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A Special Problem

Presented to

the Faculty of the Division of Physical Sciences and Mathematics

College of Arts and Sciences

University of the Philippines Visayas

Miag-ao, Iloilo

In Partial Fulfillment

of the Requirements for the Degree of

Bachelor of Science in Computer Science by

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May 5, 2022

Approval Sheet

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Declaration

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(Student)

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(Student)

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(Student)

Dedication

"Hello, world."

Acknowledgment

"Hello, world."

Abstract

Requesting documents from various offices in the University of the Philippines Visayas (UPV) is both inefficient and decentralized in nature. Some requests are not processed and some are lost tracked. Although there is an existing document request and document tracking system in the UP system, it is only used at the administration level and is not accessible for students. ReTrac is a centralized document request and tracking system designed to make the requesting and tracking or request more efficient.

Keywords: Tracking system, request system, UPV DTS, UP DRS, etc.

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Chapter 1

Introduction

1.1 Overview of the Current State of Technology

The document request in the University of the Philippines Visayas (UPV) can be done in two ways, (1) through requesting in-person, and (2) requesting through email. Both approaches consist of filling out the request form, paying the document cost to the Cash Office, then submitting the receipt to the respective office that handles the document to be requested. After that, the requester would wait for the document to be ready which takes at least one week or longer on occasions such as the enrollment period.

On the other hand, there is an existing online portal for document tracking that can be used by UP faculty and staff across the UP System. The portal, named UP Document Routing System, sets a tracking number for each document which is used to create a document trail from the office it originated to every office that

handles it.

1.2   Problem Statement

The process in the current document requesting system used by the University of the Philippines Visayas is very inefficient. Students and alumni often encounter problems with the current system among which are discussed below.

When requesting documents through email, the requester has to open the website provided by each office from which the PDF form can be accessed, then the requester would fill out the form before sending it to the respective office that handles the document. After sending the form, the requester has to pay the document cost to the Cash Office, which is a separate office from the one who handles the document requests, through Land Bank and GCash. After sending the required amount, the requester has to send an email to the Cash Office regarding the payment transaction. When the Cash Office confirms the payment, they will send a scanned copy of the receipt to the requester. Upon receiving the receipt, the requester has to forward it to the office that handles the document request, for the request to be processed.

There are instances where the office overlooked some requests due to high amounts of transactions flooding the email that is used for document requests, especially during the enrollment period, and on some occasions, requesters need to pass signed documents. Requesters may also send document requests to the wrong office which adds to the delay in the processing time.

There are also difficulties for both Cash Office and requesters during the payment process since the Cash Office only caters to money transfers through Land Bank and GCash. Some students don't have Land Bank and GCash accounts so they tend to use the accounts of their friends and relatives which makes it more difficult to track who sent the payment. Moreover, payment transactions take up to 24 hours to update in the account of the Cash Office, thus delaying the sending of receipts to the requester.

Furthermore, the decentralized nature of the document request system in the University of the Philippines makes it more difficult to track the process status of the document request. Although the UP Document Routing System is usable for UP faculty and staff, it can only track documents and not create document requests to the concerned offices.

1.3 Research Objectives

1.3.1 General Objective

The study aims to develop a centralized web application that will serve as a portal for students and alumni to request documents and track their requests, as well as, for UP offices to process the said requests. This web application will be called ReTrac.

1.3.2   Specific Objectives

The specific objectives of ReTrac are the following:

- To improve the accessibility of requesting documents from offices inside the university

- To improve the efficiency of processing documents inside the university

- To make a centralized system for requesting and processing documents inside the university

  - Students can request documents and pay seamlessly through the web application

  - Students can pay through integrated payment methods (i.e. e-wallet, banks)

  - University offices can see and process the requests of the students and alumni

  - Documents are requested and sent through the web application

  - Request status (i.e. pending, processing, etc) is displayed in the web application

1.4   Scope and Limitations of the Research

This study focuses on requesting, tracking, and paying for certain documents that students and alumni under the University of the Philippines request. These documents may be a copy of grades, transcripts, certificate of good moral character,

certificate of enrollment, certificate of non-contact/conforme, certificate of units earned, certificate of year level standing, certificate of GWA, photocopy of form 5, and/or other documents students and alumni may want to request from the Office of the College Secretary. Payment for these documents is through the University of the Philippines Visayas Cash Office. Requesting, paying, and tracking the documents will be through ReTrac.

For now, this study is limited only to the College of Arts and Sciences Office of the College Secretary, the University of the Philippines Visayas Cash Office, and the students and alumni of the College of Arts and Sciences. Once this study is successful, the document tracking system will later be adapted to all the other colleges and offices inside the University of the Philippines Visayas.

