth to mention here that the classification number used relies on DDC (Dewey Decimal Classification) system to classify the library materials in Iraqi universities. The Author table which contains the ID and author name. The book-author table contains bookID and author ID to make mapping between book table and author table.

### **3.3.3 Search Module**

#### **A-Web Server**

Web server software “Apache” recognizes that the requested file (page requested from for end user) is a PHP script. Thus the Apache server interprets the file using its PHP plug-in before responding to the page request, and it is used to check the web-page script on the personal computer before sending it to the web.

#### **B-Web Browser**

Web-browser is an HTML and PHP formatted page as shown in Figure (3-4). When the visitor browses the web page and requests some search material (book, thesis ...etc) with given search type, the web server “Apache” recognizes the request as a PHP script. Then the server interprets it and responds in full information results as part of the web-page, web-browser used as search engine in IDL(Iraqi Digital Library) system for searching library materials.



Figure (3-4): Web browser page

### 3.4 System Implementation

As be mentioned before this system is successfully implemented using Apache server, PHP scripting language and MySQL database. PHP is a server-side scripting language which will allow the Web-Server (Apache) to do more than just send plain Web pages when browsers request them. With PHP installed, the web server (Apache) will be able to read a new kind of file (called a PHP script) that can do a lot of things like retrieving up-to-the-minute information from a database (MySQL) and inserting it into a web page before sending it to the browser that requested it. It is worth to mention here that PHP is completely free to download and use [kev04].

MySQL is a relational database management system (RDBMS). It is a software package that is useful at the organization and management of large amounts of information. MySQL also makes that information easy to access with server-side scripting languages like PHP. MySQL is released under General Public License (GPL), and is thus free for most users on all of the

platforms it supports. This includes most Unix-based platforms, like Linux and even MAC OS X, as well as Windows [kev04].

### 3.4.1 System Server-Side

Server side contains two sides:

A. Library side (Search facilities):

The Library side contains:

- I- Basic search (book title, author, publishing year, subject ...).
- II- Advanced search (book title, author, publishing year, subject ...) with logical Boolean operator (AND,OR,NOT).

B. Administrating side:

- Updating the database information.
- Insert new library material.

#### A. Search facilities

##### I. Basic Search technique:

The searching technique of basic search is describing as shown in algorithm (3.2).

#### **Algorithm 3.2: Basic Search technique**

**Input:** The request entered by the end user.

**Output:** Final result of search.

**Step 1:** Collect user input: “Input term” and “search type”.

**Step 2:** If (valid input)

- Split input term
- For each of splitting term check:
  - If (Search Type=“Title”)
    - Construct SQL query to check the title record in the Book table
    - If contain this input term If exist - display results.
    - else display no result message

- else if (Search Type="Author")
  - Construct SQL query to check the author name record in the Author table contain this input term, if exist - display results.
  - else display no result message
- else if (Search Type="Date")
  - Construct SQL query to check the date record in the Book table contain this input term, if exist - display results.
  - else display no result message
- else if (Search Type="Publisher")
  - Construct SQL query to check if the Book table contain this input term, if exist - display results.
  - else display no result message
- else if (Search Type="Classification No.")
  - Construct SQL query to check classification number record in the Book table contain this input term, if exist - display results.
  - else display no result message

**Step 3:** else if no input term exist-Display error message or Invalid input.

**Step 4:** stop.

## II. Advanced Search:

- Advanced Search operators

### Logical AND operator

The logical AND is the term intersection operator. The result of a logical AND between two terms is the term which is common to both two terms.



**Logical OR operator**

The logical OR is the term union operator. The result of a logical OR between two terms is the term obtained by merging the two terms.

**Logical NOT operator**

The logical NOT is the term exclusion operator. The result of a logical NOT between two terms is the term which containing all the terms in the first input term.

- Advanced Search technique:

The searching technique of advanced search is describing as shown in algorithm (3.3).

**Algorithm 3.3: Advanced Search technique**

**Input:** The terms requested entered with Boolean limits by the end user.

**Output:** Final result of advanced search.

**Step 1:** - First take user input terms.

-Second give the selected Boolean operator (“AND”, ”OR” or “NOT”).

