



Short Paper

Using the Technology Acceptance Model in Understanding the Usage of a Web-based Document Management System for the Fire Safety Enforcement Unit of the Bureau of Fire Protection

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Date received: March 5, 2024

Date received in revised form: May 2, 2024; November 2, 2024; May 18, 2025

Date accepted: June 3, 2025

Recommended citation:

Catalan, B. B. & Natividad, R. L. (2026). Using the Technology Acceptance Model in understanding the usage of a web-based document management system for the Fire Safety Enforcement Unit of the Bureau of Fire Protection. *International Journal of Computing Sciences Research*, 10, 4207-4233. <https://doi.org/10.25147/ijcsr.v10i0.862>

Abstract

Purpose—This project aims to solve document management issues at the Fire Safety Enforcement Unit (FSEU) of a local Bureau of Fire Protection (BFP) branch in Pampanga by developing a web-based system with SMS notifications to streamline the processing of Fire Safety Inspection Certificates (FSIC).

Method—This applied research used systems development with mixed quantitative and qualitative methods, selecting respondents through purposive sampling for a survey based on the Technology Acceptance Model (TAM) to identify key factors affecting adoption.

Results—The TAM components assessment of the developed system yielded favorable results. Respondents perceived the developed system as valuable and user-friendly, with mean scores of Perceived Usefulness (PU)—4.35, Perceived Ease of Use (PEU)—4.09, and Intention to Use (IU)—4.11. The reliability and validity have also been measured, achieving



high-reliability scores for PU (0.9302), PEU (0.9029), and IU (0.8665). Spearman's rank correlation revealed significant positive correlations between variables.

Conclusion—The proposed system for FSIC processing is perceived as highly useful and easy to use. The study also extends beyond functionality by incorporating security measures to protect data within the BFP DMS.

Recommendations—Key insights improved the BFP Document Management System by simplifying the interface, enabling mobile-responsive UI, adding an inspector interface, centralizing admin control, and a proactive notification feature that strengthens compliance tracking. These changes create a user-focused, adaptable system.

Research Implications—Developing information systems entails time and resources, but their implementation of such IS indirectly improves community safety by helping manage local business compliance.

Keywords—Management Information Systems, Document Management System, SMS Integration, Security, Bureau of Fire Protection, Technology Acceptance Model

INTRODUCTION

As technology evolves, its role becomes increasingly prominent, particularly in the field of information technology. It has been critical in propelling development and streamlining procedures in both the public and private sectors. Carpio and Ong (2020) emphasize that information and communication technology (ICT) is a vital tool that enables users to perform various tasks, particularly in work settings. It plays an essential role in improving government services, enhancing public administration, and promoting participatory democracy around the world.

The local government in the Philippines has embraced IT, leading to a surge in web and internet presence. Pressured by global developments, the government has recognized the need to modernize its processes. To remain competitive, local transactions must be reinvented and adapted to the demands of the modern economy (Avila et al., 2011). The Bureau of Fire Protection (BFP) is a government agency responsible for firefighting, fire prevention, and the enforcement of fire safety codes nationwide. It manages fire and emergency services in cities and municipalities, aiming to reduce fire-related incidents across the country (Bureau of Fire Protection, n.d.). The BFP mandates compliance with the fixed convention for all establishments to obtain the Fire Safety Inspection Certificate (FSIC). The FSIC is proof of compliance with Republic Act No. 9514 for institutions, structures, and buildings/occupancies (Official Gazette of the Philippines, n.d.).

“Fire Safety Inspection on Regulated Premises” is one of six components of fire severity, an important finding in a ten-year study by the researchers on seventeen villages

in Taiwan. Fire severity increases as village density increases. Inspections from authorities should be imposed imperatively to enhance fire security. (Lee, Sung, Lin, et al., 2020).

In a spatiotemporal analysis of fire incidents in the province of Pampanga, De Leon and Miranda (2022) found that a significant number of fire incidents occurred in various municipalities. According to the Regional Office, there were a total of 3,048 recorded fire incidents from 2013 to 2020. These incidents were analyzed by time of day, as shown in Table 1, which summarizes the distribution of fire occurrences.

Table 1. A Spatiotemporal Analysis of Fire Incidents in Pampanga, Philippines (De Leon & Miranda, 2022).

| TIME | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | TOTAL |
|-----------------------------|------|------|------|------|------|------|------|------|-------|
| Morning (12:00 AM–7:59 AM) | 45 | 52 | 33 | 36 | 42 | 38 | 46 | 42 | 334 |
| Afternoon (8:00 AM–4:59 PM) | 140 | 357 | 250 | 149 | 134 | 176 | 433 | 270 | 1,909 |
| Evening (5:00 PM–11:59 PM) | 80 | 151 | 112 | 85 | 48 | 65 | 146 | 118 | 805 |
| TOTAL | 264 | 560 | 395 | 270 | 224 | 279 | 625 | 430 | 3,048 |

Fire incidents frequently occur in the country, resulting in loss of lives and property damage. From 2013 to 2018, the Philippines recorded an average of 15,733 fire incidents annually (De Leon & Miranda, 2022). In Pampanga alone, around 625 fire cases were reported in 2019, causing millions of pesos in damages. The leading causes of these fires were identified as smoking, rubbish fires, bonfires or structural fires, and electrical ignition. According to the Bureau of Fire Protection (BFP), fire incidents in Pampanga declined to 430 in the following year.

The Bureau of Fire Protection (BFP) has the primary duty and responsibility of preventing fires. The agency exerts strenuous efforts to avoid incidents of fire in the country. That’s why, during fire prevention month, they carried out activities centered on a fire precautions campaign by the Philippine Fire Code.

Fire safety refers to procedures used to stop or delay the onset of fires, control their spread and consequences, and minimize any damage they may cause (Kodur et al., 2019). There is an imperative need for fire safety requirements to be enforced, and there are regulatory considerations that must be made. The Bureau of Fire Protection (BFP) requires every establishment to comply with the abovementioned fixed convention to be able to have their Fire Safety Inspection Certificate (FSIC). FSIC proves that a particular institution, building/occupancy, or structure has been thoroughly examined and found to comply with Republic Act No. 9514. Along with compliance, establishments must process many documents and pass them on to the agency. Having many documents piling up every year, the BFP tends to need help managing the necessary files.

A process flow chart was devised to analyze the business operations that involve clearance processing, as shown in Figure 1. In line with fire safety enforcement, the

Bureau of Fire Protection (BFP) must inspect all establishments in the municipality.

If an establishment seeks compliance with the Fire Safety Protocols outlined in the Fire Code of the Philippines, a Fire Safety Inspection Certificate (FSIC) is issued as proof of compliance. The FSIC is also a mandatory requirement when applying for a building permit. There are two types of FSIC: FSIC for Occupancy and FSIC for Business. This project focuses solely on the FSIC Business process. The Fire Safety Enforcement Unit (FSEU) issues the FSIC Business once all required documents are submitted, either by the owner or an authorized representative. These include the Application Form, Inspection Order, After Inspection Report, Tax Order of Payment, Receipt, Pre-Fire Plan, and FSIC Occupancy. FSEU Clerks compile these documents and are responsible for issuing the FSIC, as well as managing and monitoring establishment profiles and relevant files on the processing of clearances.

