**Chapter 2  
CONCEPTUAL FRAMEWORK**

This chapter presented the review of related literature and studies underlying the framework of the study. It includes the conceptual model of the study and operational definition of terms.

**REVIEW OF RELATED LITERATURE AND STUDIES**

This was about the development of Thesys: A Research Management System University of Makati. The system provided features that could help organize thesis documents. It would generally help the user or future researchers to easily find references with regards to thesis topics and ideas. To create the project, researchers conducted researches and review of related literature and studies to have knowledge and to learn and gain more about the project study.

**Research of Key Technologies in Development in Thesis Management System**

According to Wang (2012), in recent years, with the expansion of college enrollment, workload of thesis guidance and administrative increased exponentially, the traditional thesis management methods cannot meet the actual requirements, a new way to efficiently manage thesis process is urgent needed. With the popularity of computer networks in universities, the necessary hardware infrastructure and operating platform of office management by the campus network are provided. University graduation thesis management system achieve business logic of the graduate design process through the network, build a software platform between the teachers, students and managers that enables teachers and students can use the system to interact, to complete their course in the graduate design needs to be done, and then achieve the thesis network automation and management purposes.

Several key technical in system development such as controlling of user access rights, using of master pages, production of Word format document, editing and publishing online information are focused on. These technologies have certain versatility in the Web application system. The results of the development and operation show that application of these key technologies improved the development efficiency and practicality of university thesis management system significantly.

**UMP Thesis Management System**

According to Rahman (2011), University Malaysia Pahang did not have an official online system for thesis management system. UMP still using hardcopy system only and has a lot of disadvantage where it will use a lot of paper and will cost a lot of money and more importantly it will affect environment sustainability. Besides that, the hardcopy of the theses is only available in the library and Faculty. Students need to go to the library and faculty to search information and to get references. Because of hardcopy usages, it takes a lot of spaces to store the thesis and it will cost a lot of money.

Besides that, thesis book is heavy for lecturer to carry around and it will give difficulty for supervisor to take along the thesis with him for evaluation. Furthermore, supervisor may have busier times where they did not have time to be in their rooms for meet the students. It will make difficulty for them to tell the students what they need to do to improve their thesis writing and to get a better mark.

Other than that there is a difficulty when students want to search the thesis for their references. Students need to search from a thousand of thesis and has to take out one by one the thesis in the library or faculty in order to see thesis title where it is located in front on thesis cover. Besides students, supervisor also has difficult times to search their student thesis.

University Malaysia Pahang Online Thesis Management Systems (lJMP thesis) is a web management system that uses as thesis management that functioning as storing data, read thesis, marking the thesis, comment on thesis, and so on. The idea to build the system by using web management systems is because nowadays internet has widely used and already become a lifestyle. Besides, UMP has wide coverage of internet where all campus area has internet coverage so students and lecturer can online the systems anywhere, anytime in the campus with free of charges. In order to build the system, the plan is by using Software Development Life Cycles (SDLC). SDLC has five stages that are planning, analysis, design, implementation and maintenance. The system use PUP and html language. As medium to store data, MySQL will be used. As a result, the systems will work nicely and will help staff to organize thesis and easier for students to make references.

**CollaborateIT: A CCS IT Thesis Portal with Electronic Document Management System**

According to Tangkeko et Al. (2016), many industries today use information technology in providing information and services to their customers. It is helping people in their day-to-day activities by granting access to a wide range of information that interests them. People can also access important information in systems that they are part of which will help them to easily view information that are related to them like work, school and personal relevant information.

A portal is a system that serves as a centralized place for accessing different resources in the Web (Atlantic Webfitters, 2014). It gathers information from different sources and put it all together in a single place which can help in accessing information by several users. It provides the users with a single point of content, data, and services. It can be personalized depending on the role of the user in the organization (Eldrandaly, 2009). There are different types of portal: general, community, horizontal, vertical, enterprise, personal, and niche. Community Portal is a system where the users are of same group of interests.

Electronic document management system (EDMS) helps in managing documents electronically (Minnesota Historical Society, 2012). Moreover, EDMS provides security of information while it still allows easy access of the users to the electronic document (Oakleigh Consulting Ltd, 2007). The process of EDMS has to do with capturing, storing, indexing and retrieval. It improves the accessing of information by the users of the organization wherein they can easily search and retrieve the documents needed. Also, there will be security in such a way that the only authorized users are allowed to access the particular documents. (ND Information Technology Department, 2014).

With these concepts, the proponents were able to come up with a system that incorporates EDMS into a portal which is the CCS IT Thesis Portal with Electronic Document Management System. The portal would be handling the entire thesis process, which starts from after passing the proposal stage up to the submitting of the final thesis project, as well as the document management of the thesis documents, which involves the storing, indexing and retrieving of thesis documents, in the IT department under the College of Computer Studies of De La Salle University.

**Electronic Document Management Systems**

According to Minnesota State Archives (2012), an electronic document management system (EDMS) is a software program that manages the creation, storage and control of documents electronically. The primary function of an EDMS is to manage electronic information within an organization’s workflow. A basic EDMS should include document management, workflow, text retrieval, and imaging. Not all EDMSs have records management capability. To qualify as a records management system, an EDMS must be capable of providing secure access, maintaining the context, and executing disposition instructions for all records in the system. Before implementing a system, you must determine how it fits into your overall records management strategy. EDMS functionality is often integrated into Content Management (CM) systems. These systems combine additional functionality such as website management with workflow tools, standard templates and access rights**.**

EDMS systems do not always include the ability to perform records management functions. Those that offer records management functionality are sometimes referred to as Electronic Document and Records Management Systems (EDRMS). In addition to these systems, stand-alone records management software, referred to as Records Management Applications (RMA), are available. A records management system must be able to provide secure access, maintain the record’s context within a record series, and automate the execution of disposition instructions for all records in the system. EDRMs and RMAs often require individual users to make decisions as to which documents qualify as records, thereby adding a layer of complexity to the work process. As a result, suitable training for all users is of utmost importance to a successful implementation.

