

A DATA-DRIVEN-SYSTEM PROCUREMENT MONITORING FRAMEWORK FOR PHILIPPINE GOVERNMENT INSTITUTIONS**Hidear Talirongan****ORCID ID - 0000-0002-9143-4458**Assistant Professor, Northwestern Mindanao State College of Science and Technology Tangub City,
Misamis Occidental, Philippines**Eljun Karl C. Atay****Vincent S. Estomata****Princess Joy S. Macalisang****Roxan D. Cayetano**NMSC Students, Northwestern Mindanao State College of Science and Technology Tangub City,
Misamis Occidental, Philippines**ABSTRACT**

The Bids and Awards Committee of a Philippine government department is operating a semi-manual process with Excel as a platform. Due to this, there have been delays and inconsistencies in the tracking of procurement milestones as well as in the generation of documents. A project has been created to solve these problems by implementing a Procurement Monitoring System that will update milestones automatically, keep the scanned documents, and generate annual analytical reports together with alert notifications.

The system utilized the prototype model in its construction and was implemented with tools such as Microsoft Visual Code, MySQL, and XAMPP. The assessment was done through Alpha and Beta Testing utilizing a 3-point Likert scale. The Beta Test was conducted with five (5) qualified participants: the BAC Head, one representative from the Budget Office, and three end-user representatives from the Engineering Office, City Health Office, and Mayor's Office, respectively.

Results have shown that the system was generally well-received. The Admin module got a calculated average of 2.90 ("Very Acceptable"). The Action Personnel module had a mean score of 2.70 ("Acceptable" to "Very Acceptable"), and the Requesting Entities module was able to get 2.60 ("Acceptable"). Such results corroborate the effectiveness of the system in accomplishing its goals and thus, the procurement workflow of the BAC office can be greatly enhanced by the system.

Keywords:

Procurement, System, Prototype Model, Process, Visual

I. INTRODUCTION

Government procurement is fundamentally the process of getting the right goods or services at the best possible price (Lysons & Farrington, 2020). Efficient and transparent procurement systems are vital for public sector organizations, as they directly influence the quality of public service delivery, the stewardship of public funds, and citizens' trust in government. However, procurement structures across the globe often face delays in documentation, fragmentation in data, and weak monitoring frameworks (Jenkins et al., 2024; Soyly et al., 2022). Such shortcomings can create opacity and increase the risk of corruption, particularly when procurement data is missing, duplicated, or poorly formatted (Basdevant, 2023; Potin et al., 2023).

As a means to deal with these deep-rooted problems, administrations around the globe are implementing digital transformation to renew their activities. The use of e-procurement platforms along with real-time data analytics and digital workflows not only automates the necessary manual operations but also makes it more efficient to supervise and control (Hlacs & Wells, 2025; Mavidis & Folinas, 2022; Mokeeva & Yurko, 2023). For example, digitized procurement systems can use the IoT and blockchain for complete traceability while concurrently using data analytics and AI in enhancement of risk management, spend analysis, and strategic decision-making (Saidu et al., 2025). Furthermore, the centralization of data significantly improves transparency and guarantees

strong auditability (Guida et al., 2023), while the imposition of universal data norms ensures effectiveness (Giorgiantonio & Decarolis, 2020).

As a result of this worldwide change to modernization, the Philippines has made it compulsory for procurement activities to be regulated through the Government Procurement Reform Act (RA 9184) as a means to achieve good governance. In the recent times, the Department of Budget and Management (DBM) and the Government Procurement Policy Board (GPPB) have placed digitalization as their top priority and are advocating for a procurement system that is more unified and centralized.

But the only have studies so far that government departments with manual procurement systems are suffering from inefficiencies in their operations due to delays, inconsistent documents and poor monitoring, among other things (Jose Vincent Querijero et al., 2024; Rashid & Uddin, 2022). To be more specific, the local government Bids and Awards Committee (BAC) of the concerned Philippine department is using a semi-manual process through Excel. Due to this reliance, they have experienced delays and inconsistencies in the recording of their procurement milestones. To resolve these issues, this study suggests the creation and implementation of a unified Procurement Monitoring System that will facilitate the automatic tracking of milestones, the handling of documents, and the generation of reports (Boafo & Ahudey, 2020; Paul et al., 2024).

II. REVIEW OF RELATED LITERATURE

2.1 Related Literature

2.1.1 Local Literature

Procurement represents the most essential and strategically-influenced action in the public sector, where it is the major propeller of not only the daily operational activities but also the long-term public investment. As a result, the level of a government's procurement work is a determining factor of the level of its public services at the strategic, tactical, and operational performance. (Manyathi et al., 2021; Tandian et al., 2025; Wan Abdullah et al., 2022).

Meanwhile, in a study done by (Jose Vincent Querijero et al., 2024; Rashid & Uddin, 2022), Public procurement has been described as one of the modern economic system layers that has a significant influence on the building up of the countries and regions' creative potential. Among its main features are the regulatory, reproductive, stimulating, social, and inventive ones. Consequently, it is a very relevant and timely topic to study the public procurement system nowadays.