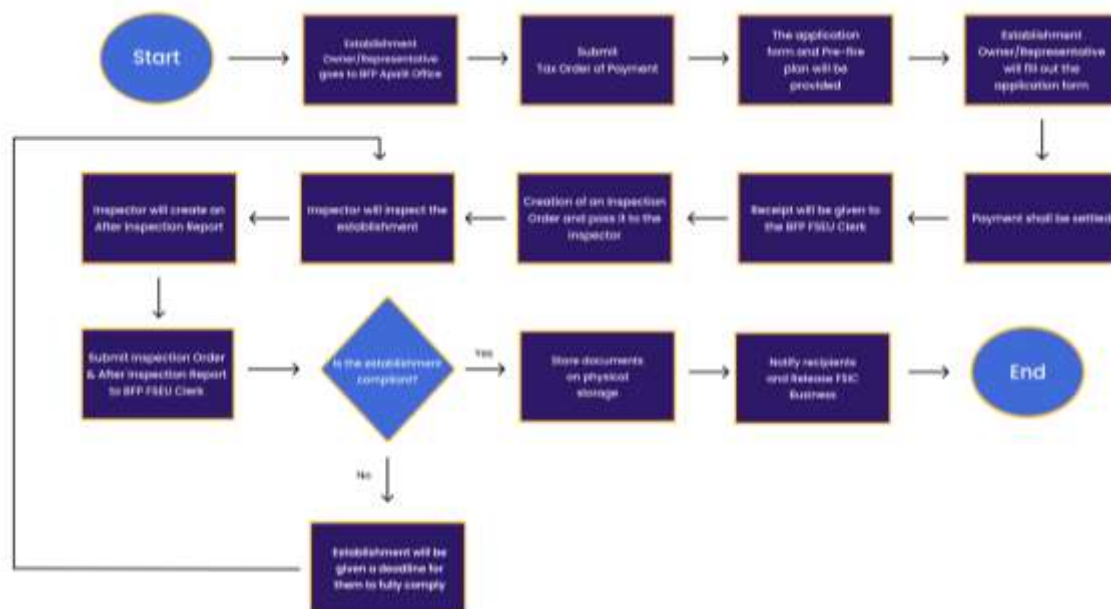


Figure 1. Current Process Flow Chart of BFP FSIC processing

The execution of fire prevention forces is not solely driven by compliance; instead, it is motivated by their conscientiousness and obligation. Due to regulatory obligations, a branch of BFP in Pampanga faces the arduous task of processing and transferring a substantial number of documents to the agency, accumulating a significant volume of files annually. Implementing a Document Management System (DMS) within an organization is an indispensable solution for managing a vast volume of documents, significantly enhancing operational efficiency and effectiveness. Udoagwu (2022) states that DMS is computer software that organizes and manages documents within an organization. It streamlines information flow, centralizes files, reduces workload, and tracks record movement.

This BFP branch in Pampanga covers up to 1,800 establishments as of 2022 and continues increasing yearly. Every year, the number of documents grows to 12,600.

Throughout the years, the agency's way of keeping, organizing, sorting, and archiving documents has been through storage boxes, file cabinets, and physical dividers. Moreover, they only use Google Sheets, a logbook for monitoring where they store business details, renewal of business, and mobile phone contact with the establishment's owner or representative. In line with this matter, they have a vast compilation of paper-based data and long-piled-up documents in their small-scale office. These documents continually accumulate yearly as the number of establishments grows rapidly. The difficulty in storing documents is that they require a significant amount of time to do this task because of the overwhelming number of papers collected daily.

The researchers proposed a web-based document management system for this BFP branch for Fire Safety Inspection Certificate (FSIC) processing with SMS integration to notify establishments of their FSIC availability. The proposed system aims to address the identified problems that they are facing:

1. **Time-consuming.** Because higher authorities occasionally request reports from the agency, generating reports involves significant time and effort spent sorting and managing files. Additionally, monitoring establishment profiles, locating specific establishment records, and manually sending out numerous SMS notifications further contribute to the considerable time and energy consumed by the FSEU Clerks of BFP.
2. **Difficulties with access.** FSEU clerks use physical storage and Google Sheets as logbooks to monitor the storage locations of business details and track business renewals. However, when one clerk is absent or on leave, other members struggle to access specific records from the database because they are unaware of where they are stored. This issue can disrupt the entire team's operations and lead to significant productivity loss.
3. **Security.** The organization's documents contain sensitive information that needs to be handled securely. Since the organization uses manual processes and physical storage, breaking into such systems and retrieving proprietary information could undermine the organization's operation.

METHODOLOGY

Research Design

The study used a combination of quantitative, qualitative, descriptive research, and applied research designs. Quantitative methods analyze numerical data to answer questions and predict phenomena (Erlandson et al., 1993). Researchers use statistical techniques to quantify variables and measure their impact. Qualitative research collects evidence through interview techniques, observation, field notes, focus groups, and document analysis to answer questions (Yilmaz, 2013). Descriptive research collects and organizes data to describe events, helping researchers investigate a research problem's background before further study (Glass & Hopkins, 1984). Applied research applies scientific

knowledge to solve practical problems and meet client needs, with researchers focusing on developing features and services (Baimyrzaeva, 2018). It expands knowledge while addressing real-world challenges.

Locale of the Study

The study was conducted at a BFP branch in Pampanga, the Philippines. The agency enforces the Revised Fire Code of the Philippines (RA 9514) and works to prevent and suppress damaging fires in its municipality. Its mission is to ensure public safety and economic growth.

Respondents

Researchers utilized a purposive sampling technique with thirty (30) selected respondents. Respondents were chosen from BFP branch personnel with deep insights into processing FSIC, particularly clerks responsible for paperwork and system utilization. Additionally, expert opinions from IT practitioners have been sought to understand their perspectives on technology functionalities and acceptance (Table 2).

Table 2. Type of Respondents

| Type of Respondents | Frequency | Percentage |
|---------------------|-----------|------------|
| BFP Personnel | 15 | 50% |
| IT Practitioner | 15 | 50% |
| Total | 30 | 100% |

Data Analysis

This study employs the Technology Acceptance Model (TAM) to analyze users' acceptance of Web-Based Document Management Systems for BFP. Figure 2 enumerates the dependent variables (external variables, perceived usefulness, and perceived ease of use) that influence the users' intention to use and actual usage of the system. It helps anticipate acceptance and identify necessary system adjustments for user-friendliness (Venkatesh and Davis, 1996). This framework is accompanied by a Likert scale, a commonly used measurement method in research to assess attitudes, opinions, and perceptions. It involves a 5-point ordinal scale where respondents rate their agreement or disagreement with a statement. This rating system helps researchers gauge individual perspectives effectively.

Calculating central tendency was performed by computing the mean and standard deviation, ensuring precise and accurate results. The researchers tested reliability to measure data validity using Cronbach's Alpha Coefficient. Spearman's Rank Method has

also been utilized to assess the correlation between variables and determine the presence of significant relationships among them—the structure of the formulas is specified in Equations 1 and 2.



Figure 2. Technology Acceptance Model 1 (Venkatesh & Davis, 1996)

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$$\alpha = \frac{(K) Sy^2 - \text{Sum } Si^2}{(K - 1) Sy^2}$$

Equation 1. Cronbach’s Alpha Equation (Cucos, 2023)

Spearman’s rank correlation coefficient

$$1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

Equation 2. Spearman’s Rank Correlation Formula

Development Stage

The term Rapid Application Development (RAD) was coined by James Martin, who described it in 1991 as a development lifecycle—as visualized in Figure 3—aimed at generating faster and higher-quality results compared to traditional methods. RAD leverages cutting-edge development software to maximize efficiency and take advantage of recent advancements in the field (Martin, 1991).