**Step 2:** -Check the selected Boolean variable

- If (‘AND’)

- Construct SQL query to check the two input terms contain in the Database, if exist-display the result of a logical AND between two input terms is containing the elements which are common to both these input terms.

- else display no result.

- else If (‘OR’)

- Construct SQL query to check the two input terms contain in the

Database, if exist-display the result of a logical OR between two input terms is containing the elements which is obtained by merging the two input variables terms.

- else display no result.

- else If ('NOT')

- Construct SQL query to check the two input terms contain in the Database, if exist-display the result of a logical NOT between two input terms is containing all the elements in the first input variable term which do not also belong to the second input variable term.

- else display no result.

**Step 4:** stop.

## B. Administration side

Administration has been illustrated in algorithm (3.4).

-Administration login as shown in figure (3-5 a).



Figure (3-5 a) Administration side security

-Updating the library materials, add, delete as shown in figure (3-5 b).



Figure (3-5 b) Administration side update

**Algorithm 3.4: Administration technique**

**Input:** Database bibliographic data for library materials.

**Output:** The updated database.

**Step 1:** - Input an authenticate librarian user name and password.

**Step 2:** - Convert the bibliographic data from CDS/ISIS system to MySQL database  
by perform the same steps in algorithm(3.1).

**Step 3:** - Stop.

### 3.4.2 System Client-Side

The client-side interface is an HTML form of IDL, the Iraqi Digital Library system as shown in Figure (3-5) which consist of:

- 1- First page shows general descriptions of library job with two enter boxes for the library and the administration side.
- 2- The Library contains two searching techniques (basic and advanced search) with full information services about the search for end user.
- 3- Administration contains updating tools about the library database materials.

### A. DL home page

This page contains the library and administration entries as shown in Figure (3-6.a).



Figure (3-6 .a) IDL Home Page

### B. Basic search Page

This page as shown below in Figure (3-6.b) is displayed by selecting the *Basic Search link* in IDL site. Basic search page contain search term bar, search type list, clear search box for re-enter new term search, basic search help for guiding the end user.



The screenshot shows the 'Basic Search' interface of the Iraqi Digital Library. At the top, there is a header with the Iraqi flag and the text 'Iraqi Digital Library'. Below this, a red banner reads 'DATABASE: Iraqi Digital Library Online Catalog'. The page features two main links: 'Basic Search' (highlighted in red) and 'Advanced Search' (a green underlined link). A 'Basic Search Help' link is also present. Instructions state: 'Search for title,author,and publisher date. Please enter your term and type before clicking Search.' The search form includes a 'Search the type' dropdown menu (currently showing 'Choose a Search Type'), a 'For the term' text input field, a '10 record per page' dropdown, and 'Submit Search' and 'Clear Search' buttons. A link to 'Iraqi Digital Lib' is visible in the bottom right corner.

Figure (3-6 .b) IDL Basic Search

### C. Advanced search Page

This page as shown in Figure (3-6.c) is displayed by selecting the *Advanced Search* link in IDL site.



The screenshot shows the 'Advanced Search' interface of the Iraqi Digital Library. The header and database banner are identical to the basic search page. The 'Advanced Search' link is highlighted in red, while 'Basic Search' is a green underlined link. A link to 'Advanced Search Help' is also present. Instructions include: 'Combine search words with boolean operators.', 'Search for title,author,and publisher date.', and 'Please enter your terms and type before clicking Search.' The search form features two identical search sections. Each section has a 'Search for' text input field, an 'As' dropdown menu (showing 'Choose a Search Type'), and radio button options for 'AND', 'OR', and 'NOT' (with 'AND' selected). Below these sections is a '10 records per page' dropdown and 'Submit Search' and 'Clear Search' buttons. A link to 'Iraqi Digital Lib' is in the bottom right. A footer bar at the very bottom contains links for 'About Our Library', 'About The Librarian', and 'Help'.

Figure (3-6 .c) IDL Advanced Search

Advanced search page contain two searches bars with Boolean terms for limiting the search, two search type lists, clear search box for re-enter new terms search, advanced search help for guiding the end user, and link to the home library page.