2.1.2 Foreign Literature

Holistic Frameworks vs. Fragmentation: Recent pieces of procurement research repeatedly highlight the need for a wider and more integrated perspective as one of their major themes. The literature keeps pointing out that the historically compartmentalized way of procurement, which, for instance, separates activities such as compliance and cost-efficiency, is still being used (Prebanić & Vukomanović, 2023). In response, many scholars advocate for more "holistic frameworks" that analyze the entire procurement lifecycle. This modern approach moves beyond the narrow focus on tendering and selection to emphasize strategic, high-level topics, particularly the central role of stakeholder theory and stakeholder engagement in creating public value (Bianchini & Appolloni, 2025).

Automation and Centralization: Adopting such advances would increase the efficiency and effectiveness of firms by automating operations and increasing coordination among employees (Harju et al., 2023; Lee et al., 2024). The comparative study on public procurement mechanisms revealed that a centralized type of mechanism that enables the use of efficient and flexible procurement methods is superior in most cases. The main factors, which decide the way the process goes, are the implementation of the principles of legality and novelty, impartial selection of the best bidder, anti-corruption measures, and ensuring the high efficiency of the public procurement execution. (Daniel Maiyaki et al., 2025).

2.2 Related System



Figure 1. Screenshot of eGov Procurement Monitoring System

2.2.1 Local Existing System: e-Gov Procurement Monitoring System

MYBUSYBEE INC, is a VAS-licensed company by the National Telecommunications Commission (NTC) and a cybersecurity provider accredited by the Department of Information and Communications Technology (DICT). The company is the pioneer in the Philippines of the e-Procurement system for government agencies that was designed to automate the procurement process and is in compliance with R.A. 9184.

- **Remote Access & Security:** This timing could not have been better as nearly the entire government workforce is telecommuting due to the health crisis. As soon as the information is keyed-in the system, it becomes safe from unauthorized access from outsiders. Through the use of the e-Gov Procurement Monitoring System, different people can view the records that are away from the office in a secure manner.
- **Efficiency:** The automated e-Gov Procurement Monitoring System takes away a good number of the dull and time-consuming tasks that are usually part of a manual procurement by simply doing all the activities. The authorizing authority may check and give his/her approval to the cases that are waiting for it right from his/her online account.

2.2.2 International Case Study: The Public Procurement Monitoring System of Montenegro

To comply with international best standards and to fulfill the prerequisites for joining the European Union (EU), Montenegro is upgrading and reorganizing its public procurement system.

- **Strategic Measures:** In order to make sure that major changes, which improve the whole procurement system, are effectively implemented, the Government of Montenegro has done a number of things to fix the problems in the system besides just drafting the strategies for the development of the procurement system and the action plans that specify the measures and the goals. Independent assessments have confirmed that these efforts have brought significant changes in the areas that were most problematic and show a slow but steady move towards more efficient procurement practices.

- **Data-Driven Monitoring:** Improving and upgrading a procurement system is very much a matter of data availability, data analysis for the business intelligence process, and other related activities. Regulations and critical performance measures (KPIs) will be put in place to revamp the management, auditing, and reporting systems. This report includes such an examination through the benchmarking of the annual reports whereby monitoring is looked at from the perspective of conformity with the set targets.

2.3 Synthesis and Comparative Analysis

Documents and studies from local and foreign authors have been considered, revised, and compared with the present researcher's work. The procurement monitoring system based on local and foreign literature and practices for the Philippine government institutions is a facility that makes their work comfortable and easy.

Gap Analysis

It is worth mentioning that the present systems such as the e-Gov solution are made with the intention of being accurate to the minute and are aimed at eliminating repetitive tasks. However, the newly planned project will concentrate only on the BAC office's transactions, operations, and processes. By means of the new arrangement, the staff members can become more productive as it is going to be easier for them to keep a record of the BAC operations and at the same time monitor the milestones of the requesting entities.

Table 1
Comparison of Existing Systems vs. Proposed System

Feature	e-Gov Procurement System (MYBUSYBEE)	Montenegro Public Procurement System	Proposed System (Philippine Gov. Inst.)
Primary Focus	General automation compliant with RA 9184 for all agencies	Modernization for EU accession and international best practices	Specialized workflow for the BAC Office transactions and operations
User Accessibility	Online/Remote access for work-from-home setups	Centralized monitoring for government oversight	Local network monitoring for BAC staff and Requesting Entities
Monitoring Scope	Approval of pending cases and general data protection	KPI-based monitoring and regulatory compliance	Detailed milestone tracking, document archiving, and specific notifications
Target Audience	General Philippine Government Agencies	Government of Montenegro & Auditors	BAC Office, Action Personnel, and Requesting Entities

Table 1 illustrates that although there are external systems available to manage overall compliance and remote approvals, a deficiency of a specially designed instrument to internally manage the daily routine of document tracking and to trigger milestone notification in a BAC office environment can be observed. The proposed system fills this gap by providing "unified source of truth" for the local office.