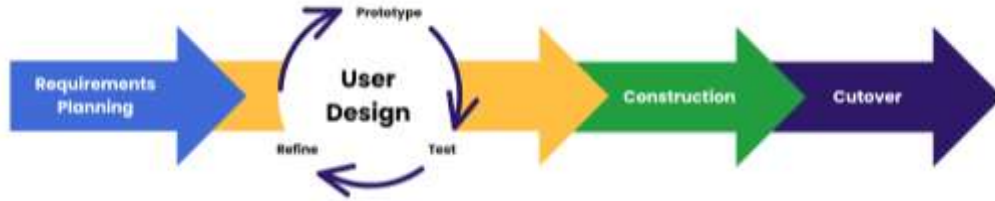


Figure 3. Rapid Application Development Methodology from Roadmunk.com.

The proponents adopted the RAD methodology for developing the web-based document management system. This methodology comprises four phases: Requirements planning, User design, Rapid construction, and Cutover, as shown in Figure 2. It is suitable for time-constrained projects, as it allows for quickly developing a functional application model. It accommodates changing conditions and involves clients throughout the development cycle. Additionally, RAD prioritizes functionality over UI/UX aspects.

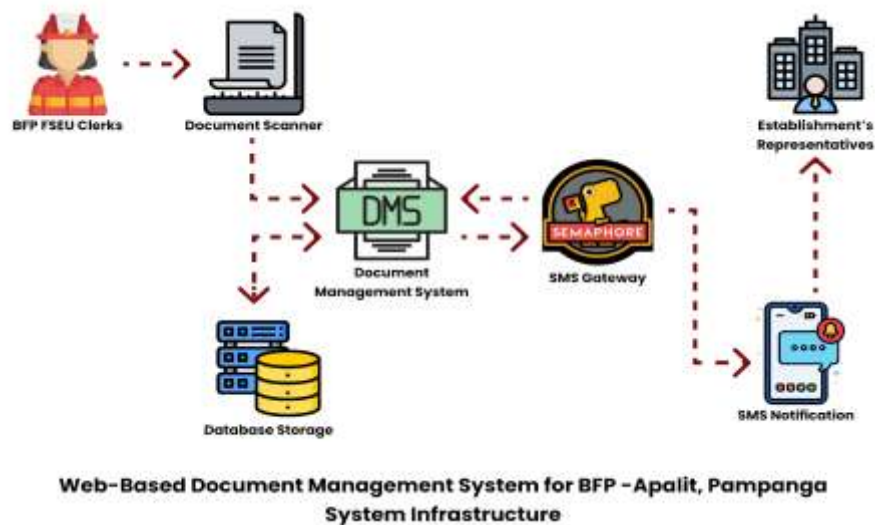


Figure 4. System Infrastructure of Web-based Document Management System for BFP FSEU

Figure 4 provides a comprehensive depiction of the system infrastructure employed in the project, along with the detailed steps of the process. Additionally, it encompasses the essential software and platforms predominantly utilized throughout the study. The core document management system is integrated with other external systems, like database software or servers and an SMS gateway (which handles SMS notifications). Semaphore is a service vendor that provides SMS messaging services. However, it should not be locked into a vendor; the organization should be able to replace it with other SMS

messaging service providers that suit their needs. Sending personalized SMS messages to each establishment's representatives through the system becomes a more accessible task compared to doing it manually.

Information Generated from the BFP DMS

The higher authorities, particularly the national sector of the Bureau of Fire Protection (n.d.), have requested a comprehensive report from their constituents, including the local industry of the different municipalities nationwide. The developed system incorporates various features to enhance the convenience and efficiency of generating reports. These features are embedded in the dashboard, facilitating the generation of more accurate and comprehensive reports and benefiting the FSEU clerk. In line with creating a user-friendly BFP DMS, our system incorporates several features to facilitate quick and efficient report generation for FSEU clerks. The amenities below highlight its ability to meet these requirements.

Figure 5 depicts the interactive user interface of the dashboard page, which serves as a central hub for accessing various data representations. The page features informative diagrams and graphs, offering a comprehensive overview of the information. One of the prominent features of this dashboard is the utilization of a bar graph to showcase the number of applicants received each month, allowing for a clear understanding of the application trends over time.

Additionally, the dashboard incorporates a filtering function that enables users to view the tally of applicants per barangay, facilitating a more focused analysis of the data. The dashboard offers a section that highlights the five most recently applied establishments, enabling users to obtain a quick preview or summary of the current applicants. It includes a tracking feature, which allows users to monitor the status of establishments in terms of approval, pending status, and closure. This feature enhances the user experience by providing real-time updates on the application process.

The dashboard's overall design aims to streamline the time-saving data-gathering process and report generation required by the FSEU clerks for national compliance. The dashboard dramatically simplifies the task by presenting visually appealing and user-friendly data, facilitating efficient data analysis and reporting. Moreover, it possesses a print function that enables immediate report generation.

Figure 6 shows a summary report generated by the BFP DMS, integrated into the dashboard with print functionality for easy access. These features help FSEU clerks generate reports quickly, streamline their workflow, and improve productivity.



Figure 5. Dashboard Page

14:25, 12/29/2018 1174642200

Summary Report

| | | | |
|-----------------------------|------|-------------------------|-----|
| Total Active Establishments | 1166 | Approved Establishments | 383 |
| FISC Renewal | 354 | Pending Renewal | 271 |
| New Applicants | 612 | Pending New | 313 |
| | | Closed Establishments | 634 |
| Balacoc | 35 | | |
| Calatagan | 103 | Apartment | 153 |
| Compostela | 95 | Hotel | 128 |
| Capatagan | 112 | Mercantile | 147 |
| Catagan | 94 | Business | 122 |
| Palaga | 101 | Storage | 125 |
| Sampaloc | 103 | Industrial | 141 |
| San Juan | 83 | Healthcare | 117 |
| San Vicente | 98 | Educational | 119 |
| Socod | 109 | Special Structures | 114 |
| Sulopon | 90 | | |
| Talaga | 91 | | |

Figure 6. Summary Report

Figure 7 illustrates the process of a web-based document management system intended for the BFP branch. The chart starts with login, where the users (BFP Clerks) will enter their authorized accounts. A successful login will enable BFP clerks to upload the required documents to process fire safety inspection clearance and add new applied establishments. There are seven (7) necessary documents in total that need to be uploaded to the system. If the seven (7) requirements are incomplete, the missing documents should be uploaded to continue the process. If all the documents are complete, and the establishment is a newly applied establishment, clerks will click the approve button. Table 3 enumerates the use cases for the BFP document management system.