1.5   Significance of the Research

This study aims to solve the inefficiencies of the current system of requesting documents inside the University of the Philippines Visayas. Once Retrac is successful and integrated into the university, it should improve the ease of requesting and paying for certain documents from certain offices inside the university for students and alumni. The system will also enable students and alumni to keep track of the current status of the documents that they requested.

Chapter 2

Review of Related Literature

2.1 Document Tracking Systems

2.1.1 Logistic Tracking Systems

Logistics tracking refers to the systems and ways of tracking resources during their movement and storage. With logistics tracking, the sender, receiver, and moderator will know where the resources are physically located at any time and schedule delivery. Tracking systems usually use waybills, a document attached to the resources that specify at minimum their nature, point of origin, and destination.(?, ?) As millions of cargos are transported every day, waybills in these systems make it possible to track the progress of each delivery.

According to Airspeed (2020), a tracking system works with the following sequence:

- Bar Code Generation - a unique ID is assigned to each resource that contains the important details of the package, such as destination, name of sender and receiver, address, and crucial information needed by the buyer. Once generated, bar code generated or waybill is attached to the resources

- Scan and Track - allows data attached to the waybill to be received by the courier service and updates the location in the database.

- Tracking Progress - real-time tracking becomes available to both sender and receiver as well the moderators of the logistics through a dedicated page.

- Product Delivery - the resources have reached the destination and are received by the recipient and, indicating that the delivery is successful.

Currently, e-commerce web applications utilize both in-app tracking and logistics waybill tracking (Brand Studios, 2021) (Amadora, 2021). This implementation makes it more convenient for customers to track their parcels at a glance on the e-commerce application, and in-depth details on the logistics tracking page.

ReTrac will follow a similar concept such as the generation of a unique waybill ID from the submission of the online form and will end the tracking when the request confirms the receipt of the document. The system's real-time update will help the requester monitor the document request and as well provide adequate information in the case issues arise on that certain transaction.

2.1.2 Document Tracking Systems in Higher Education Institutions

Several document tracking systems are implemented across academic institutions, government agencies, and private institutions. However, traditional recording systems such as logbooks and pen logging are still being used as safeguard databases. The University of the Philippines (UP) System has implemented a centralized system through the UP Information Technology Development Center called UP Document Tracking System. This system is capable of tracking document trails within offices. It includes the origin office, receiving office, and personnel handling the documents. (University of the Philippines Information Technology Development Center, 2021).

A similar model is tested in the Schools Division of Paraaque City (Emralino, 2019) where they created a system that helps the inter-offices to manage the document trail. However, tickets as waybills are used upon the request of the user for faster compliance in line with the Republic Act No. 9485 (Congress of the Philippines, 2007). The developers of the said system developed it through brainstorming, interviewing different users of the document trail, and organized orientation and training on the utilization of DoTS.

In 2019, Lingaya proposed a document tracking system for the utilization of Philippine Higher Education Institutions. Tarlac Agricultural University became the sample local of the study where user requirements specifications, design and implementation, validation, and evaluation became part of the software development process. The system is evaluated by forty (40) office personnel and five (5) experts for the user interface and functionality, database design, and security. Like the

previous study above, bureaucracy and compliance to the RA 9465 or the Anti Red-tape became one of the key factors in the development of the system.

As we adapt to paperless transactions, information systems, specifically document tracking and tracing are necessary to have an integrated, interconnected, and interpolated communication between offices and the requester (Christina Mendez, 2020).

DocuTrak was implemented in the year 2003 in Diliman Network (DILNET) as part of the university's initiated computerized projects such as Computer Registration System (CRS), Student Records System (SRS), Faculty Information System (FIS), Socialized Tuition and Financial Assistance Program (STFAP) Online, the Integrated Library System (iLib), and University Virtual Learning Environment (UVLE). As assessed by Sueo (2009), in-house developed DTS emphasizes the compliance of the system with the International Organization for Standardizations (ISO) definition of the records system. DocuTrak can identify and monitor bottlenecks in the document trail. Three years after the initial implementation in UP Diliman, the University of the Philippines Visayas Data and Information System Program (DISP) Office requested the same system to implement on its campuses. Unlike CRSIS, DocuTrak did not achieve much popularity and full-scale support. Unlike other records and information systems in UP Visayas and UP Diliman, DocuTrack lacks sanctions for non-use and non-users which makes the system optional since most of its features are readily available on manual DTS implemented under Memorandum Circular No. 13 back 1976. Recently, UP Visayas adopted once again the system-wide DTS called UP Document Routing System (UP DRS) at the same time maintains the usage of manual DTS (Camposano, 2021). Unlike its predecessor, ReTrac will have integration and would be

accessible not only to the currently employed staff and students but also to the alumni. This will also integrate UP mail domains for authentication and payment options, thus not only as a document tracking but also as a management tool.

