

# DocTrack: A Dynamic Document Tracking System for the University of Northern Philippines

Flynn V. Castro <sup>1</sup>, Eileen Rose C. Quilon <sup>2</sup>, Arpee C. Arruejo <sup>3</sup>

**Abstract:** The International Organization for Standardization (ISO) purposely aims to standardize and transform processes into paperless transactions. Hence, all organizations must create a mechanism to standardize processes for internationalization. The newly developed DocTrack: A Dynamic Document Tracking System for the University of Northern Philippines served as the central repository of documents from the time it was created until its approval. The study used descriptive-developmental research, focusing on the prevailing condition and assessing changes over an extended period. At the same time, it used the Modified Waterfall Model because it is the most applicable software development methodology since the developer had thorough planning on implementing the system. The developed system consists of six major functionalities, which are: uploading a document for approval; tracking a document; displaying a received document; displaying documents that are pending release; displaying declined documents; and archiving documents. The researchers considered security controls and measures to safeguard the documents stored from unauthorized users. Adopting this web-based document tracking system for the University of Northern Philippines facilitates easier tracking and consolidation of documents. However, the University should also purchase the necessary equipment and set it up to support the developed system. It provides the University with a mechanism for paperless transactions.

**Keywords:** document management, paperless transactions, document tracking system, file tracking, workflow automation

## 1. Introduction

In the study of Khamdamov [1], current research states that processes can be transferred electronically using information systems. Paper is still an important information carrier, even in our increasingly electronically mediated environment. Every day, we use paper documents in our office,

---

<sup>1</sup> College of Communication and Information Technology, University of Northern Philippines, Vigan City, Ilocos Sur, Philippines  
Email: flynn.castro@unp.edu.ph

<sup>2</sup> College of Business Administration and Accountancy, University of Northern Philippines, Vigan City, Ilocos Sur, Philippines  
Email: eileenrose.quilon@unp.edu.ph

<sup>3</sup> College of Business Administration and Accountancy, University of Northern Philippines, Vigan City, Ilocos Sur, Philippines  
Email: arpee.arruejo@unp.edu.ph

Received [August 15, 2022]; Revised [November 20, 2022]; Accepted [December 2, 2022]



even when electronic versions are available. Instead of replacing paper completely, as proposed by the myth of the paperless office, new ways of better integrating paper into our daily work are needed.

All business transactions require paperwork, called source documents. These business source documents must be standardized as they are essential to bookkeeping and relevant information can be easily identified and interpreted. The source documents may serve as proof of the terms and agreements entered into by your business and other persons or organizations. For example, for a sale at a cash register, the customer receives a sales receipt, and the business or organization keeps a copy of all transactions in the register.

Mancini [2] reiterated that there are 10 fast facts about the value of document management, which are: (1) companies spend \$20 in labor to file a document, \$120 in labor to find a misfiled document, and \$220 in labor to reproduce a lost document; (2) 7.5 percent of all documents get lost, and 3 percent of the remainder get misfiled; (3) professionals spend 5-15 percent of the time reading information, but up to 50 percent looking for it; (4) the average document is photocopied 19 times; (5) there are over 4 trillion paper documents in the U.S. alone, and they are growing at a rate of 22% per year; (6) corporate users received an average of 18 megabytes of e-mail per day in 2007; (7) users send and receive an average of 133 e-mail messages per day; (8) a single fax machine costs \$6,200 per year; the average time to manually fax a document is 8 minutes; (9) the average cost to send a package via courier service is between \$8 and \$15; and (10) the cost of office space has increased by 19%. The benefits of document management are obvious, it acts to safeguard the process by providing security, automatic workflow, and auditing tools. Nowadays, governments in Australia, the UK, and the United States are implementing policies for paper reduction, and Document Management Systems are the cornerstone of such policies.