### 3.5 Database Backup

It should be mentioned about database backup query in PHP file as:

```
<?php
include 'config.php';
include 'opendb.php';

$tableName = 'Booktable';

$backupFile = 'backup/Booktable.sql';
$query      = "SELECT * INTO OUTFILE '$backupFile' FROM $tableName";
$result = mysql_query($query);

include 'closedb.php';
?>
```

## Chapter Three

### *The Established Digital Library System*

# **Chapter Three**

## **The Established Digital Library System**

### **3.1 Introduction**

As mentioned in chapter one, the aim of this project is to develop a digital library system. This system is used to collect the bibliographic information from different systems of Iraqi universities libraries manually and insert them into a unified database, and perform the web-search on the collected data.

The proposed system consists basically of two Parts; search engine and database. The search engine consists of a simple HTML client and a server-side PHP script. The HTML client is an HTML form which prompts the user for search keywords and the type of the search. The PHP script carries out the search process by connecting to the MySQL database server. The database contents are collected from the present systems (i.e databases) of Iraqi universities libraries.

The system was implemented using the facilities of Apache server, PHP & HTML languages with MySQL database.



# Chapter Two

*Web-based implementation of  
digital library*

# **Chapter Two**

## **Web-based implementation of digital library**

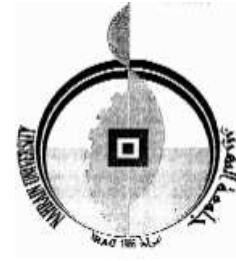
### **2.1 Introduction**

The World Wide Web (WWW) become a new way for connecting computers for circulating data and for contacting people. There is a growing trend towards opening of existing databases to access data from the web. Nowadays building Web- enabled information systems that exchange data using Web is regarded as an important application of information technology. The on-line access via Internet to various information sites enlarges the database information usability at the same time providing a dynamic content to the WWW itself. Querying different databases by applying standard Web interfaces favors significantly the human computer interface (HCI) [Jul94].

The Web creates new challenges for information retrieval. The amount of information on the Web is growing rapidly, as well as the number of new users inexperienced in the art of Web search. People are likely to surf the Web using its link graph, often starting with high quality human maintained indices such as *Yahoo!* or with search engines [SL98].

It is the Internet that bridges time, distance, and culture. It is where you can learn about almost any subject and communicate with almost anyone almost instantly [Fri96].

**Republic of Iraq  
Ministry of Higher Education  
& Scientific Research  
Nahrain University  
College of Science**



# **Web-Based Implementation of Digital Library for Iraqi Universities**

**A THESIS  
SUBMITTED TO THE  
COLLEGE OF SCIENCE, NAHRAIN UNIVERSITY  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF SCIENCE IN  
COMPUTER SCIENCE**

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*Saja*

# **ABSTRACT**

The work presented here describes a web-based digital library system for Iraqi universities. This system is capable of executing the search function of digital libraries. Library information is present in centralized database which is collected from different library systems of Iraqi universities and it provides their access through website.

The system utilizes MySQL database to store the collected data from library systems in Iraqi universities. Web technology is used for accessing library data by using HTML & PHP. Apache server is also used. The system here has used these resources to build simple and perhaps user friendly web based search system. Both, basic and advanced search are made available in the proposed system.

As a result of the presented system here the different universities members can search all materials, holdings, and information resides in all libraries and gains their full bibliographic information.

## List of Abbreviations

<b>ASP</b>	<b>Active Server Pages</b>
<b>BLOB</b>	<b>Binary Large Objects</b>
<b>DB</b>	<b>Database</b>
<b>DL</b>	<b>Digital Library</b>
<b>DBMS</b>	<b>Database Management System</b>
<b>DDC</b>	<b>Dewey Decimal Classification</b>
<b>ETD</b>	<b>Electronic Thesis and Dissertation</b>
<b>GPL</b>	<b>General Public License</b>
<b>HCI</b>	<b>Human Computer Interface</b>
<b>HTML</b>	<b>Hypertext Markup Language</b>
<b>HSM</b>	<b>Hierarchical Storage Mechanisms</b>
<b>IIS</b>	<b>Internet Information Services</b>
<b>IDL</b>	<b>Iraqi Digital Library</b>
<b>JSP</b>	<b>Java Server Pages</b>
<b>LAN</b>	<b>Local Area Network</b>
<b>MFN</b>	<b>Master File Number</b>
<b>OPAC</b>	<b>Online Public Access Catalog</b>
<b>OODBS</b>	<b>Object-Oriented DataBase Systems</b>
<b>PHP</b>	<b>Personal Home Page</b>
<b>RAM</b>	<b>Random Access Memory</b>
<b>SQL</b>	<b>Structure Query Language</b>
<b>URL</b>	<b>Uniform Resource Locator</b>
<b>WWW</b>	<b>World Wide Web</b>