**Document Maintenance & Management**

Document Management System should provide state-of-the-art technology, enabling digitalization and automate into Paperless Office. It essentially should involve Document Imaging-conversion of paper documents into electronic images on a computer. System should support Image Fusion, to meet the needs of safe archival as well as quick digital access.

The system should ensure that all the documents are digitalized & stored in a structured manner for easy access and retrieval with proper controls. File searching should be possible by file name, key words, author of the file, and hierarchical position of the author, date created, date modified, priority set and status. The solution should be easy to configure and implement, so as to integrate into existing infrastructure and applications. It should also archive records in a non-proprietary format that can be read on any operating system, without special software or any viewers, into the foreseeable future. Documents stored in the system should retain its original format and run in its native application when retrieved. The system should duly allow for easy transfer of database and images to any other system. The solution should offer a comprehensive range of cost-effective services for Document Management System as under Document Scanning and Data conversion (TIFF to RTF, PDF, HTML, XML). This solution should include conversion of image files like JPEG, TIFF, PDF, etc. to XML PDF, HTML etc. according to the proposed system of All India Council for Technical Education (2011).

**Document Management System Security**

A common demand today is that software and systems must be secure but security mechanisms are often implemented without first considering what a secure system is. A formal specification of what is allowed and not allowed in a secure system is the security policy. The SS-EN82045-1 standard is a standard that assures a certain level of quality in an electronic document management system. This presents an extendable framework to specify security policies for a document management system. As a reference implementation, a security policy for a product called Zert Infologic is specified with this framework. Zert Infologic is a product that facilitates the management of product manuals in multiple languages. The security mechanisms to enforce the security policy for Zert Infologic are discussed and a requirement specification (with respect to security) is suggested according to Johan Birme (2005).

Archival is selection of document versions are stored in a physical more compact and not modifiable form, including the associating metadata. A purpose of archiving documents is for example to fulfil legal requirements or other obligations. The contents and the metadata of an archived document must be reproducible and prevented from modification. Also, the access to the document must be controlled.

**User Adoption of SharePoint Document Management System**

According to Burner (2015), most computer users are familiar with the way that documents are stored on File Server. With ever increasing amount of documents and requirements on storage and access, management of documents becomes one of the most important areas that organizations are focusing on. Several improvements for storing and accessing files have been introduced in the latest years. Microsoft SharePoint is one of the new solutions to collaborate and SharePoint Document Management is possibly taking over the traditional File Server in many organizations. However, the use of this new technology seems to be lagging behind. To understand what influences the adoption of SharePoint Document Management System and be able to use this information can contribute to a better implementation and wider use of the system. User adoption of SharePoint Document Management System is studied in this thesis.

In order for an organization to successfully implement SharePoint Document Management System, understanding of potential adopters and the factors that influence their adoption decision is important. The findings indicate that perceived benefits and training are main variables in processing adoption. The study can contribute to understand users’ behavior and has practical implications for organizations concerned with adoption of a new technology.

As the amount of documents is being increased rapidly in business, it is necessary that these documents are preserved in a most effective way. Organizations, with the aid of document management, aim to realize their goals of working effectively, saving time and cost in order to enable right access to the right documents at the right time.

SharePoint is a huge and complex platform that has been expanded a lot during recent years. SharePoint Document Management System has been chosen by many companies to handle their documents, but how it is implemented and how to get employees using it happily instead of their old system are interesting themes to study.

The motivation for the research is from the growing importance of the topic in my own working place, as well as in Microsoft SharePoint development. Microsoft is claiming that SharePoint is the fastest growing product in the company’s history and according to Information and Image Management (AIIM), one in two organizations are using SharePoint server. This concludes that the platform could be quite stable. However, it is noticed that the use of Document Management System is the challenge that is faced by many organizations. One of the biggest issues is user adoption (AIIM, Report 2012). Many employees prefer not to use it if they have a choice, and they return to their old system whenever they have a chance. Hence, it becomes very important for organizations to find a good adoption process for the system.

**Easy Document Management**

Electronic document management solutions are designed to organize business files and records digitally, whether they started out in paper form or were generated by software applications. Paper files are first converted to electronic format by scanning. This provides a more compact means of storage, universal access for retrieval, and higher levels of data security and privacy. A company-wide document management system also controls digital files that are generated directly through applications -- such as those in the Microsoft Office suite (Word, Excel and PowerPoint), accounting software, CAD, email, and so on. Managing (rather than simply storing) documents enables quicker access to, and greater command over, business information.

Eliminating paper for businesses across the board, eliminating the bulk of their paper documents and records will immediately eliminate substantial material and labor expenditures. Companies are also liberated from paper’s inherent limitations as a means of information storage. To share or distribute paper files, they must be duplicated. To store them, companies must devote a large portion of their office area or lease a separate space dedicated for physical file storage. The more staff and files are spread out across locations, the greater the obstacles to access. Given the large expense and inconvenience of paper documents, maintaining them in digital format instead leads to a substantial increase in efficiency and decrease in operational costs (M-Files Corporation, 2011).

**Storage and Archiving**

After adopting a document management solution, the actual hardware storage location of documents will be irrelevant to the average user, who accesses what appears to be a single repository. In the background however, the system works to manage the changing conditions of server hardware storage. The system should have the versatility to change to new storage locations in the future as the organization grows and new hardware is introduced.

Storage devices have evolved considerably over the last ten years and will continue advance at a rapid rate. It is important that companies can easily transfer their data from one data storage location to another while continuing to access the documents as before. The IT administrator should also be able to designate certain

hardware to store backups or archived files. Some systems may give options pertaining to file retention, including the capability to automatically delete of certain document types past a certain age as required for certain types of confidential recordkeeping, or simply as an efficient use of storage space (M-Files Corporation, 2011).