A web-based document tracking system, an in-house developed system, is developed to keep track of the movements of all types of documents, *e.g.*, letters, files, notes, and office orders [3][4]. On the website of the Department of Public Works and Highways (DPWH) [5], the Document Tracking System, also known as DoTS, was conceptualized to come up with a system that would respond immediately to queries regarding the status of the Civil Works documents and, more importantly, prompt those in charge to perform their tasks in the least possible period of time. Since the implementation of DoTS in August 2003, it has been observed that processing offices are now more conscious of the number of processing days the document is taking in them. Furthermore, aside from the transparency in operations, another benefit from DoTS is that, if before, searching for or tracing the documents was one of the most fastidious tasks that could ever be undertaken, now contractors could just simply visit the DoTS Center and all the information would be readily available, thus minimizing follow-ups. The quest for benchmarks in this information seems never-ending. According to White [6], it is very common to see that employees spend 2.5 hours a day searching for information.

Over the decades, a multitude of tracking technologies emerged. Some of them are designed for very special tasks, while others are more generally applicable. Early experiments for object tracking were mostly based on infrared or supersonic signals. The Active Badge System was developed in the late 1980s to locate its employees within its building. A few years later, Blackie *et al.* [7], who were assigned at AT&T Laboratories, claimed that a tracking and identification system that comprises a plurality of active badges (*i.e.*, carried by a plurality of carriers within a predetermined area) and a plurality of transceiver sensor stations in the predetermined area are able to communicate with the master control center. Each active badge is arranged spontaneously to transmit its unique infrared (IR) identification signal on the occurrence of an external prompt.

According to Syntactics [8], document tracking systems help in accessing, searching, editing, and managing electronic documents and files. It also helps keep track of the changes or modifications made

to the document. It further defines that since a tracking system mainly focuses on the tracking aspect, a tracking system is considered one of the key features of a document management system. Today, many organizations track their documents manually or do not have any tracking process in place [9]. The result is time-consuming searches for documents and lower productivity because of the long document tracking process, which includes the need to answer queries made through mobile phones and telephones. The benefit of an automated document tracking solution is that it leads to up-to-date, accurate document information that improves document utilization and accountability [10].

By means of a document tracking system, users are properly informed on what is happening to the document until it is approved by the head of the agency or the officer-in-charge. Navalta *et al.* [11] stated that information is considered the lifeblood of an organization. It is a critical resource in the operation and management of organizations. The timely availability of relevant information is vital for the effective performance of managerial functions such as planning, organizing, leading, and controlling. An information system in an organization is like the nervous system in the human body. It is the link that connects all of an organization's components together and provides for better operation and survival in a competitive environment [12]. Indeed, today's organizations run on information.

The University of Northern Philippines (UNP), created by virtue of Republic Act 4449, authored by then Congressman Floro S. Crisologo, is the oldest state university north of Metro Manila. It was approved on June 19, 1965, and the Act converted the Ilocos Sur School of Arts and Trades, in the municipality of Vigan, Province of Ilocos Sur, into this university. As one of the ten (10) governance initiatives of the university, it specified the modernization of facilities, with an emphasis on Information and Communications Technology (ICT), and the thrusts of the present administration for the university to be ISO certified.

Before, the staff of the different academic and administrative units followed up on documents at the Office of the President through telephone calls or personally to those units that had no telephone line. The staff will ask if their documents have already been approved by the President. This will consume the staff's time, leaving other tasks in their respective offices hanging. Also, some faculty and staff experienced difficulty going to the Office of the President to follow up on their documents since the office is located on the 3rd floor of the administration building, especially if the staff is coming from other offices that are very far from the administration building. This is a notable scenario observed at the University of Northern Philippines every time a staff member follows up on their documents. In addition, there were problems encountered in locating documents. The difficulty of sharing the documents is also a major concern. There are documents that can be shared from one area to another for accreditation purposes or for some other reason, and a staff member needs to photocopy the document but needs to wait for their turn in the long queue since not all offices in the university have been issued with a photocopier machine. Again, this will delay other tasks in the office. Problems may also arise in terms of storage and the speed at which one can access the files when needed. The issue of security may also be included. It is hard to keep track of who has used or copied which paper documents. Looking at these issues, there is a need to implement a document management system that would address these problems.