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# Chapter One

## *Introduction To Digital Library*

# **Chapter One**

## **Introduction to Digital Library**

### **1.1 Introduction**

In the traditional sense of the word, Libraries have always been a community's 'portal' to information, knowledge and leisure, a library is a collection of books and periodicals. It can refer to an individual's private collection, but more often it is a large collection that is funded and maintained by a city or institution. This collection is often used by people who choose not to, or cannot afford to, purchase an extensive collection themselves , However ,with the collection or invention of media other than books for strong information , many libraries are now also repositories and access points for maps ,prints or other artwork , microfilm , audio tapes, CDs ,video tapes and DVDs, and provide public facilities to access CD-ROM databases and the Internet [Lib06].

Digital libraries support and expand the traditional library services that have been used through centuries. For this, libraries start to use the Internet to exchange information and materials, where the exchange can happen in seconds. Within a group of libraries it is possible to establish a simple system based to communicate between them by making a common union catalogue between the partner libraries. By applying this system on the web, users can have access to all library materials and information in seconds and gain full information from anywhere.

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# المستخلص

العمل المقدم يصف عمل نظام مكتبة رقمية لجامعات العراق باستخدام بيئة الويب ، ينفذ النظام وظائف المكتبة الرقمية ، محتويات المكتبة و هي عبارة عن محتويات وصفية تكون موجودة في قاعدة البيانات و التي يتم جمعها من مكتبات جامعات العراق و الوصول لها عن طريق الويب.

النظام يستخدم قاعدة البيانات MySQL و التي تكون موحدة لخرن البيانات التي نحصل من مكتبات جامعات العراق، بيئة الويب المستخدمة مع لغتي أل PHP و HTML مع مخدم الاباتشي Apache Server توفر الوصول لهذه البيانات عن طريق بناء أدوات البحث للمستخدم. استخدم النظام طريقتان للبحث للمكتبة بحثا بسيطا و متقدما، مع بناء ادارة للبيانات.

أظهرت النتائج إن النظام المقترح يعمل على تحقيق فهرس مشترك موحد لمكتبات جامعات العراق المشاركة،مختلف الجامعات العراقية تستطيع بحث المحتويات الموجودة في المكتبة و الحصول على كامل المعلومات الوصفية لمحتوياتها.



وزارة التعليم العالي  
و البحث العلمي جامعة النهرين  
كلية العلوم

## تنفيذ مكتبة رقمية لجامعات العراق باستخدام بيئة الويب

رسالة مقدمة إلى كلية العلوم، جامعة النهرين كجزء من متطلبات نيل شهادة  
ماجستير علوم في علوم الحاسبات

من قبل  
سجي مجيد محمد الخياط  
بكالوريوس ٢٠٠٢

المشرف  
د. عبد الكريم عبد الرحمن كاظم

٢٠٠٧  
كانون الثاني

محرم

# DEDICATION

*To my Family*

Saja

2007

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وَقُلْ اَعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَ  
الْمُؤْمِنُونَ وَ سَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَ الشَّهَادَةِ  
فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ )

صدق الله العظيم

(التوبة: ١٠٥)

## **2.2 Website**

A website is collection of documents written in the HTML language. When a user looks at a website with a browser, the browser is able to follow the instructions presented to it in HTML to make a website look a certain way, the website content in HTML is static. That is, if the user were to reload a static website, they would see the exact same content every time. Its content was written directly by an author, and when the user goes to the site, that code is downloaded into a browser and interpreted. In contrast to a static website, a dynamic website is one whose content is regenerated every time a user visits or reloads the site, so that the website content is divided into static and dynamic as follow [Php07].

### **2.2.1 Static website**

Static website usually has the filename extension `.htm` or `.html` [int04], Static content that does not change at run-time. It is mainly stored in files on servers or in databases and is presented to the user without any processing (e.g. a home page defined in HTML) [Eng02].