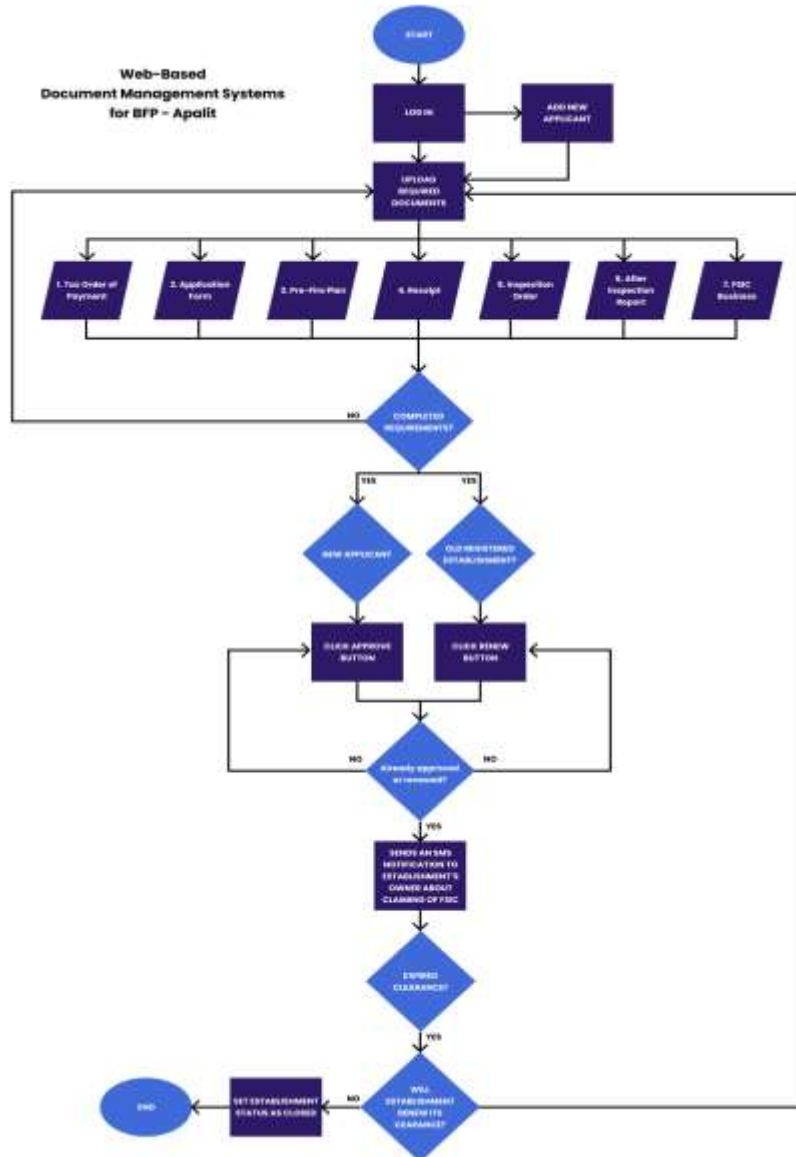


Figure 7. Process Flow Chart of Web-based Document Management System for BFP branch.

Table 3. BFP DMS Use Case Diagram

| Use Case Name | Description | Actors |
|--|---|--------------------------|
| Login | Login is the process by which BFP clerks gain access to the system's contents and functionalities via the network. | BFP FSEU Clerk/Inspector |
| Upload Scanned Documents | System users must upload seven documents for each establishment to upload scanned documents. | BFP FSEU Clerk |
| Approve Establishment for FSIC Issuance | Once all requirements are met, BFP Clerks can approve the establishment's application to issue an FSIC. | BFP FSEU Clerk |
| Renew the Establishment's Fire Safety Inspection Clearance | Upon settling the payments and passing the inspection, the BFP Clerk can approve the renewal of the inspection clearance for the establishments. | BFP FSEU Clerk |
| Filter "New", "For Renewal" and "Closed" Establishments | The filter functionality enables users to effectively sort through an extensive list and quickly locate specific information they seek. | BFP FSEU Clerk |
| Add an Applicant | The functionality of adding an applicant allows the clerk to include a newly applied establishment in the database. | BFP FSEU Clerk |
| Receive SMS Notification About FSIC Issuance | This feature will notify establishment owners once their FSIC is approved and ready for pickup. | Establishment Owner |
| Additional: | | |
| Filter the "Expiration Date" of the Establishment | The system offers an additional filtering functionality that allows users to sort the list of establishments based on the expiration date of their certificate. This feature plays a crucial role as establishments must adhere to current regulations to ensure safety and reduce the likelihood of incidents. | BFP FSEU Clerk |
| Change Password | Added security in the system by letting the admin and user change their password. | BFP FSEU Clerk/Inspector |
| View Only | Views all of the available pages. | Inspector |
| Edit Applicants' Profile | The admin can edit applicants' essential information in case of inaccuracies or mic details input. | BFP FSEU Clerk |
| Replace Uploaded Documents | When applicants renew their application and provide new documents for the renewal of FSIC, the previously uploaded documents can be replaced. | BFP FSEU Clerk |
| Delete Uploaded Documents | Allow users to delete uploaded documents if they upload incorrect documents. | BFP FSEU Clerk |
| Set Establishments as closed | Establishments that are inactive or have chosen not to renew their FSIC will be marked as closed. | BFP FSEU Clerk |
| Send an SMS for Claiming of FSIC | BFP Clerks can send an SMS notification once an applied establishment has complied with the regulations and submitted all the required documents. | BFP FSEU Clerk |
| Export to Excel the Applicants' Information | BFP Clerks can export applicants' information into Excel based on their preferred filters. | BFP FSEU Clerk |
| Print the Applicant Information | In the event of an unforeseen necessity, BFP Clerks can print applicants' information. | BFP FSEU Clerk |
| View Activity Log | One critical component of the system is the ability of an admin to access and review activity logs. This feature is essential because the system has multiple users with editing privileges. | BFP FSEU Clerk |

SMS Notification User Interface

Figure 8 shows the FSIC SMS Notification page, which showcases a comprehensive range of essential and supplementary functionalities that may present usability to users. This page empowers FSEU clerks with the capability to send messages through this developed system while also providing filtering and searching mechanisms to facilitate the identification of specific establishments. Additionally, the inclusion of export Excel features offers users a means to safeguard data through backup files, complemented by a print button for physical documentation. Notably, the FSIC Notification page exclusively features approved establishments only, ensuring that whenever an FSEU clerk intends to send a notification, they can conveniently select an appropriate establishment from the available options and no longer need to sort establishments out. The records displayed on the SMS notification page exclusively pertain to approved establishments, thereby minimizing the time required to filter out unapproved entities.