2.4 Technical Background

To ensure the successful development and implementation of the Procurement Monitoring System, the researchers utilized a specific stack of software and development tools.

Development and Server Environment

The main programming and development were carried out with the help of Microsoft Visual Code, which is a multi-purpose source code editor commonly used in the creation of web applications. Alongside this, XAMPP was utilized to facilitate the local server. XAMPP is an open-source cross-

platform web server solution, released by Apache Friends and includes the Apache distribution that was used to run the local server. Additionally, the project made use of the Windows Forms platform in the Visual Studio environment for certain application interfaces.

Design and Frontend Frameworks

The researchers used Bootstrap for the system's user interface and user experience (UI/UX) design. Bootstrap is an open-source CSS framework that makes front-end development responsive and mobile-first with ready-to-use HTML, CSS, and JavaScript templates. Figma, a browser-based vector graphics editor, was the tool for prototyping and visual design phases, and Lucid Chart was the tool for creating and collaborating on the system's flowcharts and functional diagrams.

Database Management

MySQL, an open-source relational database management system (RDBMS) that structures data into tables with rows and columns, was used for the backend data management. The system made use of Structured Query Language (SQL) to interact with, administer, and fetch data from the database, thus guaranteeing smooth data handling for the procurement records.

III. METHODOLOGY

3.1 Project Design

The researchers used the Prototype Model for the system's development. As a software development model (SDM), it guides the researchers to present a working version (prototype) of the product to be demonstrated. From the feedback of the users, it is possible to make the necessary changes before the final solution is developed.

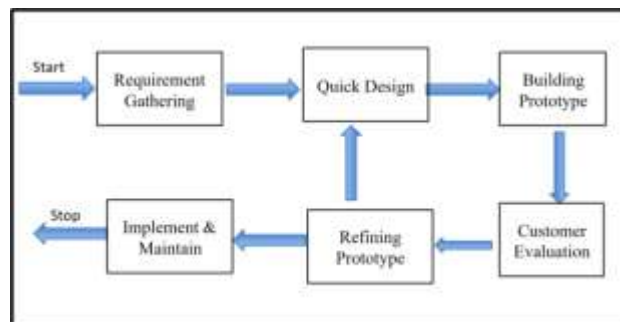


Figure 2. The Prototype Model

3.2 Requirement Analysis

3.2.1 Current Technical Situation (Procurement Workflow)

The proponents analyzed the existing workflow of the Philippine Government Institution based on the system prescribed by the BAC office. The current manual process for Purchase Requests (PR) is being done as follows in the workflow:

- Step 1: Receiving PR: The BAC Receiving Officer will receive the approved PR by the City Mayor from various departments, along with additional documentary requirement.
- Step 2: PR Evaluation: The Officer checks the PR for completeness and price accuracy based on current market values to prevent bidding failures.
 - Specific Requirements: For example, the PR for meals must include menus; electronics require technical specifications.

- Control Number & QR: Completed PR are assigned with a BAC Control Number and a QR code for tracking purposes. While, incomplete PRs are returned to the end-user.
- Step 3: Method of Procurement Selection: The BAC members determine the appropriate procurement method during their meetings. For example, Competitive Public Bidding or Alternative Methods.
- Step 4: Document Preparation: Purchased request are categorized, and the required paperwork is created (RFQs, Invitation to Bid). A softcopy of PR is used to speed up the process.
- Step 5: Publication: Request and Invitations are published on the PhilGEPS website.
- Step 6: Compilation and Release: Suppliers receive the Purchased Request (PO), Notices to Proceed, and Notices of Awards. In accordance with COA regulations, the admin gather this documents for inspection and transmission.

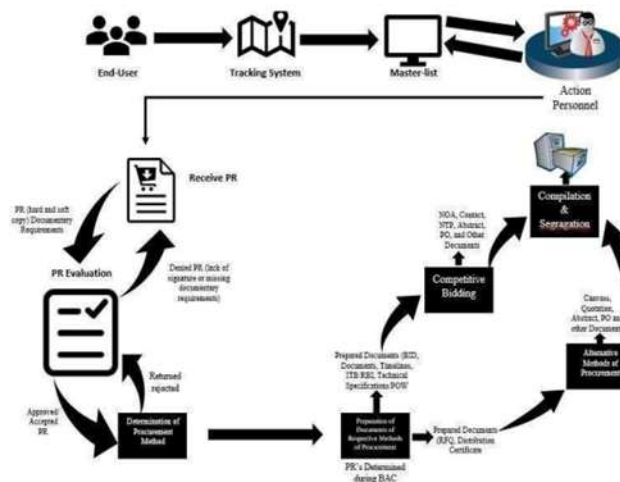


Figure 3. Procurement Procedure

3.3 Requirement Documentation

Table 2 Hardware Requirements

Name	Specification	Purpose
Laptop/PC	8GB Ram DDR3 500GB HDD	It is designed to be more portable than desktop computers while yet performing many of the same operations.
Monitor	Resolution: 1366 x 768 Screen size: 21.5"-27" Aspect ratio: 16:9	It is an output device that displays information in the form of graphics or text.
Keyboard	Standard layout, full size,F-keys ,number pad, wired	It is a type of peripheral input device that employs a set of buttons or keys to allow users to enter text, numbers, special characters, and/or specialized functions by pushing the key buttons.
Mouse	Sensor: Optical, 1000 DPI sensitivity Buttons: 2 buttons, clickable scroll wheel	It is a handheld hardware input device that points, moves, and selects text, icons, files, and folders on your computer using a cursor (graphical user interface).