### **2.2.2 Dynamic website**

Today, much of the web is dynamically generated , dynamic content that generated at run-time based on the interaction with the user (e.g. an e-commerce application that presents a welcome text and lists the current items in a user' shopping cart) [Eng02], and usually reflect the language or technology used at the server, such as PHP, JavaServer Pages, or many others, taking associated URL/filename extensions (e.g. `.php` or `.jsp`).

These technologies do ensure that simple HTML and other texts are provided to the web browser in the same way as for static web pages. [Sta06]

Dynamic web content is normally generated by a combination of 2 or 3 different parts: a **Web server**, a **dynamic content generator** and very often a **database**. Figure (2-1) shows this configuration and the protocols used to perform the interaction of these parts [Tho04]. The web server is a software technology that allows connecting to another system via the HTTP connection and then share data [Gha05], delivers all static content to the user requesting this file. If the user requests a page containing dynamic content, the web server forwards the request to the dynamic content generator, which generates the page. To do that, the generator executes the code written for this specific business logic of the web site and makes use of other files or a connected database, normally using standard SQL Queries. The content generator puts all the information generated by code and the static content associated with the web page and puts these parts together. Then it forwards the whole page to the Web server who delivers it to the user.



Figure (2-1): A typical configuration of a dynamic content web site

## 2.3 Capabilities of Digital Library Systems

Digital library systems compose a family of automated systems that together provide a comprehensive capability to manage the digital content of

an enterprise. It is useful to divide the capabilities of digital library systems into the following areas [Raj99]:

- Capture or creation of content
- indexing and cataloging (metadata)
- Storage
- Search and query
- Asset and property rights protection
- Retrieval and distribution

Content exists in multiple sizes, formats, and media, each with accompanying technical challenges. Content may be structured or unstructured. It may have exact, precise meaning; or it may be fundamentally ambiguous. Content may directly or indirectly support a business process or function.

A digital library architecture shows how capabilities are realized and related, and does this at several levels. Digital library architectures show how business processes or functions are enhanced; they show how technology components fit together and how, in detail, components interoperate with each other.

Such functions and relationships, when reduced to a particular software and hardware implementation, lead to operational digital library systems.

## **2.4 Digital Library Architecture [Try99]**

In the following paragraphs an architectural approach to the digital library will be developed, which is based on taking the fundamental capabilities, introduced in section 2.3, as the fundamental requirements the

architecture must satisfy. Architecture for digital libraries can be noticed from two points:

- A digital library approach to information management depends fundamentally upon a distinction between data and metadata. Metadata provide external classifying and organizing relations for data that may be unstructured, complex, or very large.
- Middleware services such as search, asset protection, and retrieval processes depend on metadata. Since metadata refers to data, which may be stored in separate hierarchical storage subsystems, integrity of reference must be maintained between metadata and data.

Figure 2.2 illustrates these fundamental distinctions between data management and metadata management, and between ingestion and utilization of content.