**Archive Formats**

Another consideration for long-term storage is the format of documents. It is recommended that archives utilize non- proprietary image and text formats (such as TIFF and ASCII,respectively). Even though one proprietary format may seemuniversal at the current time, this situation can rapidly change inthe future.The danger of proprietary formats is that if a software developerdiscontinues the application that reads the file, or the companyno longer owns the software, there would be no way of openingand reading the document. TIFF image format and ASCII for textare universal, non-propriety standards that will likely have easilyavailable conversion products well into the future (M-Files Corporation, 2011).

**Records Management Requirements**

Records management is a specific aspect of document management that preserves evidence of a business’ activity, usually according to prescribed rules. Records management has spread to use in many sectors of the corporate world. Some industries have further regulatory compliance mandates that require transaction reporting, auditing, and/or long-term record retention. Records management relies on many of the features inherent in document management systems, but not all DMS products have the power to completely fulfill a records management mandate. If you have legal requirements for long-term records preservation, consult Section D of this document for more specific guidelines pertaining to Records Management (M-Files Corporation, 2011).

**AgriDrupal: Repository Management Integrated into a Content Management System**

According to Keizer (2011), the system reference tool has advanced features for managing open access repositories in compliance with widely adopted library standards and the OAI-PMH protocol. The document repository features include: a) a cataloguing interface that out of the box provides the most commonly used metadata elements in bibliographic databases, in particular those defined by the Agris Application Profile , but is easily extendable to include any other element; b) internal authority lists for authors (personal and corporate), journals and conferences; c) special input interface for subject indexing with the Agrovoc thesaurus; d) search and browse functionalities; e) exposure of records through the OAI-PMH protocol, implementing the Dublin Core metadata set; f) exposure of records also as RDF feed and XML file: the XML file is compliant with the above mentioned Agris AP, while RDF feeds can be customized in order to include properties from any vocabulary, thus making the repository fully interoperable - the use of Agrovoc URIs also linking it to a published Linked Open Data (LOD) triple store; g) extensible import and harvesting functionalities that also facilitate the exchange of information with other Institutions and the building of networks.

Since it can be very easily extended to manage any information type according to any metadata standard, AgriDrupal allows to easily integrate a document repository with a website and more in general with an integrated information system. The current 0.7.3 release of AgriDrupal manages documents, news, events, vacancies, institutions, experts and of course web pages. The resulting integrated information system exposes RDF feeds for each type of information managed in the system, and the vocabularies and properties used in the RDF output can be customized, thus making an AgriDrupal installation a potential Linked Data provider.

**University of Pretoria Digital Repository**

A digital institutional repository in the context of a higher education institution can be defined as “a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution”. It was decided by the E-Information Management Team that the library in collaboration with Education Innovation will initiate this digital repository project at the University of Pretoria (UP): At the initial meeting of the e-information workgroup, stressed that this will be a university project and emphasis must be on the preservation of information according to the proposal document of Ina Smith (2010).

**A Repository for the Sustainable Management of Research Data**

According to Dima et Al. (2010), the project presents system’s architecture as well as the underlying workflow of the Extensible Repository System of Digital Objects (ERDO) which has been developed for the sustainable archiving of language resources within the Tübingen CLARIN-D project. In contrast to other approaches focusing on archiving experts, the described workflow can be used by researchers without required knowledge in the field of long-term storage for transferring data from their local file systems into a persistent repository.

Large amounts of research data are currently being stored by their resource creators on various devices, often leaving them inaccessible to the research community at large and sometimes even to the creators themselves. These data graveyards may contain treasures of results, possibly not only for the individual compiling the resource. With the help of a repository system, the challenges of archiving can be overcome, respecting the privacy and property rights of the researcher. Persistent accessibility of research data rep- resents the main purpose of a repository system, but it also enhances the visibility and search ability of the data. This is implemented by a repository system in the persistent archiving of resources: data is stored and maintained in a consistent form within dedicated infrastructures with no interference by other processes, addressing the resources from outside of the repository: making them citable and hence visible to the academic public by maintaining resolvable identifiers, describing the resources consistently: allowing for searches over their descriptions using metadata and sharing of resources: either by providing download options for the general public or by permitting user access for authorized users only.

**Online Repository System for Petakom Club**

According to Hairani (2012), Petakom Club is currently using manual registration form for their current and new members such as using paper instead of electronically. They store their document in ring file and search their member by file to file sorted by alphabetical order. This system developed to manage Petakom in handling data gathering. The system lets the user to insert or update new data information to the database such as member information and new member registration online in an efficient way. With online registration, admin can register as new member and it will be much easier for them to register at anytime and anywhere they want.

This system also allows administrator to manage all tasks especially for adding, update, monitoring and deleting data of Petakom members in the database. With this, all of the data are easier to handle and managed only by administrator. All of the searching part are done efficiently using name, and does not require a ring file just to search member’s information.

By using this system, member’s record cannot be deleted from the database. It should be kept for reporting purposes. Administrator would not have to use the log book to create a report. Current members shall have their status active. While the members that had resigned or terminated, their status should be resigned or terminated. Members Petakom Club are allowed to access their information anytime and anywhere that have internet connection. They also can upload and download file to or from this system so it will be easier for members in Petakom club to share information each other.

**Literature Review of Library System**

Library is regarded as the brain of any institutes, of course many institute understand the importance of the library to the growth of the institute and their esteem users which we categorically call the students. An integrated library system, also known as a library management system (Adamson et al., 2008) is an enterprise resource planning system for a library, used to track items owned, orders made, bills paid, and users who have borrowed.

The Library Management System is a Library Management software for monitoring and controlling the transactions in a library (Ashutosh and Ashish., 2012). Library Management System supports the general requirement of the library such as the acquisition, cataloguing, circulation and other sections. Before the advent of computer in modern age there are different methods of keeping records in the library. Records are kept in the library on shelves and each shelf are labelled in an alphabetical or numerical order, in which the categories of books available are arranged on different position on the shelves and as well are recorded on the library manuscript and when any book is to be referenced the manuscript is being referred to, to know the position of such required book by the person that requested for the book. After the invention of computer different researchers have carried out various approach on an automated library management system in which this project is as well all about.

