Development of postgraduate school's digital library as a repository of digital collections

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Abstract. The development of information and communication technology offers advantages for library management. The ease of access to the internet makes it easy for us to access the library’s digital collection without any time and space limitations. Currently, many digital libraries have been developed in various universities to complement the existence of conventional libraries. This digital library's presence can be a solution for traditional libraries to overcome existing limitations and constraints. This current study discusses how Universitas Negeri Semarang's postgraduate school digital library is developed. The waterfall method and was used to guide systems development. This paper outlines how the digital library is used to give a portrait to the users of some features offered.

1. Introduction
Libraries are a vital part of an educational institution and a place to store and search for information. The existence of conventional libraries is currently considered inefficient as information technology advances [1]. The inefficiency of conventional libraries causes libraries to become less popular. Some of the reasons for the unpopularity of conventional libraries are the unattractive collections owned by libraries, for example, collections that are not up-to-date or the number of collections is limited; less professional service; inadequate facilities; and several other reasons.

The development of information technology and the internet has brought a paradigm shift in library management and offers easy access to information without any limitations in space and time. Library automation is increasingly being implemented in various higher education institutions. This automation of libraries has also led to the emergence of library digitization, also known as e-libraries. Digital libraries generally include digital collections and services such as accessing, tracking and analyzing digital collections [2]. The presence of this digital library can be a solution for conventional libraries to overcome existing limitations and constraints.

Universitas Negeri Semarang (UNNES) has a library located on the main campus in Sekaran, Gunungpati, Semarang. This library is a smart library where library management has used information technology, commonly known as library automation. UNNES itself has several campuses spread across several locations. For example, the postgraduate campus located in the Kelud area, Semarang. A postgraduate campus separated from the main campus makes postgraduate students who want to find library collections have to spend time on the Sekaran campus. The postgraduate campus itself does not yet have an adequate collection of library resources that its students can use. Therefore, in this current study, a digital library will be developed to improve digital collections management and help postgraduate students find relevant literature sources to support their study process. One research question is posed: How to develop UNNES postgraduate digital library?
2. Digital library

The rapid development of information and communication technology (ICT) has revolutionized access to information in all areas of life, including education. Currently, libraries have benefited greatly from ICT initiatives and applications, thus changing how libraries were previously operated conventionally [3].

Digital libraries are becoming popular nowadays. Digital libraries are considered as being able to provide easy access for users to get electronic sources without the limitations of time and space [4; 5]. There are many terms for digital libraries, such as electronic libraries and virtual libraries. These terms are often used interchangeably. Sun and Yuan [6] define a digital library as "a collection of digital objects (text, video and audio) along with methods for access and retrieval, [as far as users are concerned] and also for selection, organization, and maintenance" (p.13). A digital library is a collection of informal information stored in a digital format and can be accessed via the internet network and related services. A digital library is not just a digital collection managed by a management information system. But it also includes a series of activities covering collections, services, and people who fully support the life cycle of how digital information is created, distributed, used and presented into knowledge. Several studies on digital libraries have been carried out [7; 8; 9; 10].

Kaur and Gaur [10] highlighted collection development policies to build a library used as a reference for the academy. Kaur and Gaur said that libraries need to redefine their collection development policies to select, acquire, preserve, and distribute their library collections. In a digital environment, libraries must also maintain the infrastructure needed to store digital collections so that libraries can provide the best service and adequate library resources for their users.

3. Methods

This current study outlines the development of a digital library system. The waterfall approach was used to develop the digital library system. The waterfall model can be seen in Figure 1.

![Waterfall model in the development of an information system](image)

The waterfall method is one of the classic life cycles in software development. This method describes a fairly systematic as well as a sequential approach to application development. The following are the steps that were carried out in the development of a digital library:

1. **Requirements gathering and analysis** — Gathering all requirements completely, then analyzing and defining them so that all the desired needs in the development of a digital library were met. This phase was done completely in order to produce a complete design.