Table 3

Software Requirements

Name	Specification	Purpose
Visual Studio	1.65.0 (64-bit)	It is a small code editor with debugging, task execution, and version control capabilities.
MySQL	3.0.1 (64-bit)	It is a SQL-based relational database management system. It is a dependable, powerful, and stable solution with advanced features.
XAMPP	8.1.5 (64-bit)	It can access the Internet and serve web pages. Using a specialized tool, the most crucial elements of the product are password-protected. XAMPP can also construct and manipulate databases such as MariaDB and SQLite.

3.4 Design of Software, System Products, and/or Process

3.4.1 System Architecture

The system cares for a local server environment. The office is uploading the finalized Project Procurement Management Plan (PPMP) through Excel, which is being saved on the server. The action personnel are using a router to access these files, merge them with the Annual Procurement Plan (APP), and refresh procurement milestones. The Admin is watching over all the data that are being kept, including new tasks, updated milestones, and analytical reports.

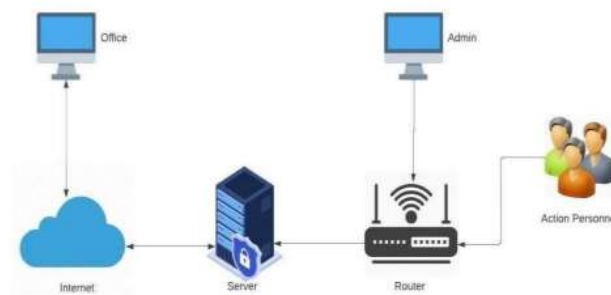


Figure 4. System Architecture

3.4.2 Context Diagram

The system interaction involves three main entities:

- Office/Admin: Upload the finalized PPMP and monitors all the paper trails and reports.
- Action Personnel: Receives assigned tasks (PRs), uploads scanned documents (PR, Abstract, PO) and updates milestones.
- Requesting Entities: Only tracks the milestone of their specific PRs and receives notification alerts when the documents are ready.

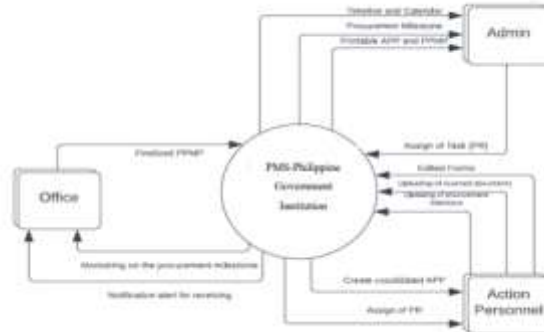


Figure 5. Context Diagram

3.4.3 Context Diagram

The movement of data revolves around the database which is the storage of milestones and entities. The Admin, through the database, registers Action Personnel and Requesting Entities. A tracking number is assigned to the Purchase Request by the Document Tracking System, and Action Personnel are handed their tasks to edit forms and upload documents.

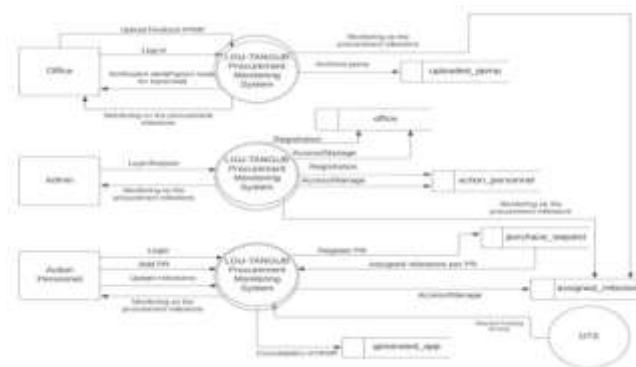


Figure 6. Data Flow Diagram

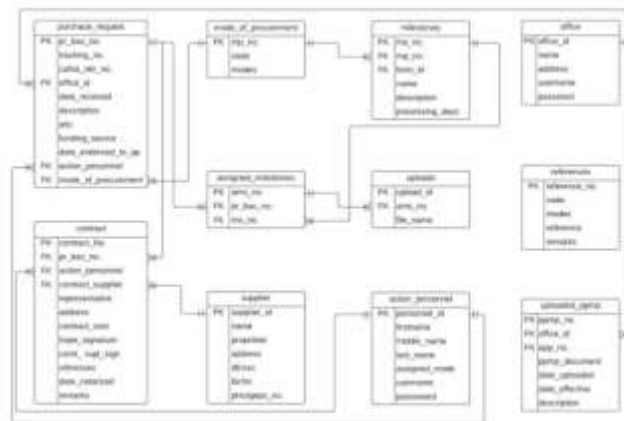


Figure 7. ERD for Procurement Monitoring System for Philippine Government Institution

3.5 Development and Testing

3.5.1 Development Phase

The developers first obtained the go-ahead from the BAC Chairman and City Planning Development Coordinator. Essential display requirements were collected through personal interviews with the BAC Secretariat and office staff. Following that, a system layout was drafted with the help of the project adviser.