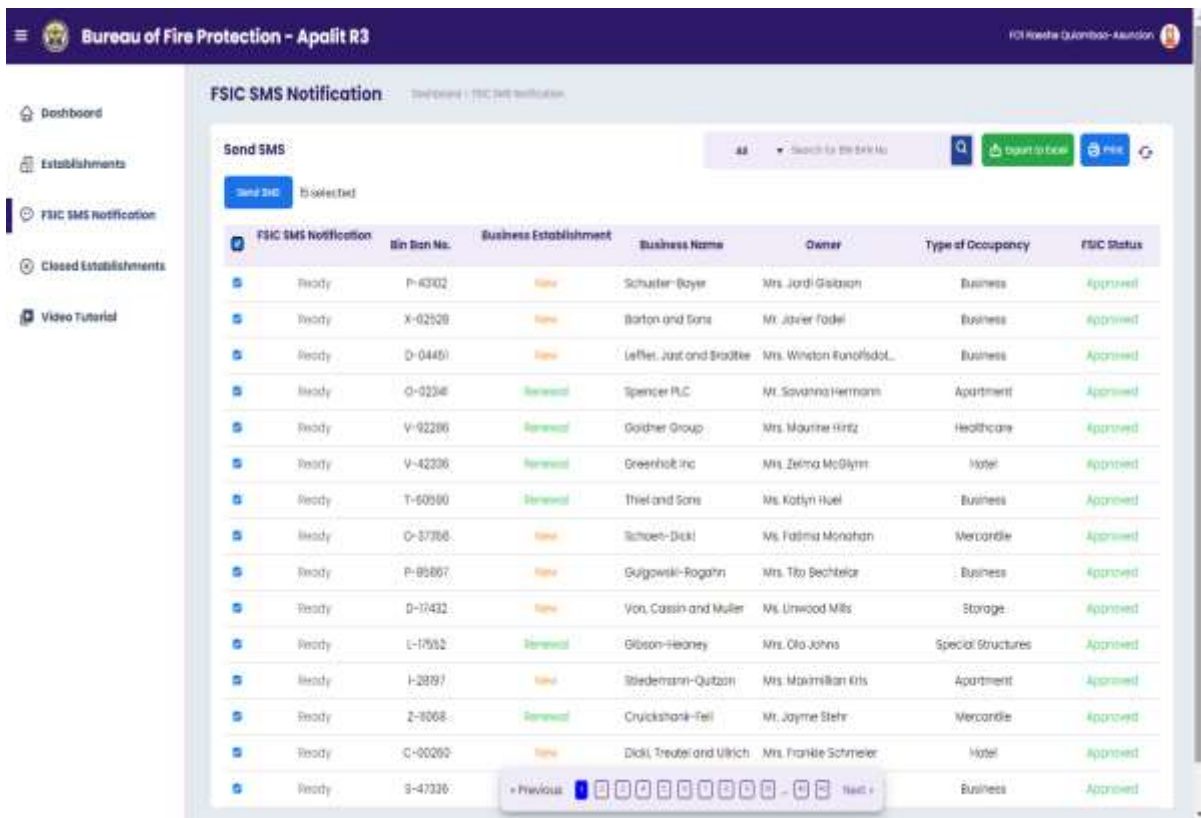


Figure 8. SMS Notification User Interface

Bulk Messaging

The SMS notification page of the System's user interface offers a convenient feature for sending bulk messages by selecting or ticking specific items. It provides an editable template allowing users to personalize messages when choosing mass recipients. Additionally, the page enables the admin, specifically the FSEU clerk, to select

establishments by ticking the boxes on the left, indicating that fire safety inspection clearances are now ready for pickup. A select-all feature facilitates a significant volume of message distribution. By clicking the "send SMS" button, all establishments that have been selected will be able to receive the corresponding notification. A customizable message template provides liberty to the staff to tailor-fit the message to its target recipients.

Table 4. SMS Bulk Messaging Benchmark

| No. | RECIPIENT | Mobile Network Operator (MNO) | LENGTH | TIME SENT | TIME RECEIVED |
|-----|--------------|-------------------------------|--------|-----------|---------------|
| 1 | 6399235XXXX | DITO | 248 | 10:42 PM | 10:42 PM |
| 2 | 6396056XXXX | GLOBE | 250 | 10:42 PM | 10:42 PM |
| 3 | 63931032XXXX | SMART | 250 | 10:42 PM | 10:42 PM |
| 4 | 63991923XXXX | DITO | 248 | 10:42 PM | 10:42 PM |
| 5 | 63906677XXXX | TM | 248 | 10:42 PM | 10:42 PM |
| 6 | 63991216XXXX | DITO | 249 | 10:41 PM | 10:42 PM |
| 7 | 63931101XXXX | DITO | 250 | 10:41 PM | 10:42 PM |
| 8 | 63956728XXXX | GLOBE | 248 | 10:41 PM | 10:42 PM |
| 9 | 63945092XXXX | GLOBE | 249 | 10:41 PM | 10:41 PM |
| 10 | 63977751XXXX | GLOBE | 251 | 10:41 PM | 10:42 PM |
| 11 | 63993406XXXX | DITO | 248 | 10:41 PM | 10:42 PM |
| 12 | 63907704XXXX | TNT | 251 | 10:41 PM | 10:41 PM |
| 13 | 63935664XXXX | TM | 251 | 10:41 PM | 10:41 PM |
| 14 | 63991859XXXX | DITO | 248 | 10:41 PM | 10:42 PM |
| 15 | 63922362XXXX | SUN | 249 | 10:41 PM | 10:41 PM |
| 16 | 63923689XXXX | SUN | 249 | 10:41 PM | 10:41 PM |
| 17 | 63992583XXXX | SMART | 249 | 10:41 PM | 10:41 PM |
| 18 | 63927580XXXX | GLOBE | 249 | 10:41 PM | 10:41 PM |
| 19 | 63922279XXXX | SMART | 250 | 10:41 PM | 10:41 PM |
| 20 | 63997364XXXX | TM | 247 | 10:41 PM | 10:41 PM |
| 21 | 63916331XXXX | GLOBE | 248 | 10:41 PM | 10:41 PM |
| 22 | 63991859XXXX | DITO | 248 | 10:41 PM | 10:42 PM |
| 23 | 63931909XXXX | SUN | 249 | 10:41 PM | 10:41 PM |
| 24 | 63993524XXXX | DITO | 249 | 10:41 PM | 10:41 PM |
| 25 | 63966632XXXX | GLOBE | 248 | 10:41 PM | 10:41 PM |
| 26 | 63950117XXXX | TNT | 251 | 10:41 PM | 10:41 PM |
| 27 | 63949596XXXX | SMART | 251 | 10:41 PM | 10:41 PM |
| 28 | 63963337XXXX | TNT | 249 | 10:41 PM | 10:41 PM |
| 29 | 63992882XXXX | DITO | 251 | 10:41 PM | 10:41 PM |
| 30 | 63992882XXXX | DITO | 251 | 10:41 PM | 10:41 PM |

Researchers conducted a benchmarking study to assess the efficiency of sending personalized SMS messages to recipients on different Mobile Network Operators (MNOs). The objective was to measure the time required to send messages to multiple recipients simultaneously with a personalized message. The study monitored the duration between the moment the messages were sent and when they were received. A total of 30 recipients were selected, comprising family and friends with subscriptions to various MNOs.

The findings are presented in Table 4 which displays the number of recipients, their respective MNOs, message lengths, and the timestamps indicating when the messages were sent and received. The table reveals that the messaging process occurred within one minute, from 10:41 pm to 10:42 pm. Most recipients received their messages promptly, in only a few seconds. However, a few personalized messages were sent at 10:41 pm and received at 10:42 pm. Although this may suggest a delay, it is more likely attributable to the last few seconds of the sending process. The study observed that SMS notifications facilitated the smooth transmission of bulk messages. Nevertheless, according to Semaphore, message processing typically occurs in the order of reception, and during periods of high message traffic, delays can occur due to SMS interference.

Table 5 compares two methods of sending SMS notifications to many recipients. In the manual setting, BFP FSEU clerks are responsible for inputting the contact numbers of each recipient or establishment. Based on testing, it was found that it takes approximately 5 minutes to input ten (10) contact numbers. Therefore, inputting all 30 contact numbers would require approximately 15 minutes. However, this manual process risks potential errors, such as inputting incorrect numbers.

On the other hand, the system offers a convenient feature known as "select all," which allows for selecting all contacts with just a single click. This automated feature takes only 1 second to complete the task. Once the numbers are entered, the clerk will compose a message to inform the recipients that their FSIC is now available for pickup. Composing a message consisting of 160 or more characters takes approximately 30 seconds. However, the messages sent in the developed system are already pre-composed.

Furthermore, it's worth noting that the notification sent is a personalized message. This implies that there are predetermined features that, once received, indicate that the message was intended for specific recipients. This task cannot be accomplished in the manual process as it only allows sending the same message to all recipients. Sending the message to approximately 30 recipients manually should ideally take 3 minutes without delays. However, during the testing phase, researchers encountered a delay that prevented successful sending. This delay could be attributed to various factors. In manual bulk sending, every message is dispatched individually, usually taking approximately 5 seconds per message to complete the process. Compared to bulk sending, the developed system allows sending personalized messages to all 30 selected recipients in less than a minute.

