

# A Framework and Prototype for Personal Digital Library System

Ali Abdurraheem Alwan

**Abstract:** Nowadays, Digital Libraries have an inescapable role on delivering information resources to their users and new trends in Digital Libraries are to change from the passive state of only providing information resources to their users to a more active state by enabling the users of Digital Library to collaborate and share knowledge with each other. This project addresses the situation of managing a personal library and converting it from manually supported system to digitally supported system, because the current system makes it hard to serve the user effectively. The main objective was to develop a digital library management system, with a search functionality to facilitate the search and management of library resources. In general, this project offers the following services to the user: (a) Identify the transaction movement for the books and other resources of the library; (b) Know the detailed information about the books and other resources of the library; (c) The ability to have reports from different kind of view for books and other resources of the library; (d) the ability to add, delete, update, find, etc. for the most data in the system in an easy way; (e) Offer a kind of security for the system by allowing to use it by having a specific password. The designed model is employed to develop the concept of personal library and make its resources available to use, integrate and share among many users efficiently and effectively.

**Keywords:** Digital Library, Personal Digital Library, PDL.

## I. INTRODCUTION

Technology has become an integral part of today's societies and has started to be an indispensable component of modern companies in various industries. Major advantages of extended use of technology are the increase in accuracy, information integrity and the high levels of efficiency that are achieved due to the optimization of resources. All industries were affected in the intensive use of technology such as trading, teaching, manufacturing, medicine and even food. Personal uses in each field are also affected by the rapid growth of technology, so many researchers and lecturers tried to make use of this developments to organize the most important things for them; their "documents" and "personal libraries".

In general, many researchers and lecturers individually have their own collections of books, journal and other information that can be shared among them. They have to searching and sharing each other to fulfill up the education cycle by doing research and also for increase the education standards. They need a system that allowed them to share, search, easy to find and borrow among them. It is important for them to have the system even they can search and borrow from existing library or they can buy the books through sales and auction from existing book shops and through internet.

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But the constraints such as no time because busy of work, location of the shops or library are too far, security of the payment system through internet and the existing books are too old version, can increase difficulties to find books or information resource for them.

By existing of Personal Digital Library (PDL), it allowed the researchers and lecturers sharing their resource as a first step in doing their research and also for increases the education standards. Personal Digital Library also allowed each researcher or lecturer to store information and listing all books, journal and magazines they have, provide a searching task for help them in searching the books they wanted, provide the borrowing task that allowed researcher or lecturers to have appointment for borrowing the resources and it can be organized individually. By using the system the researcher or lecturers can make appointment directly through online and checking any reservation result through their email. Thus, more companies nowadays are focusing on the development of Personal Digital Library to use by different kinds of people.

## II. LITERATURE REVIEW

An informal definition of a digital library is a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network. A key part of this definition is that the information is managed. A stream of data sent to earth from a satellite is not a library. The same data, when organized systematically, becomes a digital library collection. Most people would not consider a database containing financial records of one company to be a digital library, but would accept a collection of such information from many companies as part of a library [8]. PDL has potential uses in many areas such as personal use, education, commerce, finance and entertainment. Personal users can employ PDL with an Internet connection to manipulate their distributed information from anywhere around the world. They can also apply PDL to Internet shopping and real digital libraries [6].

[7]; Despite the great variety and diversity of existing digital libraries, there are a small number of fundamental concepts that underlie all systems. These concepts are identifiable in nearly every digital library currently in use. They serve as a starting point for any researcher who wants to study and understand the field, for any system designer and developer intending to construct a digital library, and for any content provider seeking to expose its content via digital library technologies. In this section, we identify these concepts and briefly discuss them. Seven core concepts provide a foundation for digital libraries. One of them appears in the definition of Digital Library to capture the commonalities between this universe and other social



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arrangements: Organization. Five of them appear in the definition of Digital Library to capture the features characterizing this kind of Organization and the expected

service: Content, User, Functionality, Quality and Policy. The seventh one emerges in the definition of Digital.