- First, the developers asked Mr. Emerson C. Dablo, the BAC Chairman and City Planning Development Coordinator, permission to develop a procurement monitoring system to be used for the Local Government Unit of Tangub- BIDS and Awards Committee (LGU Tangub-BAC).
- Second, the developers conducted a personal interview with the BAC Secretariat, with Mr. Emerson C. Dablo and the office of BAC to gather the necessary information to be displayed on the LGU Tangub-BAC procurement monitoring system.
- Third, the developers asked Mr. Bill Lawrence Samar, the adviser, to help and guide their system.
- Lastly, the developers created a design of the system followed by the structure of the prototype model.

3.5.2 Testing Phase

3.5.2.1 Alpha Testing

Conducted by the developers to validate the module specifications and functionality.

Table 4
MODULE SPECIFICATION

Module	Activities	Duration
Admin Module	<ul style="list-style-type: none"> • can log in • can add a user to the BAC office • can monitor the procurement milestone • can print • can save • can scan documents • can download all forms • can assign action personnel for respective PR • can log out 	1 Hour
Requesting Entities	<ul style="list-style-type: none"> • can log in • can monitor their respective PRs • can receive a notification alert 	25-30 minutes
Action Personnel	<ul style="list-style-type: none"> • can log in • can edit • can log out 	30 minutes

3.5.2.2 Beta Testing

The developer's goal is to create a procurement monitoring system that is managed by the admin, action personnel, and requesting entities, with the flow of procurement monitoring as the major focus of all important databases. The prime purpose of procurement

monitoring system beta testing is to allow all respondents and developers to advocate for and test the entire system and how it works. Also, the features that are designed in the system are validated or tested. 30 Developer groups must be included in system testing so that if there is something wrong or a mistake that the system's developer missed, they can offer suggestions or adjustments to the system. Internal and external testing of the system will both go through a beta testing method, which will result in a change. After all, the feedback gathered from the testers will be thoroughly analyzed to determine what adjustments they want to make to the system. Also, various functionalities that can be introduced to the system, such as features or aesthetics, need to be fixed.

3.5.3 Beta Testing Evaluation Form

Beta testing is a test initiated by developers for users that is particularly useful in determining whether the system's requirements/objectives have been met successfully. Purposive sampling is used to choose the test participants based on identifying each respondent as having the necessary knowledge and qualification to test the system. For the purpose of assisting them in the revision process, the developers also retained a record of all criticisms and suggestions.

Table 5

ADMIN'S QUESTIONNAIRE

Instruction: Please put a (✓) in the appropriate box for each statement. Your rating will be treated with the utmost confidentiality. The designers, programmers, and the rest of the researchers appreciate your time and cooperation.

The system allows the user to print the individual PPMPs/Finalized PPMP.			
The system allows the users to print the consolidated APP.			
The system allows the users to assign a task (PR) to the action group/personnel.			
The system allows the users to monitor the procurement milestones for PB and alternative modes			
The system allows the users to monitor the timelines or calendar for procurement milestone			
The system allows the users to monitor the database for scanned documents and editable forms such as PR, RFQ, PO, and Abstract.			
The system allows the users to generate annual visual analytic reports on procurement projects.			

Table 6
ACTION PERSONNEL’S QUESTIONNAIRE

Instruction: Please put a (✓) in the appropriate box for each statement. Your rating will be treated with the utmost confidentiality. The designers, programmers, and the rest of the researchers appreciate your time and cooperation.

PERFORMANCE			
	Very Acceptable	Acceptable	Not Acceptable
The system allows the users to login			
The system allows the user to update the Procurement Milestone/Timeline for tasks (PR) assigned.			
The system allows the users to monitor the forms such as PR, Abstract, RFQ, and PO			
The system allows the users to upload scanned documents such as PR, Abstract, RFQ, and PO.			

Table 7
REQUESTING ENTITIES QUESTIONNAIRE

Instruction: Please put a (✓) in the appropriate box for each statement. Your rating will be treated with the utmost confidentiality. The designers, programmers, and the rest of the researchers appreciate your time and cooperation

PERFORMANCE			
	Very Acceptable	Acceptable	Not Acceptable
The system allows the users to create an account and login			
The system allows the user to prepare PMP			
The system allows the user to upload finalized PMP.			
The system allows the users to monitor the procurement milestone for their respective PR's			
The system allows the users to receive a notification/alert via email if the papers are ready for transmittal.			