Table 5. Manual Sending and System Sending SMS Notification Testing Comparison

| Manual Sending Bulk Messages | | BFP DMS Sending Bulk Messages | |
|--|---|---|----------|
| Steps | Time | Steps | Time |
| 1. Inputting the collected number of recipients. | 5 minutes per 10 recipients | 1. Select all (feature) pre-collected numbers | 0.03 s |
| 2. Composing a message notification to be sent | 0.30 seconds, 160 characters | 2. Pre-composed message | 0.01 s |
| 3. Mass sending | It takes three minutes to send to 30 recipients; however, there are some failed messages. * cannot customize the SMS message | 3. Personalized Mass sending | 1 minute |

Therefore, this will serve as compelling evidence that the SMS notification feature provided by BFP DMS offers numerous benefits to users, effectively achieving the objectives that BFP DMS will enable FSEU clerks to send SMS Notifications quickly and efficiently.

Security Measures

In securing data stored in the BFP DMS, this study emphasizes the need for added security measures due to the sensitive nature of BFP’s information. The system includes features to securely handle data, such as user access control to monitor usage. It has an upload function that stores files in a cloud database, enabling seamless document access and retrieval. Establishments provide their information to the BFP, and clerks input it into the DMS, making it accessible on the Establishment's profiling page. For notifications, only the business owner's or representative's name and phone number—provided during the FSIC application—are required.

The system has built-in authentication and session features through the Auth and Session facades. To prevent CSRF attacks, it generates a unique, random CSRF token per

user session, resistant to guessing. It includes user authentication to detect and respond to improper login attempts, implementing temporary bans for repeated incorrect credentials to prevent breaches. Access controls assign roles and permissions, restricting sensitive data access. Only authorized personnel can update the system. Activity logs track information updates.

RESULTS AND DISCUSSION

Perceived Usefulness

The survey results about its Perceived Usefulness (PU) shown in Figure 9 implied that most respondents answered “Agree” some strongly agree, and a smaller proportion reported fair evaluations. Noticeably, there’s a “Fair” response from the data.

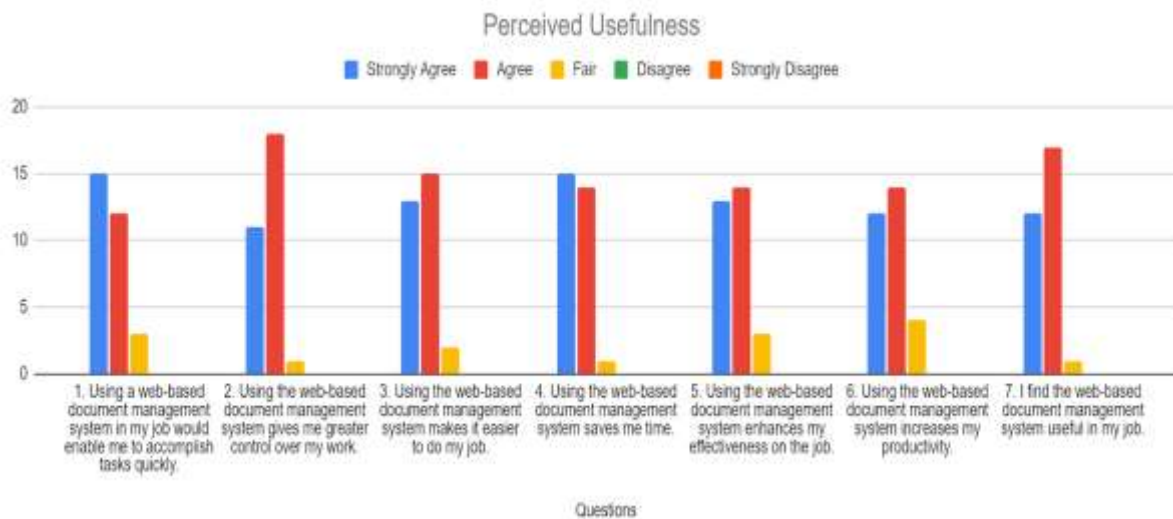


Figure 9. BFP DMS Perceived Usefulness Evaluation

The presented data in Table 5 details the comprehensive tabulated findings of the assessment on the perceived usefulness (PU) of the BFP DMS, evaluated by IT practitioners and BFP Personnel. The analysis reveals an average mean score of 4.35, with a standard deviation of 0.61, indicating a substantial consensus among the respondents. Interpreting the results, it becomes evident that a prevailing sentiment of "strongly agree" is unanimously expressed. Users believed that the web-based document management system enabled them to accomplish their tasks faster, gave them greater control, made their job easier, saved time, and enhanced their effectiveness compared to their manual process (Table 6).

Table 6. Descriptive Statistics for Perceived Usefulness of BFP DMS of All Respondents

| Questions | Mean | Standard Deviation | Interpretation |
|--|------|--------------------|----------------|
| 1. Using a web-based document management system in my job would enable me to accomplish tasks quickly. | 4.4 | 0.67 | Strongly Agree |
| 2. Using the web-based document management system gives me greater control over my work. | 4.33 | 0.55 | Strongly Agree |
| 3. Using the web-based document management system makes it easier to do my job. | 4.37 | 0.61 | Strongly Agree |
| 4. Using the web-based document management system saves me time. | 4.43 | 0.57 | Strongly Agree |
| 5. Using the web-based document management system enhances my effectiveness on the job. | 4.3 | 0.65 | Strongly Agree |
| 6. Using the web-based document management system increases my productivity. | 4.27 | 0.69 | Strongly Agree |
| 7. I find the web-based document management system useful in my job. | 4.37 | 0.56 | Strongly Agree |
| Average | 4.35 | 0.61 | Strongly Agree |

Perceived Ease of Use

Figure 10 depicts the distribution of respondents across various ranks, evaluating the perceived ease of use (PEU) of the BFP DMS. The data reveals that most respondents provided “agree” responses, with some indicating a solid agreement. Additionally, a smaller portion reported fair evaluations, while only a few respondents answered with a “disagree” response.

Table 7 presents a comprehensive summary of the assessed perceived ease of use (PEU) of the BFP DMS, incorporating results obtained from IT practitioners and BFP Personnel. The evaluation involved the participation of all respondents. The findings reveal an average mean score of 4.09, accompanied by a standard deviation of 0.76, indicating a substantial level of agreement among the participants. The data signifies a unanimous "strongly agree" interpretation across all evaluated aspects.

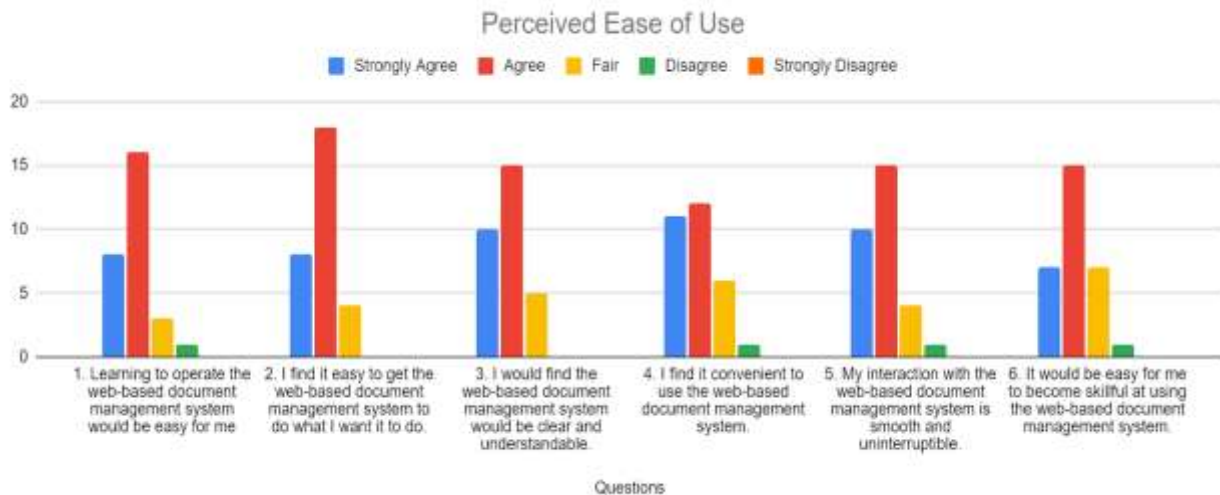


Figure 10. BFP DMS Perceived Ease of Use Evaluation

Table 7. Descriptive Statistics for Perceived Ease of Use of BFP DMS of all Respondents