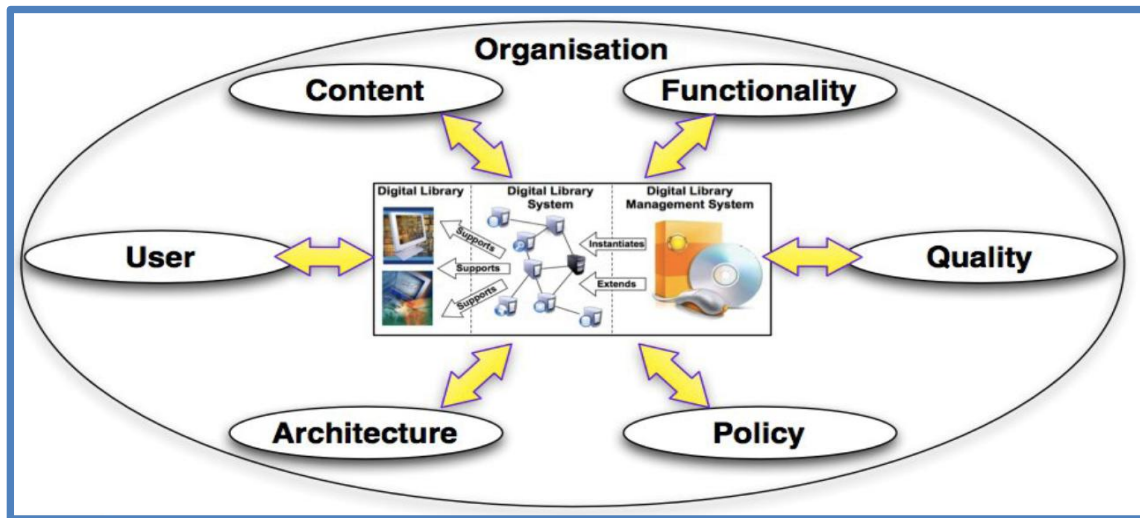


Figure (2.1) Main Concepts of a Digital Library

Library System to capture the systemic features underlying the expected service: Architecture. All seven concepts influence the Digital Library three-tier framework, as shown in Figure (2.1).

## 2.1. Organization

The Organization concept is surrounding the entire Digital Library universe. A Digital Library is a kind of Organization by its own, it is a social arrangement pursuing a well-defined goal (the digital library service).

This concept subsumes the mission the Digital Library has been conceived for and every other aspect that is needed to define this mission and the operation of the resulting service.

However, the Digital Library, being an Organization by its own, has the power to control its own behavior and evolution in the frame defined by the Institution. This concept is fundamental to characterize the Digital Library universe because it highlights the commonalities between this universe and another one dedicated to capture organized body of people having a particular purpose.

## 2.2. Content

The Content concept encompasses the data and information that the Digital Library handles and makes available to its users. It is composed of a set of information objects organized in collections. Content is an umbrella concept used to aggregate all forms of information objects that a Digital Library collects, manages and delivers. It encompasses a diverse range of information objects, including primary objects, annotations and metadata.

This concept is fundamental to characterize the Digital Library universe because it captures one of the major resource these Organizations are called to manage, i.e. the data and information that is made available through it.

## 2.3. User

The User concept covers the various actors (whether human or machine) entitled to interact with Digital Libraries.

Digital Libraries connect actors with information and support them in their ability to consume and make creative use of it to generate new information.

User is an umbrella concept including all notions related to the representation and management of actor entities within a Digital Library. It encompasses such elements as the rights that actors have within the system and the profiles of the actors with characteristics that personalize the system's behavior or represent these actors in collaborations. This concept is fundamental to characterize the Digital Library universe because it captures the actors of the overall Organization.

## 2.4. Functionality

The Functionality concept encapsulates the services that a Digital Library offers to its different users, whether individual users or user groups. While the general expectation is that Digital Libraries will be rich in functionality, the bare minimum of functions includes new information object registration, search and browse. Beyond that, the system seeks to manage the functions of the Digital Library to ensure that the overall service reflects the particular needs of the Digital Library's community of users and/or the specific requirements related to its Content.