3.5.4 Participants and Sample Size

Purposive Sampling was used to select participants for the Beta Test. Those participants were the ones who had the specific knowledge and qualifications related to the procurement process. The testing group consisted of five (5) qualified participants:

1. The BAC Head.
2. One representative from the Budget Office.
3. Three end-user representative from the Engineering Office, City Health Office, and Mayor’s Office.

This sample size was chosen to ensure that key stakeholders from every stage of the procurement lifecycle (budget, approving, and requesting) were represented.

3.6 Data Analysis Plans

To determine the degree of system approval, the study employed both quantitative and qualitative analysis methods.

3.6.1 Quantitative Analysis

A 3-point Likert Scale survey questionnaire was given to the participants. The data were analyzed through Weighted Mean to identify the level of acceptability of the system.

Weighted mean and thematic analysis were applied as statistical techniques to examine the data received from survey questionnaires distributed to the participants of this study to 34 determine the degree of system approval. The 3-point Likert scale was used to tabulate and analyze the data.

Rating Scale:

The concerned end user will be given a questionnaire to complete in order to collect data and information (s). It is a 3-item questionnaire where responses are rated in 3-1-point scores with respective verbal interpretations.

Points	Verbal Interpretation
3 points	Very Acceptable
2 points	Acceptable
1 point	Not Acceptable

The three-point Likert scale was weighted as follows: very acceptable – 3, acceptable – 2, and not acceptable = 1. The following decision rule was used:

Table 8
Likert Scale Table

Range of the Weighted Mean	Points	Interpretation
2.8 – 3.0	3	Very Acceptable (Functionalities of the system are well understood by the users)
1.9 – 2.7	2	Acceptable (Functionalities of the system are somewhat understood by the user) or accepted with a minor condition)
1.0 – 1.8	1	Not Acceptable (The functionalities of the system are not understood and is not clear for the user)

Note: This indicates that any method with a mean score of less than 1.9 was regarded to be irrelevant.

3.6.2 Qualitative Analysis

Apart from numerical scores, the research team used Thematic Analysis to understand the user feedback during the test sessions. The developers kept a log of all the negative feedback, comments, and suggestions made by the respondents. These qualitative statements were sorted into different themes (for example, malfunctioning issues, visual improvements, new features) and were instrumental in the decision-making process for the final changes of the system.

3.7 Functional Decomposition Diagram



Figure 8. Functional Decomposition Diagram

IV. SYSTEM DESIGN AND MODULES

This chapter displays the system’s prototype and the results of the system test after completing the development phases described in the preceding chapter. Procurement Monitoring System for Philippine Government Institution has finished prototype.

4.1 System Modules

4.1.1 Login Module

In order to maintain safety and limit access depending on the user role, the system is designed with different login windows. Admin, Action Personnel and Requesting Entities need to verify their credentials in the system before they can take advantage of its functionalities.

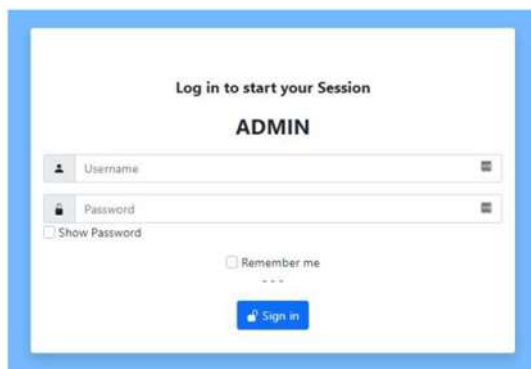


Figure 9. Admin Login

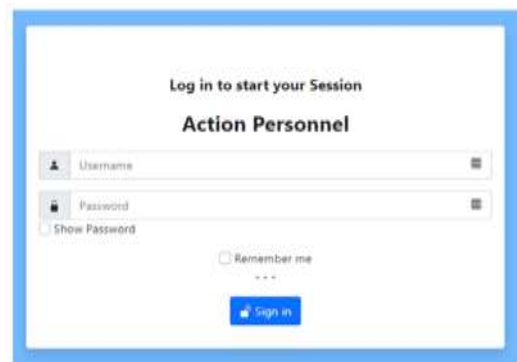


Figure 10. Action Personnel Login

4.1.2 System Admin Module

Admin Module serves as the command center for the BAC office.

- **Dashboard:** When the Admin logs in, a dashboard is shown to him/her where procurement activities are displayed after being filtered by month, year, and mode. The application visually differentiates the status of the projects for quick recognition by using colors. A project that is finished is represented by the color pink, whereas a project that is still going on is represented by the color blue.
- **User Management:** The Admin can perform the following actions: view, add, and update the details of Action Personnel and Requesting Agencies/Entities.
- **Document Archiving:** A special function is available, through which the Admin can upload and download scanned files. This will be the basis of a digital archive for audit