| Questions | Mean | Standard Deviation | Interpretation |
|--|-------------|--------------------|-----------------------|
| 1. Learning to operate a web-based document management system would be easy for me. | 4.13 | 0.78 | Strongly Agree |
| 2. I find it easy to get the web-based document management system to do what I want it to do. | 4.1 | 0.66 | Strongly Agree |
| 3. I would find the web-based document management system would be clear and understandable. | 4.17 | 0.7 | Strongly Agree |
| 4. I find it convenient to use the web-based document management system. | 4.1 | 0.84 | Strongly Agree |
| 5. My interaction with the web-based document management system is smooth and uninterrupted. | 4.13 | 0.78 | Strongly Agree |
| 6. It would be easy for me to become skillful at using the web-based document management system. | 3.93 | 0.78 | Agree |
| Average | 4.09 | 0.76 | Strongly Agree |

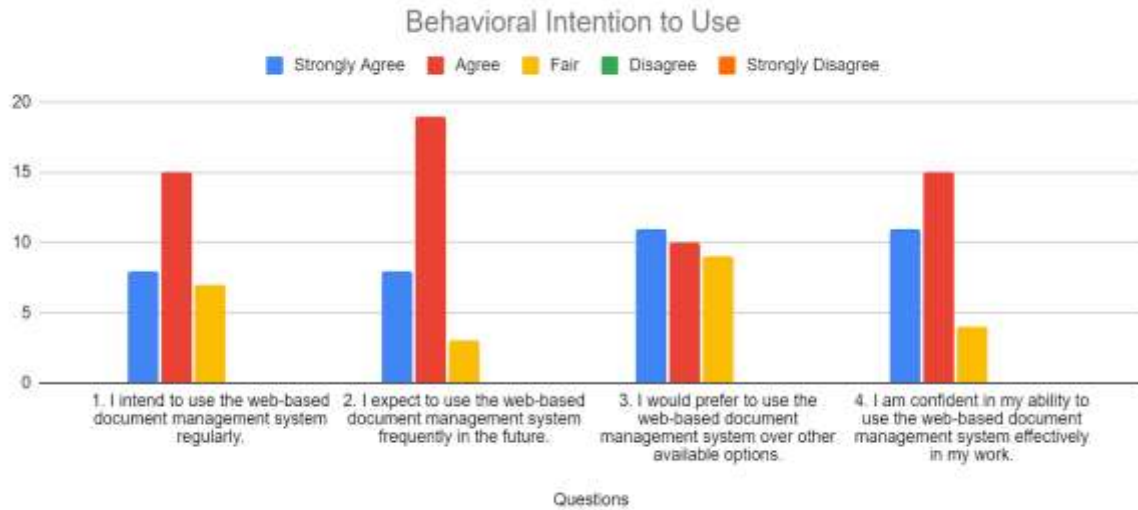


Figure 11. BFP DMS Behavioral Intention to Use Evaluation

Behavioral Intention to Use

The visual representation in figure 11 above illustrates the distribution of respondents across different ranks in assessing the behavioral intention to use (IU) the BFP DMS. The data reveal that a substantial majority of respondents agreed, with a considerable number indicating strong agreement. Additionally, a smaller portion of respondents reported fair evaluations.

Table 8. Descriptive Statistics for Behavioral Intention to Use of BFP DMS of all Respondents

| Questions | Mean | Standard Deviation | Interpretation |
|---|------|--------------------|----------------|
| 1. I intend to use the web-based document management system regularly. | 4.00 | 0.74 | Agree |
| 2. I expect to use the web-based document management system frequently in the future. | 4.13 | 0.63 | Strongly Agree |
| 3. I would prefer to use the web-based document management system over other available options. | 4.07 | 0.83 | Strongly Agree |
| 4. I am confident in my ability to use the web-based document management system effectively in my work. | 4.23 | 0.68 | Strongly Agree |
| Average | 4.11 | 0.72 | Strongly Agree |

Table 8 thoroughly summarizes the evaluation results concerning the overall response of two groups, BFP Personnel and IT Practitioners, regarding their intention to utilize the BFP DMS. The findings demonstrate an average mean score of 4.11 and a standard deviation of 0.72. These values signify a strong agreement among the respondents, explicitly indicating a "strongly agree" interpretation across all evaluated aspects.

Actual Use

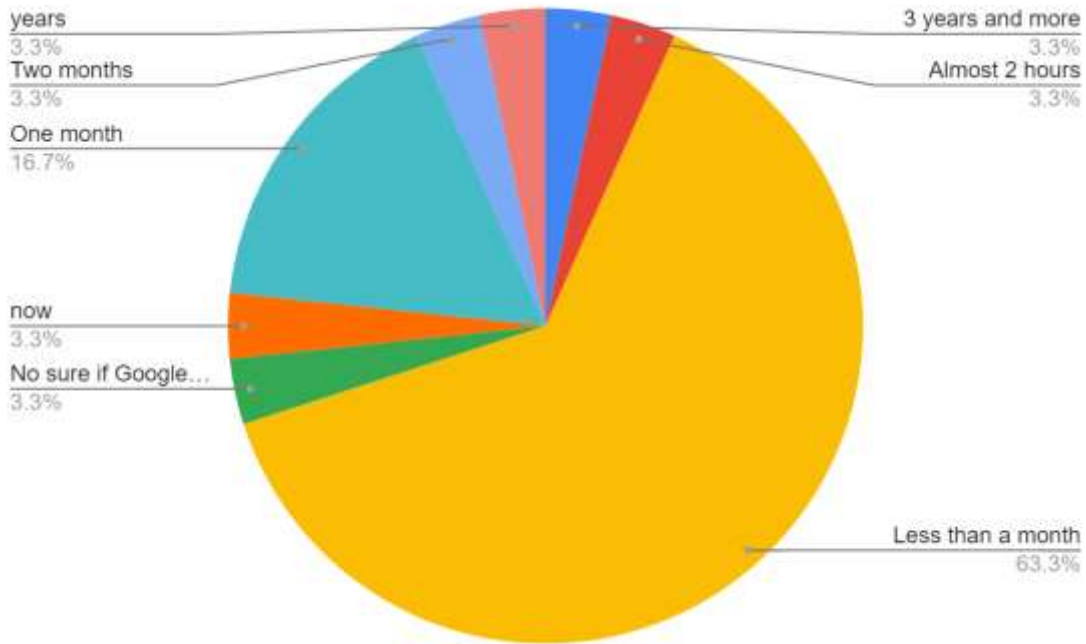


Figure 12. How long have respondents been using the Web-based Document Management System (BFP DMS)

According to the survey results, all thirty (30) respondents were found to be utilizing the BFP DMS and tried sending SMS notifications using the system.