The first library management system to be reviewed is the KOHA library management system. The original implementation, KOHA functionality has been adopted by thousands of libraries worldwide, each adding features and functions, deepening the capability of the system. With the 3.0 release in 2005, and the integration of the powerful Zebra indexing engine, KOHA became a viable, scalable solution for libraries of all kinds. LibLime KOHA is built on this foundation. With its advanced feature set, LibLime KOHA is the most functionally advanced open source Integrated Library System in the market today.

The major setback of this Library Management System is that it is a web based and as a result it is not security conscious because hackers could have the database hacked and access or modify the information of such user.

Another Library Management System is the Capital’s library software with the following benefits Increases support available for staff and users in any modern library service, provides efficiency, innovative system that’s saves library time and improves the user experience (Tosin, 2015).

**Library Management System**

According to Kumar, et. Al (2014), Library Management System is a project which aims in developing a computerized system to maintain all the daily work of library. This project has many features which are generally not available in normal library management systems like facility of user login and a facility of teachers’ login. It also has a facility of admin login through which the admin can monitor the whole system. It also has facility of an online notice board where teachers can student can put up information about workshops or seminars being held in our colleges or nearby colleges and librarian after proper verification from the concerned institution organizing the seminar can add it to the notice board. It has also a facility where student after logging in their accounts can see list of books issued and its issue date and return date and also the students can request the librarian to add new books by filling the book request form. The librarian after logging into his account i.e. admin account can generate various reports such as student report, issue report, teacher report and book report. Overall this project is being developed to help the students as well as staff of library to maintain the library in the best way possible and also reduce the human efforts.

**Open Source Library Management System**

According to Morshed (2008), BRAC University’s Ayesha Abed Library is not equipped with adequate software, which can access books from different branched, and sub-systems within BRAC University itself. This proves to be a problem for students and people within BRAC who could benefit within BRAC University. The present software only provides a database for existing books available or not within this single library. What is therefore required is such software that can provide access and information of all the other books, articles and journals present within BRAC. Now such software does exist named KOHA, which provides the abovementioned benefits. However, KOHA needs to be modified, customized and made compatible for BRAC University, in order for the student and employees of BRAC to use and benefit from it. This thesis paper aims to analyze KOHA and thereby provide a customized version for BRAC University.

**Web-based Library**

According to Kamel and Hassan (2012), the designed work is a website that is an interface for the library to able researchers to access the library and searching easily, and the ability to borrow different kinds of documents online, In addition to that, the system facilitated the job of the librarians and the work became easier by keeping the data (books, theses, the borrowing information and user information) stored electronically, and accessing them is much easier in any time, and that led to time consuming. It is easier to find a book and access it, now it is able to follow up the operations of borrowing and late follow-up elements, facilitate the process of inventory where they can now begin in the inventory without disrupting the activity of the library borrowing.

The purpose of this project is to build an integrated system for the central library in order to facilitate the work of the Central Library to store data books, thesis, names of staff and users. It also facilitates the search and borrows books by users using the Internet. With the availability of any computer connected to the network, the reader can access the library so easy, without needing any installation of any application; any internet explorer can be enough for exploring the library. The site contains both English and Arabic Interfaces. And this work divided the users of this site in to three types. The first type is the Director; the director that is responsible of the site is the only one who has the authority to add employees in addition to all other privileges. The second type is the employee, he will have the right to add a book or a thesis or user, the third type is the ordinary User, he can login to the site and conduct the search on a book or thesis and asked borrowed books online.

**Web-based Digital Library Management System**

As the number of documents in digital library grows, it becomes increasingly difficult to store, manage the large amounts of documents and find requested relevant documents by users. A Web based Digital Library Management System (DLMS) was designed for this purpose. It helps to create unlimited quantity of digital information and make it available to the world in parallel. The system is designed to acquire research materials for the institution and then publish it to users in their remote areas. The design parameters are Java Programming language, PHP and HTML; Database type: MYSQL. It is designed as an interactive and content management system. The content management system deals with data entry, validation and updating while the interactive system deals with system interaction with the users.

A digital library is a library in which collections are stored in digital formats (as opposed to print, microform, or other media) and accessible by computers. The digital content may be stored locally, or accessed remotely via computer networks. A digital library is a type of information retrieval system. In the context of the Delos, a network of excellence on digital libraries, and dl.org, a coordination action on digital library interoperability, best practices and modeling foundations, digital library researchers and practitioners produced a digital library reference model which defines a digital library as; a potentially virtual organization, that comprehensively collects, manages and preserves for the long depth of time rich digital content, and offers to its targeted user communities specialized functionality on that content, of defined quality and according to comprehensive codified policies.

Therefore, a Web Based Digital Library Management System is software designed for collection of digital/research material, storing them, and making available to users in parallel via the internet. In this thesis, a web-based digital library management system will be discussed, designed and implemented. The paper also contains a digital library write up which introduces the three types of relevant systems, i.e. Digital Library (DL), Digital Library System (DLS), and Digital Library Management System (DLMS). It describes the main concepts characterizing these systems, i.e. organization, content, user, functionality, quality, policy and architecture. It introduces the main roles that actors may play within digital libraries, i.e., end-user, manager and software developer. Finally, it describes the reference frameworks needed to clarify the DL universe at different levels of abstraction, i.e. the digital library reference model and the digital library reference architecture (Tochukwu, et. Al, 2015).