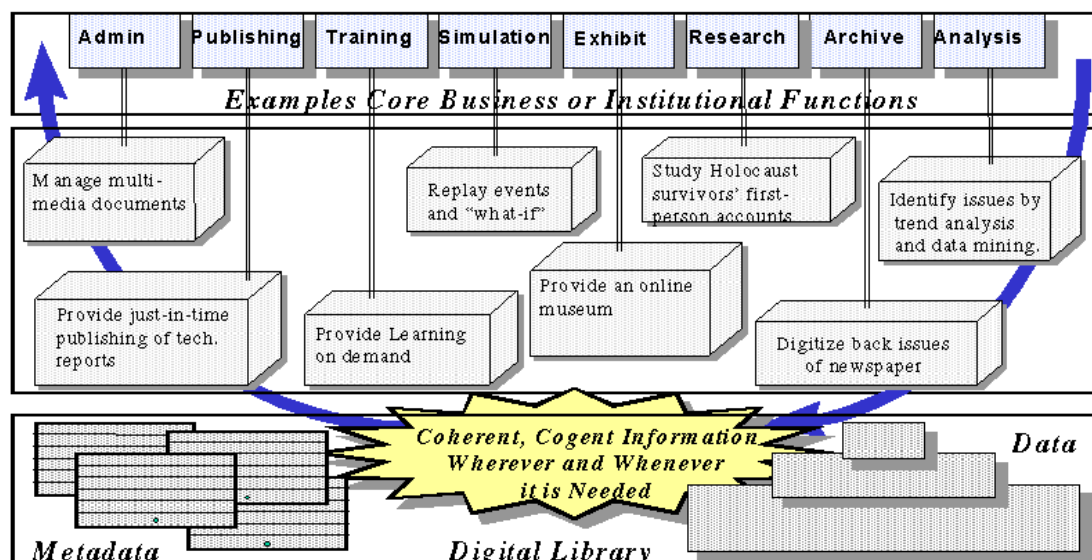


Figure (2-2): digital library architecture--building blocks of information to enhance existing functions and enable new operational capabilities



### 2.4.1 Operational Architecture

Operational architecture is an information management system represented in terms of the business processes it supports, and how information related to conduct of the business processes passes through the system's components.

Figure 2.3 is an example of digital library architecture. The operational (business) processes, most obvious in the example, depend on the timely and well-organized capture of training information as it happens, and both contemporaneous and retrospective search and retrieval of information from a training event. Although the information is generated in several different enterprise domains (eight in the example), effective utilization of information often depends on cross-domain searches and retrievals. Therefore, digital library services must provide information interoperability in middleware.

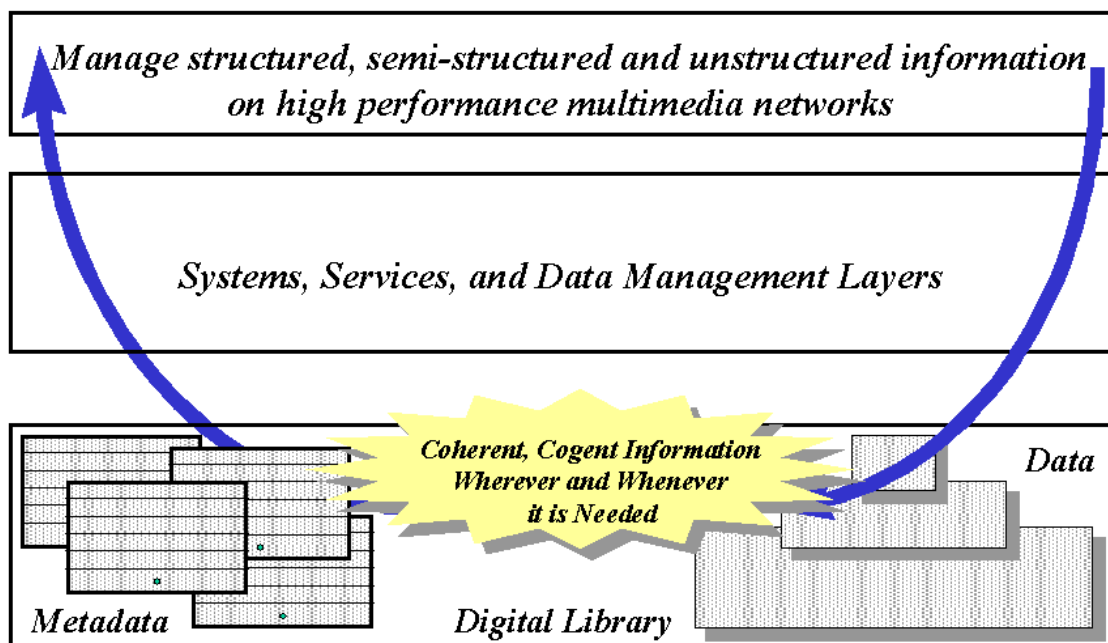


Figure (2-3): Operational architecture

## 2.4.2 Technical Architecture

A technical architecture breaks down operational (business) processes into functional components and capabilities (Figure 2.4). Hardware and software implementations are still not resolved.

The utilization of digital library materials depends on the existence of metadata to give an efficient and accurate view of content. Metadata must be created as content is added to the digital library. Metadata and data must be bound together logically, and there must be a robust underlying technology to manage the logical connection through time, across platforms, and over geographical separations, all on a networked, distributed system.