This concept is fundamental to characterize the Digital Library universe because it captures the facilities offered by the overall Organization [7]

## 2.5. Policy

The Policy concept represents the set or sets of conditions, rules, terms and regulations governing every single aspect of the Digital Library service including acceptable user behavior, digital rights management, privacy and confidentiality, charges to users, and collection formation.

Policies may be defined within the Digital Library or be superimposed by the Institution establishing the Digital Library or outside of that (e.g., Policy governing our Society). The policies can be extrinsic or intrinsic policies.

Definition of new policies and re-definition of older policies is part of the policy-related functionality that must be supported by a Digital Library. This concept is fundamental to characterize the Digital Library universe because it captures the rules and conditions regulating the overall Organization.

### 2.6. Quality

This concept represents the parameters that can be used to characterize and evaluate the overall service of a Digital Library including every aspect of it, i.e. Content, User, Functionality, Policy, Quality, and Architecture.

Quality can be associated not only with each class of content or functionality but also with specific information objects or services. Some of these parameters are quantitative and objective in nature and can be measured automatically, whereas others are qualitative and subjective in nature and can only be measured through user evaluations (e.g., focus groups). This concept is fundamental to characterize the Digital Library universe because it captures qualitative aspects characterizing the Organization.

### 2.7. Architecture

This concept refers to a Digital Library System and represents a mapping of the overall service offered by a Digital Library (and characterized by Content, User, Functionality, Policy and Quality) on to hardware and software components. There are two primary reasons for having Architecture as a core concept:

- (i) Digital Libraries are often assumed to be among the most complex and advanced forms of information systems.
- (ii) Interoperability across Digital Libraries is recognized as a major challenge. A clear architectural framework for Digital Library Systems offers ammunition in addressing both of these issues effectively. This concept is fundamental to characterize the Digital Library universe because it captures the systemic part of the service offered by the Organization.

The concepts populating the areas just introduced (Organization is a special case since it subsumes all the rest) share many similar characteristics and all refer to internal entities of a Digital Library that can be sensed by the external world.

Therefore, there has also been introduced a higher-level concept referring to all of these, i.e., Resource, which enables us to reason about the common characteristics in a consistent manner. These are User, representing the external humans or hardware interacting with the Digital Library, and Content, representing the material handled by the Digital Library. Architecture, representing the technological design on which the Digital Library System is based, represents the underlying technology that is called to implement all the rest. On top of these concepts there comes Functionality, primarily representing the means for connecting User to Content, i.e., all procedures, transformations, actions and interactions that bring Content to User or vice versa. Finally, operation of the Digital Library and activation of its Functionality are based on Policy and aim to achieve certain Quality [12].

## III. USING WISDM METHODOLGY IN PDL

An approach known as WISDM, which is a modification of Multview [16], for web development has been used in the development of PDL. It is a mix of Website development techniques together with traditional Information System (IS) development competencies in database and program design [1].

Quantitative research methods would be used in this research. The researcher conducted a survey to determine the user requirements that are necessary for the creation of a prototype creating personal Digital Library (PDL). In the evaluation of this prototype system, qualitative elements such as interviews would be used to assess its usefulness.

In this study, the researcher will use the quantitative research approach due to the exploratory nature of the problem at hand. The respondents would provide the necessary user requirements that would lay the foundations for the development of a digital library.

## IV. DATA COLLETION AND ANAYLSIS METHOD

After agreeing to participate in the study, participants were asked to complete an initial survey questionnaire. The survey questions were administered via E-mail, and participant answers were collected through E-mails. Questions for the survey were selected based on themes and patterns that arose in the literature review. The primary data source will be the feedback from the personal citizens through surveys. The researcher sent questionnaires through e-mails and gave the questionnaires through personal contact. The last part of the survey questionnaire had open-ended questions. The questions in the questionnaires will be simple to understand and easy to respond and this will ensure any misconception or misrepresentation. This will provide for citizen's personal opinions as well their selection from the current cultural digital library in a generic way. Distributing the printed questionnaire to the Iraq peoples through an online survey was hosted in Prosurvey.com.