This study aimed to design, develop, and deploy a web-based document tracking system for the University of Northern Philippines. Specifically, it sought to meet the following objectives:

1. To determine the processes and procedures for tracking documents at the University of Northern Philippines;
2. To identify the requirements of the different stakeholders;
3. To describe the features of the system; and
4. To test the acceptability of the system.

## 2. Methods

This study used descriptive-developmental research. This type of research obtains information concerning the current status of the phenomenon to describe “*what exists*” with respect to variables or conditions in a situation. The methods involved range from the survey, which describes the status quo, to the correlation study, which investigates the relationship between variables, to developmental studies, which seek to determine changes over time.

The Modified Waterfall Model was used as a system model and seen as the most applicable software development methodology for a thorough planning of the development of the system. The developed DocTrack: A Dynamic Document Tracking System for the University of Northern Philippines was developed using five (5) phases, namely: Requirements, Analysis, Design, Implementation, Testing, and Maintenance.

The Modified Waterfall Model has continuous interaction with the developer and the users of the developed dynamic document tracking system. These include the following phases:

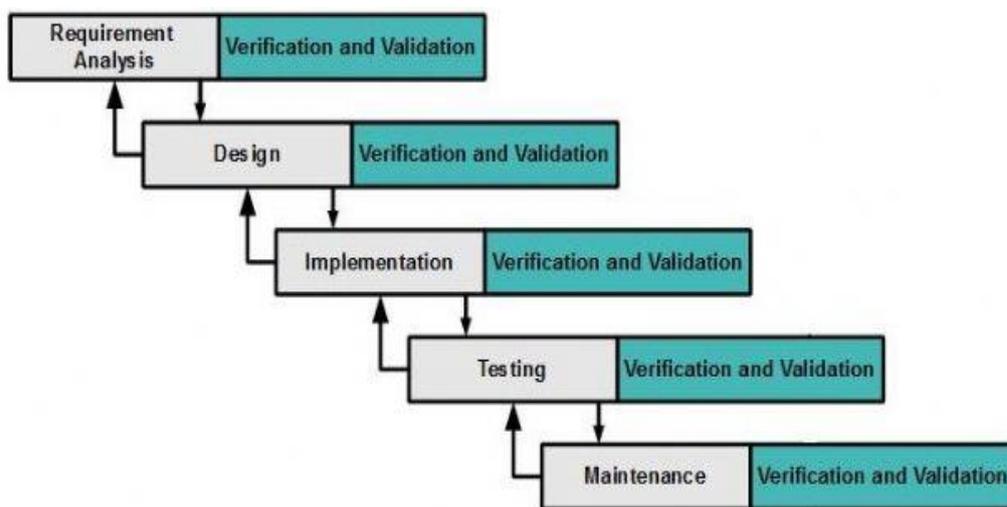


Figure 1. Modified Waterfall Model

### 2.1 Requirements Analysis

At this phase, all areas that are associated with the developed system are viewed, such as the stakeholders and the procedures involved in the operations. Interviews and observations were conducted to gather the necessary data. Consequently, the data gathered from these steps identified what functions the system would support.

#### 2.1.1 Instrumentation and Data Collection

Interviews, library research, and Internet research were done to gather the necessary data for the full development and documentation of the dynamic document tracking system.

#### 2.1.2 Sources of Data

Information from concerned stakeholders was elicited to be able to get pertinent data necessary for the analysis and identification of the functional requirements of the developed system. Pertinent data were gathered through interviews and observation in relation to consolidating necessary documents for the development of the Document Tracking System at the University of Northern Philippines. Hence,