**Computerized Library System**

Now, in our society all over the world technology is the most important advancement, a necessity in bringing about progress as we move along in this computerized world. These changes in effect make man’s life easier and more convenient. The relationship between the library and computer is constantly changing that the use of computer contributes to the way man learns and communicates. It easy in this world to strive for changes and since library is no different from any firm and institution, considering the use of computer to perform a given task will be efficient. Librarians have the responsibility not only to know about the ways in which libraries will be managed using techniques of computerized, but also to be aware of the changes that computerized can bring to the library services in the near future (Grace, 2011). Traditionally, library systems are implemented manually. Forms are given to Librarian and they fill them of using pens. Afterwards, the school administrators process them manually and complied on large bulky file cabinet. Indeed, the manual Library system is very costly, time consuming and tedious. The primary complaint of school administrators with this system is the tiresome task of searching through records just to verify your query data. The fast phased of technology attributed a lot to the improvement of the library system. Technology enabled software developers to computerize the library system. The automated library system helped the academe greatly. Library, transactions and queries can be created in a single click (Doble, 2012).

**Computerized Library System for Montessori School**

According to Alcantara, et. Al, (2011), a system is a network of interdependent components that work together to try to accomplish the aim of the system. A system must have aim. Without the aim, there is no system. In this so-called computer age, almost all people from various ages know how to use computer. Some uses it for educational purpose, communication online games and most especially in Business and Transactions. With the use of computer and knowledge of a programmer they can build a computer-based system. And one of these is Library System of a School. Library systems are in demand nowadays. It can make the librarian’s work more manageable and accurate compared to a manual system. It is important to a school to have an effective and efficient library system not only to accommodate large number of books, but also to make the updating and borrowing, returning and organizing of book records. Through its use, it can improve the accessibility of records, and make the librarian’s tasks more manageable.

After the researchers studied some schools’ Library processes and surveyed some students and school employees, the researchers found that there are most schools still use Manual library system. A prevalent finding is that these schools encounter problems in the filing and retrieval. One of these schools is Sta. Monica De Minalin Montessori School.

Recent advance in library technologies and processor have transformed the contemporary libraries to a modern information center. Library trends are clearly toward the idea of making information available and quickly reaching the public. Thus, the researchers proposed for the computerization of the library of Sta. Monica De Minalin Montessori School.

**Computerized Library System for F.P. Felix National High School**

According to Lalisan, et. Al, (2015), a Library Computer System is the software used to catalog, track circulation and inventory a library’s assets. It is intended for home, church, private enterprise or other small to medium sized collections. It is an integrated library, used to track information of the borrowed books, the newly acquire books and the information of the borrower, the information of penalties and magazines, etc.

A Library System usually comprises a relational database, software to interact with that database, and two graphical user interface. Most integrated library system separate software into discrete programs call modules, each of them integrated with a unified interface. Examples of modules might include cataloging, circulation, serials and the OPAC or public interface for users.

An Online Public Access Catalog or OPAC or simply Library Catalog is an online database of materials held by a library or group of libraries. Users search a library catalog principally to locate books and other material physically located at a library.

**Advantages of Computerized Library System**

The days of the old card catalog are gone--it's been replaced by computers, both inside and outside the walls of the library. In the past 50 years, automation has had a profound effect on both the work of the library staff and on the amount of information available to library patrons. Automation of acquisitions, cataloging, circulation and patron catalogs has made all parts of the library structure faster, more accurate and more accessible.

**Structure and Automation**

All libraries, large or small and regardless of type, perform the same functions of purchasing, cataloging and loaning materials. Libraries are very record-intensive; that is, they must maintain acquisition records and bibliographic data of many specific materials. They also must record multiple transactions to keep track of each patron's and material's circulation status. By inputting all library data into one central database, record maintenance is both faster and more accurate.

**Decentralized Access of the System**

When libraries first began applying automation to their structure, it was not unusual to automate only one function, such as acquisitions or circulation, or to have similar but multiple databases for different functions. Advances in library automation software now allow users of each library function--whether staff or patron--to access the same database. This means that updates to the database are seamless and accurate. It is common today for library patrons to be able to not only access a library's catalog, but to perform transactions that previously required the assistance of library staff such as placing holds, renewing materials or setting up an interlibrary loan, all from their home computer.

**Quick, Accurate Updating of the System**

Although a material's bibliographic data needs to be entered only once, every check-in and check-out of each copy must be recorded. Such work is repetitive and time-consuming; automating circulation systems is a time-saver for both staff and patrons. Many libraries now have free-standing check-out and check-in kiosks, allowing patrons to quickly process their own loans.

**Standardization of Systems’ Data**

Libraries have long sought to maintain common standards for cataloging and subject classification. With the advent of automation, the MARC (machine readable cataloging) format has provided both national and international standards for how catalog records are communicated from one machine to another. This, together with another important library automation standard called "linked systems protocol," essentially allows library users to effortlessly access not only their own library's records but the records of many remote library systems.

**System Data Requirements**

The Library Management System shall be required to maintain information about its users and books. It shall store databases for students, teachers and books, employee books. The student database stores information about a student's roll no, name, address, course and year. The book database stores information about a book title, author, publisher, cost, bill number, year of publishing and pages. The teacher database stores information about a teacher's id, name, department, and designation, address and telephone number.

**Manual Library System**

According to UKessays (2015), the days of the old card catalog are gone--it's been replaced by computers, both inside and outside the walls of the library. In the past 50 years, automation has had a profound effect on both the work of the library staff and on the amount of information available to library patrons. Automation of acquisitions, cataloging, circulation and patron catalogs has made all parts of the library structure faster, more accurate and more accessible.

Manual operating systems are vulnerable to human error. For instance, a librarian who misfiles a borrower's records or indexes a book incorrectly slows down the process and wastes employees' time. Manual systems are also slow to operate. Instead of using a computer to issue and take back books, locating and updating a card index is slow and laborious. Manual systems are unable to store large amounts of data efficiently. With manual systems staff spends a lot of their time on mechanical, clerical tasks rather than liaising with library visitors.