As tracking and tracing resources have been widespread in industries as such e-commerce, logistics, and shipment, having essential information about the status and location of resources allows better planning, scheduling, and monitoring. Implementing some form of tracking system enables monitoring of performance and behaviors of concerned offices in document processing. However, privacy issues are predominant in offices, sender, and receiver such that their essential information and work behaviors are accessible to certain roles, this perceived risk must be considered when implementing a DTS. (Jandl, et. al., 2021). In the process of developing ReTrac, the developers consider DocuTrak and UP DRS as their predecessors. The existing Privacy Notice for UP Personnel for the Cash Office and Office of the College Secretary, UP System Privacy Notice for Students will be observed to safeguard the privacy and data of its employees, staff, students, and alumni.

2.2 Electronic Payment

According to (Yu, et. al, 2002), the worldwide proliferation of the Internet gave birth to electronic commerce, a type of business that allows electronic transfer of transactions. Electronic commerce grew because of the openness, speed, anonymity, digitization, and global accessibility characteristics of the Internet. It facilitated real-time business activities which included advertising, querying,

sourcing, negotiation, auction, ordering, and paying for merchandise.

The level of security in each step of the transaction is the main concern with electronic payment because money and merchandise are transferred with no direct contact between parties involved in the transactions. If there is even a slight chance that the payment system may not be secure, trust and confidence in the system will begin to erode, destroying the infrastructure needed for electronic commerce.

As stated in Yu, et. al.(2002), there are four categories of electronic payment systems: (1) Online credit card payment, (2) Electronic cash, (3) Electronic checks, and (4) Small payments. Each of these systems has its advantages and disadvantages:

- **Online credit card payment** - the most popular system widely used by many establishments because of its acceptability all around the world and it is a relatively safe mode of payment. The disadvantage of using this system is that using credit cards have high transaction fees and have a limit on how much you can charge the credit card

- **Electronic cash** - the second most popular mode of payment because of its accessibility, low transaction fees, the payment between parties, and anonymity. The disadvantage of using electronic cash is that electronic cash is not replaceable once it is lost.

- **Electronic checks** - are mostly used by government and private institutions because transactions made between institutions usually involve large amounts of money and electronic checks make transferring large amounts

of money possible because they do not have a limit on how much money is transferred at a time. The disadvantage of using electronic checks is that the cost of using electronic checks is high. They can only be used in the virtual world, and they do not protect a user 's privacy.

- **Small payments** - mostly used by establishments that provide certain services. Here, a consumer can only pay for a certain amount for a certain service that the establishment provides instead of paying for a membership for all the services. This makes it convenient for consumers that are not frequent users. One disadvantage of using this mode of payment is that they are not brought forth by financial organizations and they do not use traditional financial systems or methods as their structure.

2.2.1 Online Banking and Mobile Banking

An article by Zoleta (2021) defines online banking as any transaction involving finances that are performed over the internet through a bank's website on a user's computer. For users to use online banking services of the bank that they have accounts in, the banks usually require them to register for an online account whenever a user opens a new account or if they have existing accounts, they inform the users to register for one. Once users are registered, they can complete bank transactions (i.e. fund transfer, bills payment) anytime and anywhere without going to a physical branch of a bank.

Mobile banking is essentially the same as online banking. It also enables users to complete bank transactions online anytime and anywhere. The only difference is how these two services are accessed by users. Online banking can be accessed

through computers and mobile banking can be accessed through mobile phones.

ReTrac will be using online and mobile banking as one of the payment options. This will enable students and alumni of the University of the Philippines who have access to these kinds of services to pay for their documents.

2.2.2   E-wallets

GCash is one of the popular e-wallets used in the Philippines. Through GCash, users can top-up load, send and receive money to other users, pay bills, and transfer money to bank accounts partnered with GCash. Users can also scan QR codes generated within the GCash application for faster transactions.

Another popular e-wallet in the Philippines is Paymaya. Paymaya is very similar to GCash. Users can also top-up load, send and receive money to other users, pay bills, and transfer money to bank accounts partnered with Paymaya. Like GCash, users can also generate QR codes within the application for faster transactions.

ReTrac will be using Paymaya as one of the payment options. This will enable students and alumni of the University of the Philippines Visayas, especially those who do not have bank accounts to pay for the documents that they requested.

2.2.3   Contactless Payment

According to Joseph, QR codes can be used to store bank account and credit card information. They can also be designed specifically to work with particular payment options. With that in mind, some e-wallets (i.e. GCash and Paymaya)

use QR codes to make payment for requesting documents faster.

ReTrac will focus on contactless payment and utilization of banking portals as its primary payment method. With the shift to online transactions over the pandemic (Christina Mendez, 2020), payment options other than cash should be available to the requester in a contactless way and can be processed remotely. PayMaya utilizes QR scanning to pay feature and Landbank uses Link.BizPortal.