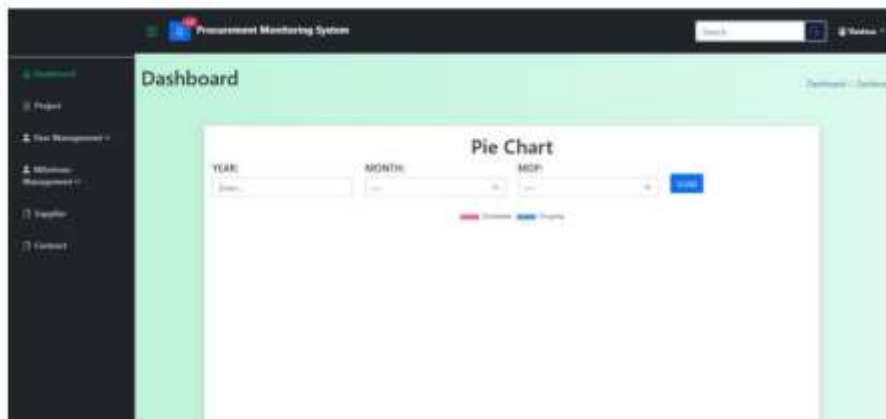


Figure 11. Admin Dashboard Module



Figure 12. Admin Table

4.1.3 Project Monitoring Features

The main function of the system is the real-time tracking of Purchased Request (PR)

- **Milestone Tracking:** Admin can monitor the specific milestone of every project in the Admin Monitor Project Table.
- **Alerts and Notifications:** The system sends notifications alerting the completion of a PR milestone, thus guaranteeing the moving of the steps on time.
- **Prioritization:** Priority PRs are color coded to visually separate them from the rest of the PRs and let the user know that these are the most urgent tasks which require immediate attention.

Project ID	PR No.	Description	Date Received	Date Endorsed to Ap	Mode of Procurement	Active Milestone	Deadline	Remaining Days	Operations
1204	20220000	Pre bids	2022-11-04	2022-11-14 20:21:05	PR_Scoping	Pre bids	2022-12-01	9	
1205	20220001	Purchase Request/PR	2022-11-11	2022-11-11 06:29:12	PR_Consulting	Purchase Request/PR	2022-11-21	1	
1206	20220002	Purchase Request/PR	2022-11-15	2022-11-15 06:30:04	PR_Implementation	Purchase Request/PR	2022-11-18	4	

Figure 13. Admin Monitor Project Table

Project ID	PR No.	Project Name	Date Received	Date Endorsed to Ap	Mode of Procurement	Active Milestone	Deadline	Remaining Days	Operations
1205	20220001	Pre bids	2022-11-04	2022-11-14 20:21:05	PR_Consulting	Pre bids	2022-12-01	1	
1206	20220002	Pre bids	2022-11-04	2022-11-14 20:21:05	PR_Scoping	Pre bids	2022-12-01	1	

Figure 14. Admin Notification Alert of Completed PR

4.1.4 Action Personnel Module

This unit is specially prepared for the employees who are in charge of document processing. It provides Action Personnel with the opportunity to look at the tasks that have been assigned to them specifically and to bring the milestones up to date as they finish their part of the work on a Purchase Request.

Project ID	PR No.	Project Name	Date Received	Date Endorsed to Ap	Mode of Procurement	Active Milestone	Deadline	Remaining Days	Operations
1205	20221105	Purchase Request/PR	2022-11-05	2022-11-05 01:41:20	PR_Scoping	Purchase Request/PR	2022-11-06	1	

Figure 15. Action Personnel Monitor Respective PR

V. TESTING RESULTS AND DISCUSSION

This chapter presents the findings of the system assessment describing in detail the procedures that were undertaken and the quantitative data that were collected from the respondents.

5.1 Alpha Testing Results

Developers (proponents) performed the first test of the system to check the module specifications and functionalities. This stage was primarily concentrated on fixing errors and confirming that the system's logic, for example, the flow of a Purchase Request (PR) from "Pending" to "Approved", was working properly without the need of any user from outside.

Table 9 Alpha Testing

	Activities	Duration
Admin Module	Allow the user to login	1-2 minutes
	Allow the user to assign action personnel	3-5 minutes
	Add user to the BAC	5 minutes
	Allow the user to assign a task (PR)	6-7 minutes
	Allows the user to monitor the procurement milestone	3 minutes to 4
	Allows user to monitor the timelines or calendar	2 minutes
	Allows the user to monitor the database for scanned documents	3 minutes
	Allows the user to generate annual visual reports.	4 minutes
Action Personnel	Allows the user to login	2 minutes
	Allows the user to update the procurement milestone/timeline for tasks	3 minutes
	Allows the user to monitor the forms such as PR, Abstract, RFQ and PO	5 minutes
	Allows the user to upload scanned documents such as PR, Abstract, RFQ and PO	6 minutes
Agency	Allow the user to create an account and login	4 minutes
	Allow the user to monitor the procurement milestone	12 minutes
	Allow the user to receive a notification alert	10 minutes

5.2 Beta Testing Procedure

5.2.1 Participants and Demographics

The Beta Test involved purposive sampling in participant selection in order to have evaluators who are knowledgeable and qualified. Five (5) qualified individuals were thus chosen to represent the various user roles in the procurement lifecycle:

- 1 BAC Head (Admin/Oversight role)
- 1 Representative from the Budget Office (Financial Oversight)
- 3 End-User Representatives (from the Engineering Office, City Health Office, Mayor's Office, respectively)

5.2.2 Evaluation Metrics

The evaluation was made through a survey that involved a 3-point Likert scale. The answers were examined by the weighted average to establish the degree of acceptance.