Manual systems in libraries struggle to cope with the recent explosion in information requests, many of them about online resources. Manual systems find it hard to cope with the volume of borrowers' inquiries about books and research information. On a simple level, locating a precise book within the local library system is time-consuming without a linked computer network. On another level, meeting an inquiry about a precise online resource becomes almost impossible.

With a manually operating system librarians rely on regular contact with their members and generally communicate by mail. By contrast, an automated system allows librarians to send emails and enables borrowers to send inquiries and renew books via a website. Automated IT systems also enable librarians to list up-to-date information on a website such as events and changes to opening hours.

Librarians find it difficult to offer a wider range of new services with a manual library system. For example, a library can put its catalog on the Web allowing readers to access it remotely; with a manually system members have to visit or telephone the library to find this information.

**Transforming a Paper-Based Library System to Digital**

According to Sherzad (2010), resourceful libraries have long attracted knowledge-seekers and have played an important role in education and research. With the astonishing advances in science and technology, traditional libraries have not remained unaffected and the concept of digital library has emerged and caused a revolution in these old institutions. A digital library can provide access to many of the information networks around the world, which is a necessary component of almost any research experience today. Considering the facilities associated with a digital library, gradual replacement of traditional libraries by digital ones appears to be inevitable. As an important step in enhancement of education in Afghanistan, the concept of digital libraries must be introduced and integrated into the rapidly evolving educational system. This thesis addresses the challenges existing in Afghanistan university libraries. A solution for each challenge is defined by introducing digital and automated systems and finally a scheme is provided for switching from a paper-based library system to a digital library system. In physical or traditional libraries, access to books is only possible as much as the number of existing copies allow, and next visitors cannot use them until they are brought back; in contrast access to resources of a digital library are available for unlimited number of users. Using of traditional libraries is restricted to certain days of week and certain hours of day, but in digital libraries there is no time limitation and at any time the system can be used.

Physical access to the library for people in remote areas could not be accomplished and this makes it difficult for anybody who lives away from physical libraries to use them for educational, research and study purposes but in digital libraries distance has no meaning, anyone in any place who has access to Internet can use the resources. In physical libraries risk of loss of documents and resources due to negligence or mistake exists and sometimes it may even be impossible to compensate such losses, but this concern does not exist in digital libraries and the documents can be kept in a secure way. The aforementioned benefits also apply to the digital index and not only to digital library. For instance, in traditional libraries the book-registration log can be used by one user at a time and also it is not available remotely and risks for loss of it exist as well. Overall, considering the problems with paper-based systems, and the benefits of computerized systems, it is decided to implement such a system to overcome some of the aforementioned difficulties and offer services with ease and efficiency instead.

**Review of Library Professionals in Developing Countries**

New tools of information technology have absolutely changed the role & responsibilities of librarians. A number of studies have been conducted to explore the problems faced by librarians. Given section reviews the studies conducted at International level in general and particularly in developing countries to investigate the problems confronted by the librarians.

Adomi and Anie, (2006) in their research on computer literacy skills of professionals in Nigerian University libraries concluded that most of the professionals do not poses high level of computer skill and their use of computer and technology is still maturing. They recommended that library management and leaders should organize and offer in-house computer training programs for librarians and enough computers should be provided in this regard.

Johnson, (2007) viewed library and information science education in developing countries. He concluded that LIS programs in developing countries continue to suffer from lack of financial support by governments. Rahman, Khatun and Islam, (2008) reviewed the library education in Bangladesh. The study found that majority of institutions in Bangladesh do not have well-equipped computer labs or sufficient numbers of computers for students. A sufficient number of classification and cataloguing tools (DDC, LC, Sears list of subject headings for practical were not present. Many institutions either have no library or inadequate collection of textbooks. Professional’s status was also found very low, low pay scale and limited opportunities for promotion. In Nepal, Siwakoti, (2008) found that there was no government agency to control, monitor and evaluate the school libraries activities. There was lack of awareness programs, budgetary constraints, inadequate space, inadequate library materials, lack of trained and skilled manpower and lack of appropriate government policy and lack of information literacy.

Ademodi and Adepoju, (2009) investigated the computer skill among librarians in academic libraries on Ondo and Ekiti State in Nigeria. It was found the shortage of computers and computer skills among professionals. The study recommended that more attention and funds should be provided for training and procurement of ICT infrastructure in Nigerian University libraries. For computerization purpose, library administration should solicit funds and assistant from foreign agencies and foundations who are interested for the cause.

Dasgupta, (2009) searched out that in India there is non-existent of norms and standards for the education of librarians. Problems for Indian librarians discovered in his study were emergence of new Library Integrated System schools, insufficient faculty strength, and lack of accreditation bodies, lack of proper library facilities, inadequate physical facilities, little attention for selection criteria, and lack of apprenticeship programs. Study suggested that the Government of India should play a leading role in promoting LIS education in India, by creating more job opportunities for LIS professionals and removing disparity in pay scales among LIS professionals. In Iran Gavgani, Shokraneh and Shiramin, (2011) concluded that librarians do not have traditional skills and sufficient background knowledge to meet the changing needs of their customers. They need to be empowered by new skills and information before going to empower their patrons. So there must not be a gap between librarian’s professional/technological knowledge and their societies informational need that to be answered by librarians (Sherzad, 2010).

**Automated Library Management System**

Library is a fast growing organism. The ancient methods of maintaining it are no longer dynamic and efficient. For expeditious retrieval and dissemination of information and better service for the clientele, application of modern techniques has become absolutely indispensable. A properly computerized library will help its users with quick and prompt services. Library automation refers to mechanization of library housekeeping operations predominantly by computerization. Objectives of this study.  To develop and updated database of books and other resources of the school of Chemistry Library, Bharathidasan University. to implement automated system using Koha Library Integrated Open Source Software to carry out the charging and discharging functions of the circulation section more effectively to provide various search options to know the availability of books in the Library to generate the list of books due by a particular member and also the overdue charges. Koha is an integrated software system with all the required models for small to very large libraries. It is found that this automation projects will serve as a model for any library. Being an open source, any Library wanted to go for automation for their library housekeeping operations can make use of this software (Neelakandan, et. Al, 2010).