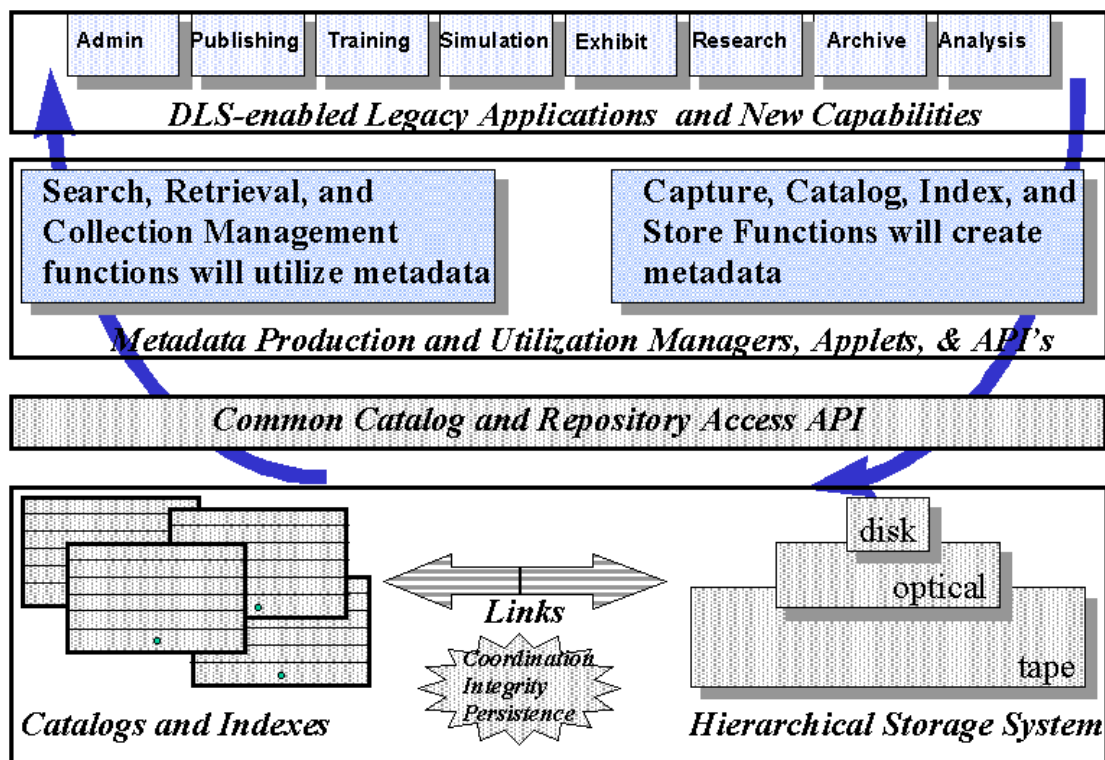


Figure (2-4): Technical architecture

### 2.4.3 Systems Architecture

Systems architecture shows the technology enablers and their interrelationships. In Figure 2.5, the digital library is a centralized subsystem that interacts with a variety of data producers and consumers within a complex distributed system.