Chapter 3

Research Methodology

3.1 Research Activities

3.1.1 Information Gathering

The developers reached out to the College of Arts and Sciences Office of the College Secretary to decide the features and functionality of ReTrac. They asked what type of documents can be requested at their office, the cost for requesting each document, and the process for requesting the documents. The Office of the College Secretary also shared the blog site where the document request form can be downloaded.

The document request is as shown in the figure below:

$$\ll insert flowchart here \gg$$

The developers interviewed Ms. Maureen Kay Ongco, Chief of the University's Cash Office, regarding the payment methods for requesting documents, the payment methods currently being implemented, and the payment methods they are planning to remove and/or add.

The Cash Office currently supports Land Bank and GCash payment transactions. However, Ms. Ongco elaborated that the GCash payment is only temporary. It was only implemented during the pandemic since some students who request documents do not have bank accounts, specifically that of Land Bank. Ms. Ongco said that the Cash Office is currently negotiating with PayMaya and that PayMaya will be their main payment method when the negotiation pushes through.

3.1.2   Application Features

The application will have the following features:

- Students can make document requests

- Students can track and see which office handles their request

- The students can retrieve the documents they requested

- The students can pay through the in-app payment integration

- The Office of the College Secretary (OCS) can see the number of pending requests

- The OCS can also retrieve and process the request

- The OCS can send the documents through the application

- The Cash Office can confirm the payment made by the students

3.1.3 Platform

There are three options for the applications platform, (1) desktop, (2) mobile, and (3) web. The pros and cons of each platform are as discussed below.

A desktop application is more accessible for University Offices since they already use desktop computers for their day-to-day tasks. However, not all students have access to desktop computers. Most students own a smartphone that makes mobile applications more accessible to them. On the other hand, web applications can be accessed both on mobile devices and desktop computers through web browsers.

With those considerations, the developers decided to settle with using the web as the platform for the document request and tracking application. Furthermore, developing a version for the desktop and mobile separately would make it more difficult to update feature changes and patches. Developing a web application would also mean that only one application will be maintained making it faster to implement changes.

3.1.4 Technology

There are a lot of free-tier or trial versions in the market for cloud services and tools such as Google Cloud, Amazon AWS, Microsoft Azure, IBM Cloud, and many more. However, the developers settled on using Firebase. Firebase is a backend-as-a-service (BaaS) web technology under Google.

The tools needed for the document request and tracking system includes:

- Hosting - a domain to make the website accessible to users

- Database - to store documents and information on the web application

- Authentication - to secure the application and only allow authenticated users to make and track requests.

The tools mentioned above are all present in Firebase. Instead of using multiple cloud services which makes it difficult to manage the web applications dependencies, it is better to use a cloud service that provides all the tools needed for the web application. Moreover, the Spark Plan, which is the free-tier offer of Firebase, can provide enough resources to deploy a big web application.

In addition to the cloud service, the developers will also be using React as a Javascript framework to develop the front-end of the web application. There are a lot of Javascript frameworks currently existing in the market, however, since the developers are more experienced in using React than any other framework, React will be used.

3.1.5   Development Framework

This study will use the incremental and iterative approach in developing the entire system, specifically, the Scrum Framework in Agile Development.

Through incremental and iterative approach, the progress is more trackable and consistent since each iteration will focus on a certain feature or implementation.

The Scrum Framework will enable the developers to deliver the minimum viable product (MVP) as early as possible for feedback collection. The said framework would also help given the limited manpower.

3.2 Calendar of Activities

A Gantt chart showing the schedule of the activities should be included as a table. For example:

Table **??** shows a Gantt chart of the activities. Each bullet represents approximately one week worth of activity.

Table 3.1: Timetable of Activities

Activities (2009)	Jan	Feb	Mar	Apr	May	Jun	Jul
Study on Prerequisite Knowledge			●●	●●●●			
Review of Existing Racing Strategies	●●	●●●●	●●●●	●●●●			
Identification of Best Features				●●●●	●●		
Development of Racing Strategies				●●	●●●●	●●	
Simulation of Racing Strategies				●●	●●●●	●●●	
Analysis and Interpretation of the Results					●●●●	●●●●	●
Documentation	●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●

Chapter 4

Results and Discussions/Analyses

This chapter presents the results or the system of your SP. Include screenshots, tables, or graphs and provide the discussion of results.

Chapter 5

Conclusion

This chapter summarizes your SP and provides conclusions regarding your results and analyses. Provide recommendations on what ought to be done with your SP or provide further directions on the topic you covered.

Chapter 6

References

Appendix A

Appendix

Appendix B

Resource Persons

Dr. Firstname1 Lastname1

Adviser

Affiliation1

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Mr. Firstname2 Lastname2

Role2

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Ms. Firstname3 Lastname3

Role3

Affiliation3

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