**Citation**

A citation is the way you tell your readers that certain material in your work came from another source. It also gives your readers the information necessary to find that source again, including information about the author, the title of work, the name and location of the company that published you the copy of the source, the date your copy way published, and the page numbers of the material you are borrowing.

**Citation Styles**

A citation style dictates the information necessary for a citation and how the information is ordered, as well as punctuation and other formatting. There are many ways of citing resources from research. The citation style sometimes depends on the academic discipline involved like APA (American Psychological Association) which is used by Education, Psychology, and Sciences. Another one is MLA (Modern Language Association) which is used by the Humanities and the Chicago/Turabian Style which is generally used by Business, History, and the Fine Arts.

**Web Development**

In the study of Jansen (2010) as cited by Baria, et. Al (2014) that web development also known as website development broadly refers to the tasks associated with developing websites for hosting via intranet or internet. Web development is the coding or programming that enables website functionality, per the owner’s requirements. It mainly deals with the non-design aspect of building website, which includes coding and writing mark-up.

The term Web development is used for several different activities which are linked to the developing of a website especially for the WWW which is the World Wide Web or also called as an intranet.

The Web development strategies include the business of the e-commerce, the web designing, the web content development, the client and server-side coding and also the configuration of the web server.

**Database Systems**

According to the study of Hans-Petter Halvorsen (2016), a database is an integrated collection of logically related records or files consolidated into a common pool that provides data for one or more multiple uses. One way of classifying databases involves the type of content, for example: bibliographic, full-text, numeric, and image. Other classification methods start from examining database models or database architectures.

The data in a database is organized according to a database model. The relational model is the most common.

A Database Management System (DBMS) consists of software that organizes the storage of data. A DBMS controls the creation, maintenance, and use of the database storage structures of organizations and of their end users. It allows organizations to place control of organization-wide database development in the hands of Database Administrators (DBAs) and other specialists. In large systems, a DBMS allows users and other software to store and retrieve data in a structured way.

Database management systems are usually categorized according to the database model that they support, such as the network, relational or object model. The model tends to determine the query languages that are available to access the database. One commonly used query language for the relational database is SQL, although SQL syntax and function can vary from one DBMS to another.

A great deal of the internal engineering of a DBMS is independent of the data model, and is concerned with managing factors such as performance, concurrency, integrity, and recovery from hardware failures. In these areas there are large differences between products.

**Database Management**

According to Tatum and Harris (2014) as cited by Barja, et. Al (2014), that one of the oldest components associated with computers is the Database Management System or DBMS, is a computer software program that is designed as the means of managing all databases that are currently installed on a system hard drive or network. Different types of database management systems exist, with of them designed for the oversight and proper control of databases that are configured for specific purposes.

**MySQL**

Jansen (2014) as cited by Baria, et. Al (2014), describes MySQL as a free- software engine originally developed and first released in 1995. It is very popular for web-hosting applications because of its overabundance of web-optimized features like HTML, data types, its robustness and stability, and because it is available for free. It is part of the Linux, Apache, MySQL, PHP(LAMP) architecture, a combination of platform that is frequently used to deliver and support advanced web applications. MySQL runs the back –end databases of some famous websites such as Wikipedia, Google and Facebook.

**XAMPP**

Dvorski (2007) as cited by Barja , et. Al (2014), explained that XAMPP is a small and light Apache distribution containing the most common web development technologies in a single package. Its contents, small size, and portability make it the ideal tool for students developing and testing applications in PHP and MySQL. XAMPP is available as a free download in two specific packages: full and lite.

**PHP**

According to w3school.com, PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. It is a widely-used, free, and efficient alternative to competitors such as Microsoft's Active Server Pages (ASP).

PHP is used to create highly stylized websites because it is one of the most widely server-side scripting languages used for the soul purpose of designing websites. It is just like HTML and is used in the same way. PHP can be used in the Windows NT and also in the versions of NT, together with that PHP can be made to run as a CGI and can be built as a binary and also an Apache module. When the PHP is built as the Apache module it is very speedy and lightweight, and so it can be easily used to return results very quickly without any overhead process creation

**HTML**

According to Waterman, Joseph and Wynn (2014) as cited by Baria, et al (2014), Hypertext Mark-up Language is a type of computer language that is used to create pages that can be posted on the internet or sent via email. It is considered to be a relatively simple language although it might seem complex to many people.

**CSS**

According to Kyrnin (2014) as cited by Baria, et. Al (2014) that Cascading Style Sheets (CSS) was made for developers to define the look and feel of their web pages. It is a simple mechanism for adding style such as fonts, colors, and spacing to web documents. It was made to separate the design and layout work from html, which will focus on mark-up of the content.

**Adobe Photoshop**

According to Haughn (2015), The software provides many image editing features for [raster](http://whatis.techtarget.com/definition/raster-graphics) ([pixel](http://whatis.techtarget.com/definition/pixel)-based) [images](http://whatis.techtarget.com/definition/image) as well as vector graphics. It uses a layer-based editing system that enables image creation and altering with multiple overlays that support transparency. Layers can also act as masks or filters, altering underlying colors. Shadows and other effects can be added to the layers.

Photoshop actions include automation features to reduce the need for repetitive tasks. An option known as Photoshop CC (Creative Cloud) allows users to work on content from any computer.

Adobe Photoshop is the predominant photo editing and manipulation software on the market. Its uses range from full featured editing of large batches of photos to creating intricate digital paintings and drawings that mimic those done by hand**.**

**Adobe Reader**

Adobe Acrobat Reader DC software is the free global standard for reliably viewing, printing, and commenting on PDF documents. It's the only PDF viewer that can open and interact with all types of PDF content, including forms and multimedia.