## V. FRAMWORK DESGIN

Before the system design process begins, a development framework is proposed. This could be used a planned strategy to lay the foundation for creating a website that would host the Personal Digital Library. The framework can further be viewed as a building block for building Iraqi culture including search, master files, miscellaneous, report, utilities and exit . Other frameworks were analyzed and evaluated to obtain ideas on developing a framework. As regards system development methods, Rapid Application Development (RAD) method was used. In this method, a prototype is developed fast through incremental and iterative approach. Furthermore, use case tools were used. Object oriented analysis and design is more on object-oriented modeling that uses use cases to address business requirements [9].

A functional framework to support PDL is proposed and this is depicted in Figure 5.2. The framework shows the





various parts of the PDL and how one part interacts with another so that the digital resources could be accessed.

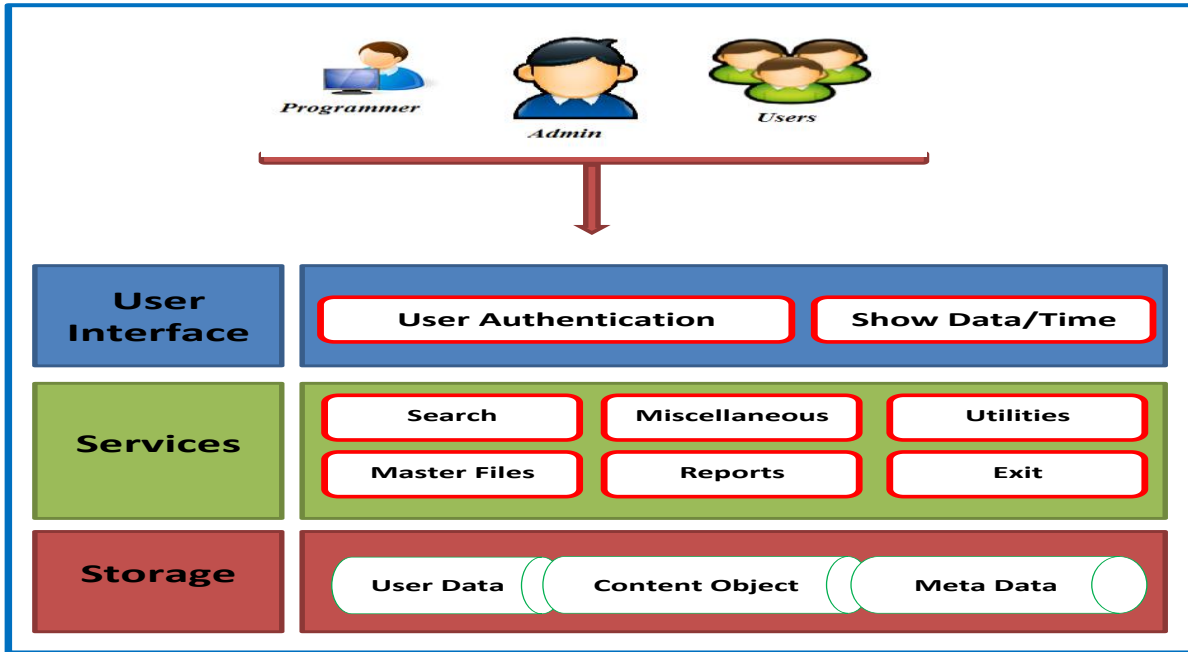


Fig 5. 2 Structure of PDL Framework

## VI. CONTENT MANGAMENT SYSTEM

Personal Digital Library system has three modules:

### 5.1 User interface

According to [14], user interface tasks are used to add, modify and deactivate user records and to regulate users. Besides managing user account and group manipulation, specific tasks, which does IBM specify, include the following:

- Manage user partitions.
- Define user profiles and assign them to users.
- Define user roles and assign them to users.