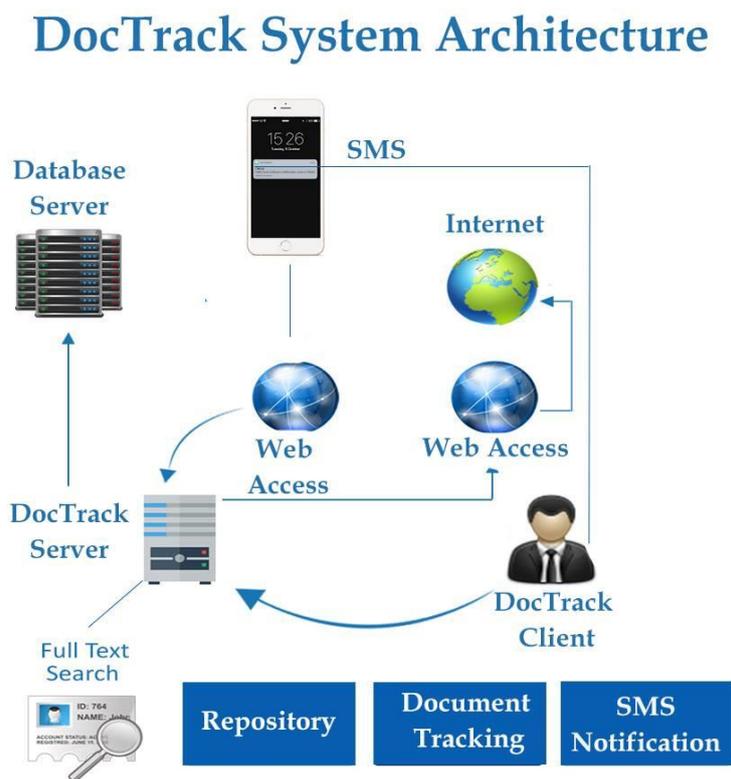
the researchers interviewed the University President, Vice President for Finance and Administration (VPFAd), Director of the University Planning and Information System Management Office, Director of the Records Office, College Deans, the Clerk assigned at the Registrar's Office, and the Human Resource Management Officer II regarding the process of tracking a document until its approval by the President or the Officer-in-Charge.

## 2.2 Design

In this phase, the hardware and software requirements were defined, the performance and security parameters were specified, the data storage containers and constraints were designed, and strategies to deal with issues such as exception handling, resource management, and interface connectivity were indicated. All the gathered data was converted so that it would be easy to interpret.

### 2.2.1 DocTrack System Architecture

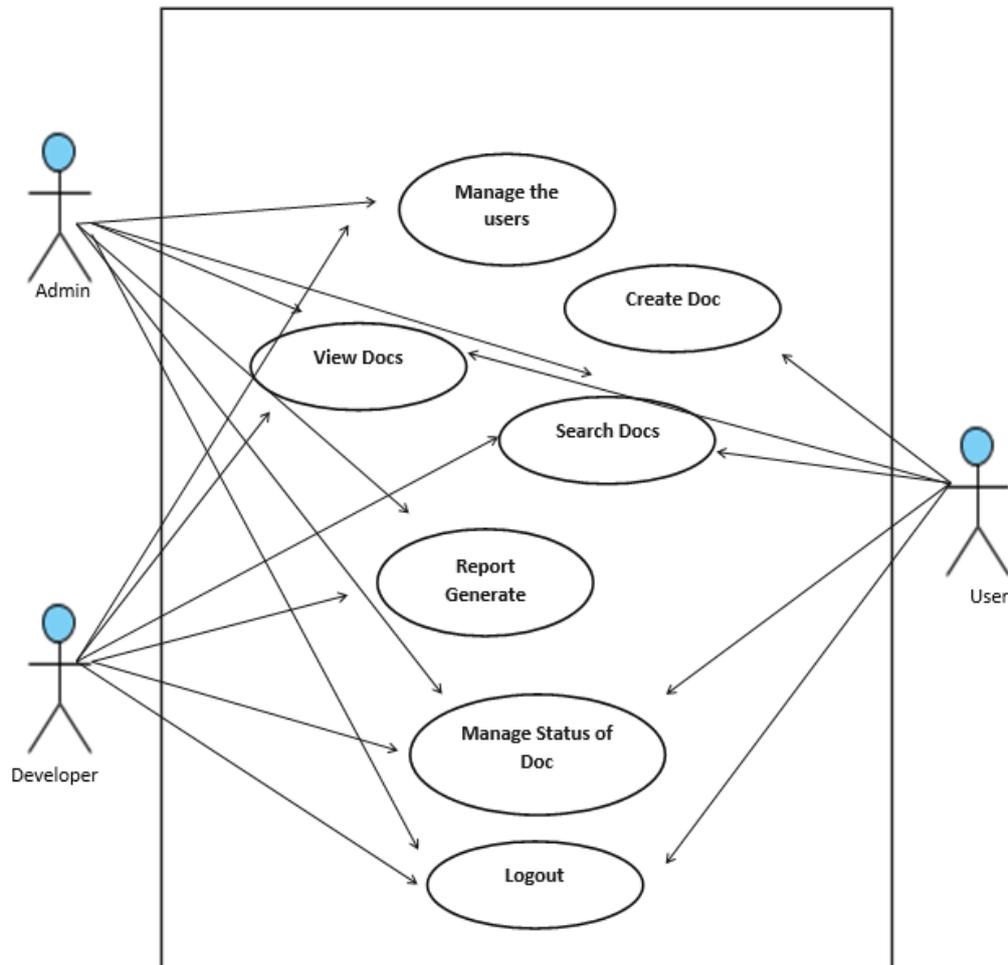
Figure 2 shows the system architecture of DocTrack, the dynamic document tracking system. The registered client can track the documents through a search mechanism feature of the developed web-based system. MySQL was utilized as the backend framework and PHP CodeIgniter as the frontend.