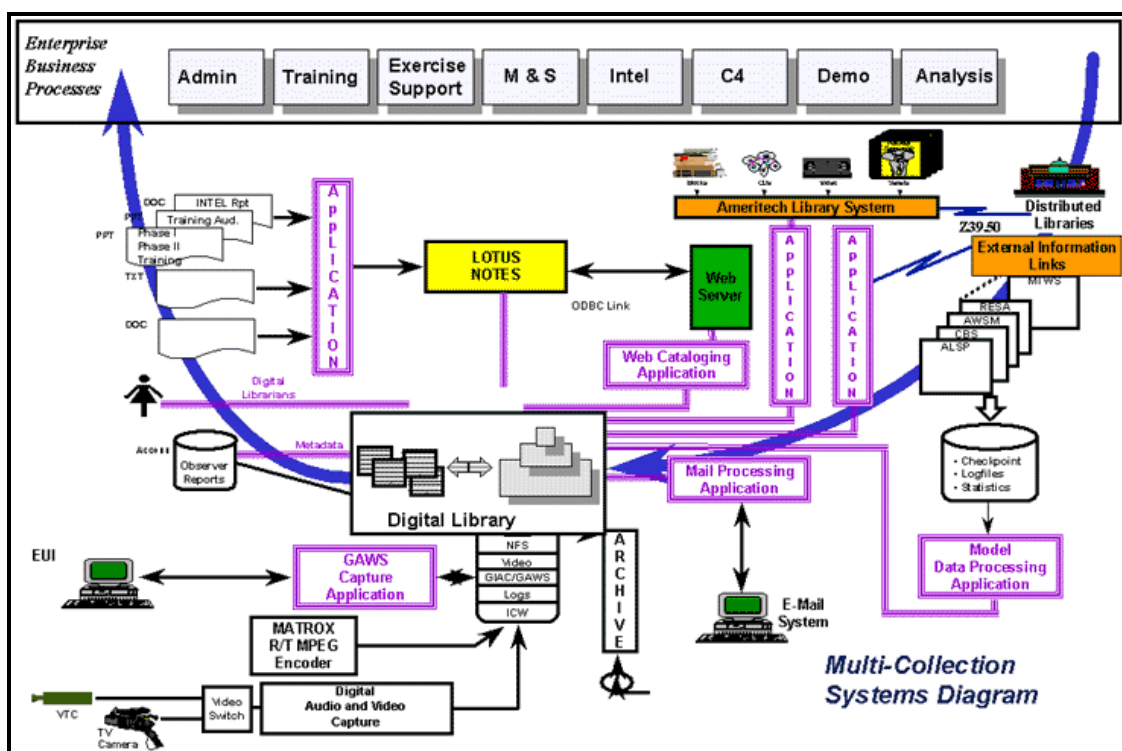


Figure (2-5): Systems architecture

## 2.5 Digital libraries in a distributed environment [Laf00]

Cost cutting and personnel restructuring are forcing organizations to make difficult decisions on where to spend money. One of the areas hit hard by budget cuts is education and training. Academic, industrial, and

governmental institutions are all seeking means to leverage technology to improve the timeliness, efficiency, and standardization of their required training. One way to extend budgets while continuing to deliver training is by constructing distributed digital libraries. A distributed digital library consists of material on separate machines connected via a network. The challenge of managing this information is deciding how to store the information and how users will connect, search, and retrieve the material. One method, the monolithic library, forces all user interactions through a single, controlling node of the library network. Another is called the distributed library, which hides the actual server architecture by allowing the user to interact with whichever library node is nearest to him.

The distributed solution has some apparent problems. Namely, the information is not centrally located; therefore, it can be more difficult to manage. This is true in terms of hardware, networking, and information retrieval.

The distributed model has several advantages, however. For example, the distributed model provides a location and space for schools to develop and distribute material. Approved material is placed in a specific directory structure where a master index would know to look for it. A distributed model also has the advantage of eliminating a single point of failure. A mirror plan can be implemented where if one server is down, another server with a copy of the information can still provide access to users. With information stored locally, the authors retain ownership of the documents and multimedia stored on their server. The distributed model also can reduce access time for certain users, especially if highly utilized information is mirrored to different geographical locations. The distributed model would provide space for development and distribution needs. Approved material

would be placed in a specific directory structure where the master index would search, catalog, and retrieve it.

Digital libraries provide online access to a vast number of distributed text and multimedia information sources in an integrated manner. Providing global access to digitized information which is flexible, comprehensive, and has easy-to-use functionalities at a reasonable cost has become possible with the technical developments in several areas of Computer Science such as databases, communications, multimedia and distributed information systems. Digital libraries encompass the technology of storing and accessing data, processing, retrieval, compilation and display of data, data mining of large information repositories such as video, audio libraries, management and effective use of multimedia databases, intelligent retrieval, user interfaces and networking. Digital library data includes texts, figures, photographs, sound, video, films, slides etc. Digital library applications basically store information in electronic format and manipulate large collections of these materials effectively. Their services provide capabilities for storing, searching, transmitting, viewing, and manipulating complex information. They provide a consistent and transparent view of underlying heterogeneous repositories.

In a wide area environment, the anomalies (failures, load on the network, message traffic) affect the communication of data. The multiple media of digital library data introduce further complexity since each media has its own communication requirements. The current network technology does not provide the bandwidth required to transmit gigabytes of digital library objects. The cost of access in the context of communication and networking is the response time required to access digital library data. A

digital library user might have to wait for several minutes to receive the data due to bandwidth limitations.