**Evaluation tools**

**ISO 9126**

An international standard for the evaluation of software. The standard is divided into four parts which addresses, respectively, the following subjects: quality model; external metrics; internal metrics; and quality in use metrics. ISO 9126 Part one, referred to as ISO 9126-1 is an extension of previous work done by [McCall (1977), Boehm (1978),](http://www.sqa.net/softwarequalityattributes.html) [FURPS](http://www.sqa.net/index.htm#furps) and others in defining a set of software quality characteristics.

**Functionality**

A set of attributes that bear on the existence of a set of functions and their specified properties. Functionality is the essential purpose of any product or service. The functions are those that satisfy stated or implied needs.

**Reliability**

Once a software system is functioning, as specified, and delivered the reliability characteristic defines the capability of the system to maintain its service provision under defined conditions for defined periods of time.

One aspect of this characteristic is *fault tolerance* that is the ability of a system to withstand component failure. Reliability bear on the capability of software to maintain its level of performance under stated conditions for a stated period of time.

**Usability**

Usability only exists with regard to functionality and refers to the ease of use for a given function. A set of attributes that bear on the effort needed for use, and on the individual assessment of such use by a stated or implied set of users.

**Efficiency**

A set of attributes that bear on the relationship between the level of performance of the software and the amount of resources used, under stated conditions. This characteristic is concerned with the system resources used when providing the required functionality.

**Maintainability**

A set of attributes that bear on the effort needed to make specified modified modifications. The ability to identify and fix a fault within a software component is what the maintainability characteristic addresses. In other software quality models this characteristic is referenced as supportability.

Maintainability is impacted by code readability or complexity as well as modularization. Anything that helps with identifying the cause of a fault and then fixing the fault is the concern of maintainability.

**SYNTHESIS**

Data gathering allowed the researchers to gain and learn more about their chosen topic study. The researchers conducted studies for the success of the project. The review of related literature and studies gave insights and outlook for an improved understanding of the research undertaken. In addition, the researchers truly believe that data gathering was necessary in creating and developing a certain project. The researches about the management systems helped the researchers to focus on the would-be-capabilities of the project.

The researchers identified the goals in creating a functional system, the ideas and materials of making an effective research management system and the possible requirement for a project. The different research management system – arXiv.org the e-Print archive, ProQuest the Databases, EBooks and Technology Research and University of California the world class public research for and by the university also helped the researchers to come up with a very good idea for the concept and features of the project.

UMak Library supports the research of students, faculties and even the visitors that more likely a researcher or group of students who systematically searching for data and facts in their topic study. UMak Library provided a certain area or place for theses wherein, researchers manually looking for thesis documents. The developed Thesys: A Research Management System University of Makati used the researches for the quality of the system and to improve the manual system in the library in terms of thesis searching.

The background, history, description and capabilities of existing open source technologies were also discourse to support the development of the system. There were various readings as discussed above, that supports the requirement of an effective research. The ISO standard 9126 was also mentioned to depict the criteria used in evaluation during the testing phase of the system.

**CONCEPTUAL MODEL OF THE STUDY**

In the basis of the foregoing concepts, theories and findings of related literature and studies presented and insights taken from them, a conceptual model is developed as shown below:

**INPUT PROCESS OUTPUT**

**Knowledge Requirements**

1. System Designing
2. Website Programming
3. Programming Language
4. Knowledge in MySQL
5. Content Management
6. Research Management System

**Software Requirements**

1. XAMPP
2. Sublime Text 3
3. Web browser such as Google Chrome and Mozilla Firefox
4. Adobe Photoshop
5. Adobe Reader

**Hardware Requirements**

1. Desktop / Laptop
2. Mobile / Smart Phone

Thesys: A Research Management System University of Makati

Design

Development

Testing

EVALUATION

**Figure 1. Conceptual Model of the Study of Thesys: A Research Management System University of Makati**

The input consists of the knowledge requirements on system designing, website programming, programming language, knowledge in MySQL, content management and research management system. This includes the knowledge of the researchers to develop the project and also, it included basic ideas a user needed to know in able to understand easily the developed project research.

On the other hand, the software requirements of the system support the following platform: XAMPP, Sublime Text 3, any web browser such as Google Chrome and Mozilla Firefox, Adobe Photoshop and Adobe Reader for documents in PDF. While, the hardware requirements consist of Desktop/Laptop for the developed project. It includes the technical requirements of the developed project. A computer is required to run the system and to locally host the system. The system will be run through intranet in University of Makati Library. Mobile Phone is also required for scanning of document and conversion of image to PDF using the third party app.

The process stage is composed of Design, wherein, the researchers designed the system’s features, Development or the coding phase for the features to be functional and Testing to test the developed system if the system reached the expected results. Accomplishing these processes would produce the expected output Thesys: A Research Management System University of Makati. The system will be evaluated by the users based on its functionality, reliability, usability, efficiency and maintainability. The process of evaluation is needed to measure the effectiveness and importance of the project.

**OPERATIONAL DEFINITION OF TERMS**

To better understand the conducted study, the following terms were operationally defined:

**Thesys** A Research Management System University of Makatiwas capable of managing the records of theses and helps to have a faster flow of process in theses searching and reviewing of related studies. Users or researchers would have a great benefit from this.

**System** is a set of related components or procedures that produces certain results that would organize the data with regards to the theses in University of Makati.

**Web browsers** display a web page on a monitor or mobile device. Web browsers coordinate the various web resource elements for the written web page, such as style sheets, scripts and images, to present the web page of the Thesys.

**MySQL** for database management system that was used for Thesys: A Research Management System University of Makati.

**Database** is a collection of information that is organized so that information or data in Thesys could easily be accessed, managed, and updated. In one view, databases can be classified according to types of content: bibliographic, full-text, numeric, and images.

**Reports** or the documents and statistical data regarding the system such as the most viewed and the most downloaded thesis documents in Thesys.