**Figure 2.** DocTrack System Architecture

### 2.2.2 Use Case Diagram

The Use Case diagram was used to get an overview of the system requirements, which included the involvement of the stakeholders and the process flow of the system. This is useful for presentations to management and/or project stakeholders, but for actual development, the Use Case diagram provides significantly more value as it describes the actual requirements.



**Figure 3.** Use Case Diagram of DocTrack

### 2.2.3 Database Schema

**Table 1.** DocTrack: Database Schema

*tbl\_transaction database schema*

Field Name	Data Type	Description
Tracknum	varchar(30)	Tracking number
signatoryid	varchar(10)	ID of the signatory
datesigned	date	Date signed
datereceived	date	Date received
Signed	varchar(30)	Sign the document

The database schema shown in Table 1 was used to look at the graphical depiction of the system's database structure. This defines the fields of each table and the relationships between fields and tables.

### 2.2.4 Database Instance

**Table 2.** DocTrack: Database Instance

*tbl\_declined\_information Database Instance*

tracknum	signatoryid	reason	login-id	status
DOC019	LHPL003	Test 1 document declined	LHPL002	Declined

*tbl\_doctype Database Instance*

Docid	doctype	docsignatory
Doc001	Request letter	0

The database instance depicted in Table 2 was used to manipulate the data in the database. It was used to maintain internal data structures so that they could be properly accessed by users.

### 2.3 Implementation

In this phase, the gathered data and design were executed, thus implementing the application. The system was divided into modules, in this way, it can be elaborated into smaller programs called units. Each unit is developed and tested separately for its functionality. Unit testing mainly verifies if the modules meet the specified requirements.

### 2.4 Testing

In this phase, both individual components and the integrated whole of the system are methodically verified to ensure that they are error-free and fully meet the requirements outlined in the requirements analysis. A proper execution of all the preceding phases ensures an application as per the provided requirements, and most importantly, it guarantees a satisfied client. A thorough test of the system is done to meet the client's specified requirements. Hence, the system was tested to check and verify that all modules coordinate with each other and that the system functions as a whole based on the specifications.

### 2.5 Maintenance

In this phase of the Modified Waterfall Model, regular maintenance and support are provided for the developed dynamic document tracking system. Thus, the client's satisfaction can be guaranteed by providing a systematic inspection, detection, and correction of failures before they develop into major defects. This will prevent the consequences of system failures. This also includes complete testing over a specified period.

### 2.6 Data Analysis

For the data analysis, the weighted mean was used for the implementation of the system acceptability test. Table 3 depicts the Likert scale used in the study. It shows the numeric value and equivalent descriptive rating for the system evaluation.