User interface contains simple objects for creating; deleting, managing and enumerating user accounts [5].

### 5.2 Services

When a user enters a query into a search engine, the engine examines its index and provides a list of best-matching web pages according to its matched word. The index is built from the information stored with the data and the engine looks for the words or phrases exactly as they are entered. The proposed PDL has full text searching which looks beyond key words and the searches are now more accurate and reliable. Also Content management refers to the collection, management and storage off articles, images, sounds, raw data and anything else, which is useful and can be considered as content. Content Management further encompasses content in the World Wide Web [15], and content in other forms of repositories. There are now services available, which capture content, standardize content format and continually update the content to reflect the latest additions, modifications or deletions [15].

### 5.3 Storage

The storage of data base is designed for easily managing the incoming media from a variety of sources. It provides

for media simply as files can be attached to posts, providing the ability for display of images, audio and video within a post [11]. Media management in PDL includes other digital resources namely newspaper, books, journals and articles. The administrator has been given the authority to define the access rights to specific data files and set access rights to all the different users in an organization.

## VII. DISCUSSION

Demographic Background of Respondents, According to collected data, percentages of male and female respondents were (66%) and (34%) respectively. More than half of respondents were between 26-30 years while others distributed among other range of age categories. The Majority of Respondents were college students (72 %), and from various departments, and engineering students were (28%) of total respondents. For example, they collected data from the Engineering Faculty of Baghdad University which has four postgraduate master programs (Computer Science, Library and Information Science, Software Engineering and Information Technology). Through data collection process, researchers tried to have respondents from mentioned programs and since the majority of students in the faculty are computer science postgraduate students, (61%) of respondents were from this master program while others have (15%, 14% and 10% )of total respondents respectively.

Students' Preferences and Problems in storing their E-documents, The aim of this part is to investigate what kind of devices are used by students to store their e-documents and the associated problems they have faced in storing e-documents as well as the level of usage of online repositories among them.

The collected data shows that postgraduate students use Laptop as their main repository for storing their e-documents (65%) and the use of external storage devices (25%) would be considered as a temporary storing device or as a mean to share and transfer their data. So, (90%) of students use either laptops or other external storage device to store their e-documents while using desktops (10 %) is not as common as former devices and it would mostly because of portability and characteristic of those devices. Since PDL would act as a tool to store e-documents and by considering the fact that there is not any online tool for students to store their e-documents, students are questioned about level of usage of online repository to store their e-documents. Among 100 respondents,( 43%) students have used online repositories to store their e-documents. Since usage of online repository is not as common as other storage devices, in the follow up survey, it is going to investigate what is student's preference for storing their e-documents when collaboration and sharing resources is the main concern.

Research collaboration activity, as mentioned before one objective of the proposed PDL system is to support collaborative research environment for postgraduate students. In this part of the questionnaire, students are asked to rank their major collaboration activities with other postgraduate students. This result implies the importance of resource sharing as one of the important factors to develop tools and systems to support collaboration. To illustrate, [4] mentioned "sharing data is a core element of scientific collaboration", recommended that agreements about sharing data are core of establishing collaborations. Moreover, [3] by analyzing over 44 research prototype that offering collaborative service concluded that "File & document sharing is clearly the most common and at the same time most needed collaboration service". So based on the questionnaire result and previous research, supporting files and document sharing would be the necessary service in order to develop proposed prototype system. The next step based on current results is to investigate from research students' perspective, what are their preferences in terms of data sharing tools and systems as well as their opinion about current systems inside our university in terms of providing data sharing and collaborative services for research students. This part will be covered up in the follow up survey in second phase of research.

The Similarity in research factor, In addition, the students are asked to rate level of importance to know other students with similar research interests. Out of 100 respondents, 44 percent answered very important and 40 percent answered important which means that almost 84 percent of students are agree that knowing other students with similar research interests is really important in their research.