The pie chart in Figure 12 shows the utilization and testing duration of the developed system, BFP DMS, based on the feedback received from respondents. The results reveal a significant level of variation in responses. Notably, most respondents (63.3%) reported using the system for "less than a month." However, it's worth mentioning that a respondent reported a usage duration of 3 years or more. This respondent may have needed to understand the question or provided a more apparent answer, as this response deviated from the project's expected timeframe.

Reliability Testing

The collected survey data were subjected to a reliability analysis to evaluate the internal validity of the findings and determine the reliability of the data related to PU, PEU, and IU. The analysis results in Table 8 indicate a significant internal consistency across all constructs, with reliability values ranging from 0.86 to 0.93. These values surpass the recommended minimum threshold of 0.70 suggested by Moran (2021), indicating high data reliability. A higher Cronbach's Alpha value signifies more excellent data reliability. Specifically, the reliability scores for each construct were as follows: system PU (0.9302), PEU (0.9029), and IU (0.8665). These findings strongly support the overall reliability of the collected data (Table 9).

Table 9. Data Reliability Statistics by Cronbach's Alpha

| Technology Acceptance Model (TAM) | No. of Items | Mean | Cronbach's Alpha | Interpretation |
|-----------------------------------|--------------|------|------------------|----------------|
| PU | 7 | 4.35 | 0.9302 | Excellent |
| PEU | 6 | 4.09 | 0.9029 | Excellent |
| IU | 4 | 4.11 | 0.8665 | Good |

Spearman's Rank Correlation Analysis

Spearman's correlation is revealed as an optimal statistical tool for assessing the associations between constructs within the Technology Acceptance Model (TAM) framework. The accompanying p-value of Spearman's correlation facilitates the determination of statistical significance for these associations. By utilizing Spearman's correlation and examining corresponding p-values, researchers can effectively evaluate the strength and statistical significance of the relationships among the different components of TAM (Table 10).

Table 11 presents the results of hypothesis testing conducted on the Technology Acceptance Model (TAM) components, emphasizing the correlation values and their corresponding p-values. Notably, all hypotheses have been confirmed, as the correlation values indicate a solid and nearly perfect monotonic relationship ($r = -1$ or $+1$). The table reveals correlation values of .90 and above.

Table 10. Dancey and Reidy's (2004) correlation categorization

| Correlation Coefficient | Interpretation |
|-------------------------|----------------|
| 1 | Perfect |
| 0.7 - 0.9 | Strong |
| 0.4 - 0.69 | Moderate |
| 0.1 - 0.39 | Weak |
| <0.1 | None |

Table 11. TAM Components Hypotheses Testing

| Formulated Hypotheses | r | df | p-value | Remarks |
|---|-------|----|---------|-----------|
| <i>H1: Perceived Usefulness (PU) significantly influences the Perceived Ease of Use (PEU) of BFP DMS</i> | 0.916 | 28 | p<0.001 | Supported |
| <i>H2: Perceived Usefulness (PU) significantly influences the Intention to Use (IU) the BFP DMS</i> | 0.938 | 28 | p<0.001 | Supported |
| <i>H3: Perceived Ease of Use (PEU) significantly influences the Intention to Use (IU) of the BFP DMS.</i> | 0.932 | 28 | p<0.001 | Supported |

The analysis findings strongly support all hypotheses. A correlation coefficient of $r=0.916$ demonstrates a significant association between PU and PEU ($p<0.05$). Increasing PU corresponds to higher PEU, establishing a direct positive influence. Similarly, the correlation between PU and IU is strong ($r=0.938$, $p<0.05$), indicating that higher perceived usefulness leads to increased intention to use. The relationship between PEU and IU is also significant ($r=0.932$, $p<0.05$), showing a positive connection between the two variables.

CONCLUSION

Implementing all the features and functionalities of a Web-based Document Management System in the BFP branch in Pampanga has proven to be highly useful and user-friendly, as it received favorable evaluations for its comprehensive range of features

and functionalities. Based on the analysis, the system is perceived as useful ($\bar{x}=4.35$, $\sigma=0.61$, $\alpha=0.93$), perceived ease of use ($\bar{x}=4.09$, $\sigma=0.76$, $\alpha=0.90$), and intention to use ($\bar{x}=4.11$, $\sigma=0.72$, $\alpha=0.86$). While the validation of BFP DMS' usefulness and ease of use, the data revealed high-reliability scores of PU (0.9302), PEU (0.9029), and IU (0.8665), indicating strong support for the reliability of the data. In addition, Spearman's Correlation yielded the following results: PU to PEU ($r = 0.916$, $p < 0.05$), PU to IU ($r = 0.938$, $p < 0.05$), and PEU to IU ($r = 0.932$, $p < 0.05$). These findings indicate a strong positive relationship between the variables, demonstrating a high statistically significant correlation. Overall, the developed system, a web-based document management system for FSIC processing with SMS integration, is perceived as highly valuable and user-friendly. This study delves beyond functionality, extending its focus to encompass security measures designed to safeguard the data housed within the BFP DMS.

RECOMMENDATIONS

To enhance the usability and functionality of the BFP Document Management System (DMS), the following improvements are recommended:

1. User Interface (UI): Simplify navigation by reducing unnecessary clicks and typing. Develop a mobile-friendly interface to increase accessibility and improve the functionality of critical elements like buttons for smoother interactions.
2. Future Research and Development:
 - Field Inspections: Include a specialized user interface for BFP inspectors to access inspection checklists on mobile devices or tablets, streamlining the inspection process in the field.
 - Superadmin Role: Implement a superadmin role to oversee system access, manage user roles, and control site-wide settings, enhancing security and administrative efficiency.
 - FSIC Expiration Notifications: Expand notifications to alert FSEU clerks when an establishment's Fire Safety Inspection Certificate (FSIC) is approaching or has reached expiration, improving compliance tracking.

These enhancements ensure the BFP DMS remains user-centric, adaptable, and efficient, laying a foundation for further improvements.

ACKNOWLEDGEMENT

The researchers are forever indebted to the Almighty God for His immeasurable blessings and lovingkindness, the Lord Jesus Christ for His sacrifice, peace and Joy of the Holy Spirit. The researchers were also grateful to the academic institution, La Verdad Christian College, and its leaders and sponsors for the scholarship opportunity and the sincere support. They also sincerely thank their clients, Ms. Raeshe Quiambao-Asuncion and Willa Pateo from BFP Apalit, Pampanga, for their unwavering support and valuable insights throughout the research journey. The researchers are thankful for the guidance of their IS capstone project instructor and the committee of panellists who provided helpful feedback. They also acknowledge the contributions of their classmates and alumni, whose assistance and insights enhanced the study.

DECLARATIONS

Conflict of Interest

The researchers declare no conflict of interest in this study.

Informed Consent

A data privacy notice and consent were provided before collecting the client's information to ensure that they understood and consented to the processing of their personal information.

Ethics Approval

This research project has received approval from the Bachelor of Science in Information Systems Program faculty at La Verdad Christian College, Apalit, Pampanga. The approval covers all study aspects, including research design, informed consent procedures, and data collection methods. This ensures that the research adheres to ethical principles, prioritizes the well-being and rights of participants, and maintains confidentiality.

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Author's Biography

Ms. Bless B. Catalan graduated with a Bachelor of Science in Information Systems from La Verdad Christian College. Following her education, she completed an on-the-job training program at an IT Solutions Company and secured a permanent position for

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Mr. Romack L. Natividad's research interests include Information Systems, Model-Based Software Engineering, and Intelligent Systems.