**Table 3.** Likert Scale

<b>Numeric Value</b>	<b>Equivalent Rating</b>
4.21-5.00	Highly Acceptable
3.41-4.20	Very Acceptable
2.61-3.40	Acceptable
1.81-2.60	Fairly Acceptable
1.00-1.80	Not Acceptable

The statistical tools used in determining the acceptability of the DocTrack for the University of Northern Philippines were the weighted scores and weighted mean of the responses to the different statements about the system.

$$\sum x = \frac{wf}{n} \tag{1}$$

where  $w$  = weight,  $f$  = frequency, and  $n$  = number of respondents.

In finding the weighted score, equation (1) was used. The respondents were the different personnel of the university who are holding clerical positions (10 each) in the different units: the director of the University Planning and Information System Management Office, the Head of the Records Office, and the Staff of the President’s Office.

### **3. Results and Discussions**

#### **3.1 Features of the System**

The developed system aimed to automate the management and tracking of documents at the University of Northern Philippines, particularly the Request Letters and Operational Plans. Thus, it plays roles such as: uploading accurate documents for Faculty, Non-Teaching Personnel, and Students; and tracking the documents until their approval.

The developed system would show a clearer view of how the features of the system were implemented given the different modules.

##### **3.1.1 Log-in Module**

The log-in module as depicted in Figure 4 is used to access the page where the user must enter the correct username and password. In the developed system, there are two levels of access: the administrator and the registered user. The administrators will be the Records Officer, a Staff member of the Office of the President, and a Staff member of the University Planning Information System and Management Office. On the other hand, the registered users of the system will be the Faculty, Non-Teaching Personnel, or Students.

**Figure 4.** DocTrack – Log-in Module

### 3.1.2 Administrator Tracking Module

Track Number	Document Title	Document Type	Date Filled
DOC002	acceptability rating	request letter	2016-03-17
DOC003	document1 letter	request letter	2016-03-17
DOC004	electric fan request	request letter	2016-03-17
DOC005	diet program	request letter	2016-03-17
DOC010	charity request	request letter	2016-03-17

**Figure 5.** DocTrack – Administrator Tracking Module

The Administrator Tracking module depicted in Figure 5 is used by the administrator to track all documents that are released by a registered user for the approval of concerned officials. It can show who has already signed and the location of the document. The administrator can fully track a document once it has been uploaded.

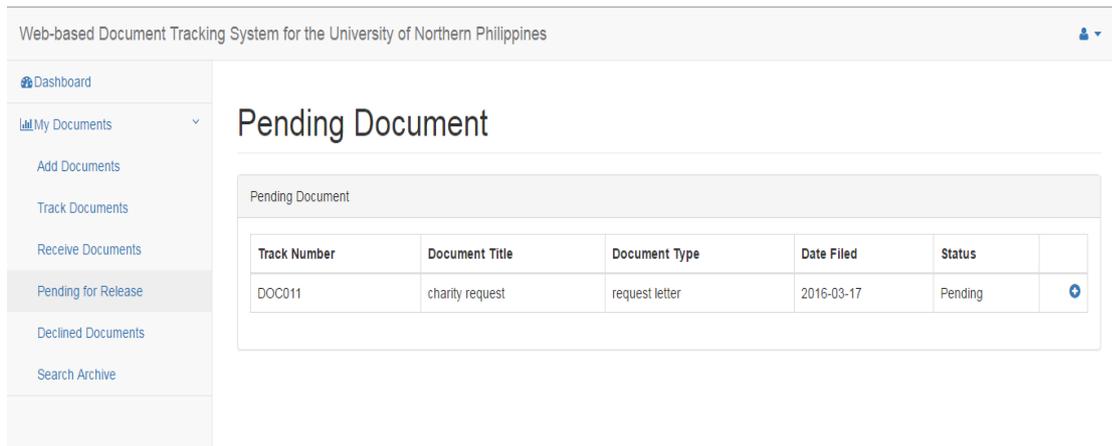
### 3.1.3 Administrator Archive Module

Track Number	Document Title	Document Type	Date Filled
DOC001	stakeholder request	request letter	2016-03-17

**Figure 6.** DocTrack – Administrator Archive Module

The Administrator Archive module depicted in Figure 6 allows the administrator to view all documents that have already been fully approved by concerned officials. The administrator can easily find a document in the system’s database using the search bar. The administrator can use the tracking number and the document title for fast searching. Thus, this module serves as the central repository of documents, and the documents can be viewed and printed when they are needed by the stakeholders.