As knowing other students with similar research interests is important to conduct the research and since there is no system that postgraduate students can find students with similar research interest, they were asked how they would know other students with similar research interest. Among 100 respondents (52 %) mentioned that according to background information and 26 and 18 percent mentioned by asking other students and searching in research lab respectively; however the remaining 4 percent mentioned

they would know by either asking their supervisor or based on their classes, which is also kind of background information. Besides, they were asked how they ranked the level of difficulty to find other students with similar research interest. The answer to this question rates from very hard (1) to easy (4).

As it was mentioned earlier, sharing resources is the most common collaboration activity among students; therefore this section is going to investigate how important it is for students to have access to other students with similar research interest. The students are asked to rank from very important (1) to not important (4). Out of 100 respondents, 39 and 42 percent mentioned to sum up, 84 and 81 percent of respondents believed that it is important to know other students with similar research interest and having access to their resources respectively, which means that knowing other students and also accessing to their e-resources almost have the same value which implies that students not only want to have access to e-documents but also they want to know the owner of that document. In this part of questionnaire students are asked whether they have used any web-based tool to collaborate with other students. Out of 100 respondents, 65 percent mentioned they have used and 35 percent mentioned they haven't used. Eagerness to use web-based collaborative tool, Students are also asked to rate their level of willingness to use web-based tool to collaborate with other students. The survey showed that out of 100 respondents with a rating scale from very eager (4) to not eager (1), (57%) and (27%) answered eager and very eager respectively. With Mean=1.9000 it can be inferred that students are eager to collaborate with each other via web-based tool.

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Barrier of Collaboration,[10] Proposed five success factors affecting collaboration:

- The nature of the work
- Common Ground
- Collaboration Readiness
- Management, Planning and Decision Making
- Technology Readiness

Among mentioned factors, Collaboration Readiness deals with participants' motivation to work together and Technology Readiness deals with reliability and comfortableness of technology. Based on these two factors, the next question tries to investigate barrier of collaboration among postgraduate students based on their willingness to collaborate with each other and the lack of supportive tool. The result demonstrates that from postgraduate students' point of view, they have willingness to collaborate and the lack of supportive tool is the major barrier of collaboration, Follow – up Survey.

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This survey is open-ended survey based on the questionnaire survey. The aim of this survey is to investigate in depth the respondents' point of view about 5 questions. The e-mail is used to send the questions and getting feedback because it provides the comfort for respondents to find the proper time to think about the questions and deliver succinct and elaborated answers.

## VIII. CONCLUSION

The world of libraries and information centers has been witnessing a sea of changes due to its development and deployment of information and communication technologies have not only changed the way information is generated, organized, stored and distributed but more importantly they have become indispensable tools for teaching, learning and research. Since the new technologies are forever redefining the model of delivering instruction and service to keep pace with the technological advancement in Information and Communication Technology to meet the expectations of the users. With PDL, a user will be able to have information at his fingertips by: following trails, browsing across PDLs, or using the PDL searching mechanism. With information readily available, a user may then focus his energy on thinking or being creative, without the need to muddle through heaps of folders, searching for information which may end up nowhere to find, or browsing across huge volumes of books painfully when trying to recollect his prior "trails" just to piece together some loose ideas. With PDL, the effort of retrieving relevant information has been made minimal. Retrieving information will no longer be a hurdle to the road of creation.

The proposed model was generally successful to support students' research collaboration thorough their shared collections; however, there are some issues regarding to this system. First of all, since the system is a personal computer-based system, the storage capacity is a big challenge. This means that by increasing the number of data the computer would not be able to store large amount of digital contents. Another limitation of the system is related to the software platform which was used to build the system. MS-Access presents friendly interface and a cheap platform to build the system, but it may cause some difficulties in updating the system with more features or in depending on it to analysis some data in the system for statistical researches or even in the security issues. These problems can be solved by using more developed DBMS such as Oracle.

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