2. **System design**, in this stage, the developer produced an overall system and determined the flow of the digital library system into a detailed algorithm.

3. **Implementation** is the stage where the entire design is converted into program codes. The resulting program code is still in the form of modules that will be integrated into a complete system.


4. **Integration and testing** — At this stage, modules created were combined, and this test was carried out to determine whether the digital library system created is in accordance with its design and the functions of the digital library system have errors.

5. **Verification**, at this stage, the client or user was asked to test the system to see if the system is in accordance with what they have agreed to.

6. **Operation and maintenance** — At this stage, the system's installation and maintenance process were carried out as approved between user and developer.

### 4. Results and discussion

In this research, there are several considerations in the results of the digital library system development as follows: (1) there are three levels of users in this digital library application, namely super admin, operator, and library user; (2) currently, the contents of the digital library are still in the form of electronic books, journals, and scientific articles; and (3) there are two methods that can be used by librarians, namely Borrow and Download.

#### 4.1. User Levels

This subsection describes three user levels, namely super admin, operator, and library.

1. **Super Admin**
   
   This is a level user who has access to all the features in the system. Super admin is responsible for monitoring the digital library to make sure that the digital library is run properly. In addition, the super admin has the authority to manage digital library content and change features in the application and manage the maintenance process.

2. **Operators**
   
   The operator level has several functions that can be used in managing the contents of the system, such as managing the collections, managing the borrowing process, and viewing statistics.

3. **Library users**
   
   The library level is the general level for users who register themselves in the application. The application will ask for some data for user identification. The library features are similar to the library's authority in general, such as borrowing books, download books, and searching for books.

#### 4.2. Digital library management

The operator and super admin can carry out the management of the digital library. In the current system development, either operator or super admin has one different feature, namely the user management feature, where it is only found in the super admin view. Meanwhile, the rest features are the same for both the super admin and operator. The following are the features of the digital library system.

4.2.1. **Dashboard.** The dashboard page contains a statistic of the digital library system. The statistics illustrate brief data regarding the total files or materials in the system, total users, total collection borrowed, and total downloads. This page can be seen in Figure 2.

![Figure 2. Dashboard page](image)

In addition, this dashboard page also shows what collections have been recently uploaded and what collections are most frequently borrowed by users.
4.2.2. Catalogue. Catalogue page contains collection data management such as adding, editing and deleting library collections. The catalogue page is shown in Figure 3.

![Figure 3. Catalogue page](image)

4.2.3. Statistics page. The statistics page contains graphs representing statistical data from the digital library system (see Figure 4). The statistical graphs are grouped into two categories, namely library collection and user statistics. On this page, users can see the distribution of statistical charts in the digital library.

![Figure 4. Statistics page](image)

4.2.4. Author management page. This page is used for managing the authors of the collection that will be uploaded. Using this feature, the operator or super admin enables adding, editing, and deleting the authors (see Figure 5).

![Figure 5. Author management page](image)

4.2.5. The borrowing page. This page contains a log of borrowing transactions made by users. Users who have access to borrow existing collections can see the details of the collections they borrowed. They can also cancel borrowed collections. The borrowing page can be seen in Figure 6.
4.2.6. User management page. This page contains a list of registered users. Through this page, the super admin can see a list of registered users. They can also change their access authority. The page for user management can be seen in Figure 7.

5. Conclusion
In this current study, a digital library has been developed which can be used to manage library collections, such as books, journal articles and other lecture books in the Postgraduate environment of UNNES. Digital library development is carried out with an iterative model with a waterfall approach so that it is possible to easily develop it again in the future.

There are still many features that need to be developed in this digital library system, for example, the login page feature with a single sign-on and increasing the collection of postgraduate student scientific publications in digital form. Thus, the utilization of this system can be optimized. With the collection of publications produced by students, it is hoped that the library collections can become reference material for other postgraduate students.

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