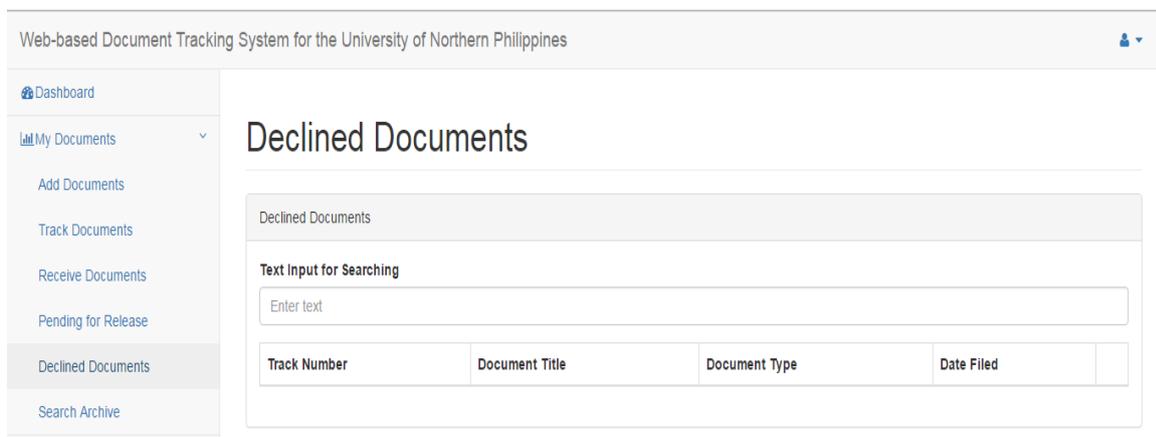
### 3.1.4 User Pending Document Module



**Figure 7.** DocTrack – User Pending Document Module

The User Pending Document module depicted in Figure 7 enables the registered user to view the documents that were added during the process. It allows the user to release, review, and choose concerned personnel that will be signatories of the document. Thus, the registered user must choose signatories that are appropriate to upload documents. If the request letter or the operational plan requires funding, the registered user should pass it through the Accounting Office. Moreover, the registered user must have enough knowledge to choose who among the Vice Presidents will sign depending on the nature of the document.

### 3.1.5 Declined Document Module



**Figure 8.** DocTrack – Declined Document Module

The Declined Document module shown in Figure 8 allows the registered user to view the documents that it refuses to sign. If the signatory fails to sign the document, the system enables the uploader of the

document to receive a Short Message Service (SMS) to the user's mobile phone stating the reasons why the signatory refused to sign the document.

### 3.2 The Acceptability of DocTrack

**Table 4.** DocTrack System Evaluation

Criteria	Weighted Mean			Description
	Faculty	NT	Stud	
Functionality	4.60	4.53	4.58	HA
Reliability	4.53	4.33	4.43	HA
Usability	4.58	4.60	4.60	HA
Efficiency	4.50	4.40	4.35	HA
Maintainability	4.67	4.27	4.40	HA
Portability	4.48	4.30	4.45	HA
<b>Overall Weighted Mean</b>	<b>4.56</b>	<b>4.41</b>	<b>4.47</b>	<b>HA</b>

Table 4 shows the evaluation results of the developed DocTrack. The stakeholders perceived the DocTrack System for the University of Northern Philippines as “Highly Acceptable” by the Faculty, Non-Teaching Personnel, and Students respectively in terms of Functionality, Reliability, Usability, Efficiency, Maintainability, and Portability. The system acceptance is proven and therefore indicates the readiness of the system for deployment.

## 4. Conclusions and Recommendations

After the development of the software, the following conclusions were drawn:

- The DocTrack for the University of Northern Philippines helps the different stakeholders in the processing of documents for approval by authorities, as well as saving our mother earth from overusing her resources by eliminating the use of paper and electricity.
- The functional requirement maximizes the utilization of the system's capabilities as specified by the stakeholders so that end users will meet the expected results.
- The different features implemented in the developed document tracking system of the University of Northern Philippines were described to accord with the functional requirements specified by the stakeholders.
- The different security and control measures integrated in the system were identified to protect the system and the stored documents from unauthorized users.

Based on the findings, the researchers recommended DocTrack be implemented at the University of Northern Philippines to facilitate the fast tracking of documents by the stakeholders and make them more efficient in their assigned work. Furthermore, there should be a main admin user of the developed system, probably a representative from the University Planning and Information System Management (UPISM) Office or at the Office of the President of the University, where the developer is currently designated to manage all operations that the system provides. Also, necessary equipment should be purchased, a network setup should be laid to support the developed system, training should be conducted

for the different end users of the developed system, and further assistance should be extended to make sure that the system works properly. Lastly, the responsibility of maintaining, updating, and safeguarding the developed system should be handed over to the University Planning and Information Systems Management (UPIISM) Office of the University.

## References

- [1] U. Khamdamov, “*Conceptual Model of the Education Management Information System for Higher Education Institutions*”, International Journal of Advanced Trends in Computer Science and Engineering, vol. 9, no. 5, September - October 2020, pp. 7295-7300, doi: 10.30534/ijatcse/2020/59952020.
- [2] J. Mancini, “*10 Fast Facts About the Value of Document Management*”, [www.info.aiim.org/aim-blog/newaiimo/2008/10/27/10-fast-facts-a](http://www.info.aiim.org/aim-blog/newaiimo/2008/10/27/10-fast-facts-a) (Accessed July 15, 2022).
- [3] M. Rieser, “*Document Tracking Diploma Thesis*”, M.S. thesis Global Information Systems Group, Institute of Information Systems, Department of Computer Science, ETH Zurich, 2005, doi: 10.3929/ethz-a-005007785.
- [4] L. Sun, “*Web-based Document Processing and Management System*” [www.academia.edu/23856881/Web\\_based\\_document\\_processing\\_and\\_management\\_system](http://www.academia.edu/23856881/Web_based_document_processing_and_management_system) (Accessed July 10, 2022).
- [5] Department of Public Works and Highways, “*DoTS Document Tracking System*”, [www.dpwh.gov.ph/about\\_us/reforms/rimss/success\\_stories/dots.htm](http://www.dpwh.gov.ph/about_us/reforms/rimss/success_stories/dots.htm) (Accessed July 10, 2022).
- [6] M. White, “*Time Spent Searching – A Chronology of the Myth and Some Recent Research*”, [www.linkedin.com/pulse/time-spent-searching-chronology-myth-some-recent-research-white](http://www.linkedin.com/pulse/time-spent-searching-chronology-myth-some-recent-research-white) (Accessed July 26, 2022).
- [7] T. D. Blackie, A. Harter, A. Hopper, and R. Want, “*Tracking and/or Identification System*”, Australia Patent AU663770B2, October 19, 1995.
- [8] Syntactics “*What are Document Tracking Systems*”, [www.systacticsinc.com/news-articiles-cat/document-tracking-systems/](http://www.systacticsinc.com/news-articiles-cat/document-tracking-systems/) (Accessed July 25, 2022).
- [9] J. P. Sathiadass and G. N. Wikramanayake, “*Document Management Techniques & Technologies*”, in 5<sup>th</sup> International Information Technology Conference (IITC), Colombo, Sri Lanka, December 1-7, 2003, pp. 40-48, ISBN: 955-8974-00-5.
- [10] N. Fallon, “*Best Document Management Software*”, [www.businessnewsdaily.com/8038-best-document-management-software.html](http://www.businessnewsdaily.com/8038-best-document-management-software.html) (Accessed July 10, 2022).
- [11] S. L. Navalta, and M. B. Mendoza, “*Don Mariano Marcos Memorial State University Integrated Management Information System*”, unpublished.
- [12] R. H. Sprague, “*Electronic Document Management: Challenges and Opportunities for Information Systems Managers*”, MIS Quarterly, vol. 19, no. 1, March 1995, pp. 29-49, doi: 10.2307/249710.