- Range 2.34 – 3.00: Very Acceptable
- Range 1.67 – 2.33: Acceptable
- Range 1.00 – 1.66: Not Acceptable

5.3 Beta Testing Results

The information taken from the respondents was arranged in a table to evaluate the system's efficiency for each of the three primary modules.

5.3.1 Admin Module Results

The Admin module which was scored by the BAC Head and Budget Office representative got the highest marks. The evidence reveals that the system has effectively achieved its goals in user management, document archiving, and project monitoring.

Table 10
Beta Testing Result for Admin

PERFORMANCE			
	Very Acceptable (3)	Acceptable (2)	Not Acceptable (1)
The system allows the user to login	✓		
The system allows the user to assign action personnel for a respective PR	✓		
The system can add a user to the BAC office	✓		
The systems allow the user to generate the individual PMPs/Finalized PMP.	✓		
The system allows the users to generate the consolidated APP	✓		
The system allows the users to assign the task (PR) to the action group/personnel	✓		
The system allows the users to monitor the procurement milestones for PB and alternative modes	✓		
The system allows the users to monitor the timelines or calendar for procurement milestone	✓		
The system allows the users to monitor the database for scanned documents such as PR, RFQ, PO, and Abstract	✓		
The system allows the users to generate annual visual analytic reports on procurement projects			

Analysis: The mean value computed at 2.90 suggests that the concerned system is "Very Acceptable" by the administrators. It is this topmost rating that provides a solid indication that the procurement workflow is well facilitated through the use of the dashboard and notification features.

5.3.2 Action Personnel Module Results

This module was assessed through the lens of how efficiently the milestones were updated and the documents were uploaded.

Table 11
Beta Testing Result for Action Personnel

PERFORMANCE			
	Very Acceptable (3)	Acceptable (2)	Not Acceptable (1)
The system allows the user to login	✓		
The system allows the user to update the Procurement Milestone/Timeline for tasks (PR) assigned	✓		
The system allows the user to monitor the forms such as PR, Abstract, RFQ, and PO		✓	
The system allows the users to upload scanned documents such as PR, Abstract, RFQ, and PO		✓	

Analysis: The Action Personnel module got an average score of 2.70 which is considered "Very Acceptable". It means that the employees considered the system to be efficient in their regular work, however, a little improvement can still be made in comparison with the Admin module.

5.3.3 Requesting Entities Module Results

The end-user's representatives of the Engineering, Health, and Mayor's offices tested the tracking and notification features.

Table 12
Beta Testing Result for Requesting Entities

PERFORMANCE			
	Very Acceptable (3)	Acceptable (2)	Not Acceptable (1)
The system allows the users to create an account and login		✓	
The system allows the users to prepare PPMP		✓	
The systems allow the users to upload finalized PPMP		✓	
The system allows the users to monitor the procurement milestone for their respective PR's		✓	
The system allows the users to receive a notification alert if the (papers are ready for transmittal)		✓	

Analysis: The Requesting Entities module was scored on average 2.60, which can be loosely translated to "Acceptable". So, although the system is working and users can definitely keep an eye on their PRs, the score that is a bit lower than average may indicate that the end-users would like to have some more improvements quite possibly in the usability or the interface design for them to be completely satisfied.

5.4 Summary of Findings

Overall, all groups have been positive to the system on average. The combined findings confirm the success of the system in achieving its objectives, thus indicating that the acquisition process of the BAC office can be visually improved to a great extent through its implementation.

5.5 Implementation Plan and Feasibility

5.5.1 Technical Feasibility

The system is technically possible since it relies on proven, open-source technologies.

- **Hardware Compatibility:** The system operates on standard office desktops and laptops that are presently in use in the BAC office. There is no need for any specialized proprietary hardware.
- **Software Stack:** The development is based on XAMPP (Apache/MySQL) which is free to use and widely supported. The frontend is built with Bootstrap, thus the application is compatible with the modern web browsers (Chrome, Edge, Firefox) that are already installed on government computers.

5.5.2 Operational Feasibility

The operational feasibility is evidenced by the successful Beta Testing results. The favorable acceptability rating given by the Admin (2.90) and Action Personnel (2.70) denotes that the system is very much in line with the current work of the BAC office. The interface is intended to simulate the paper-based process (receiving PRs, updating milestones), thus the staff has less time to get used to it.

5.6 Implementation Plan

The implementation phases the work to ensure the adoption is done smoothly without disturbing the daily operations.

Table 13
Project Implementation Table

Phase	Activity	Duration	Objectives
1	Deployment & Setup	Week 1	Installation of XAMPP server and database configuration on the local network.
2	Data Migration	Week 2	Encoding of current Annual Procurement Plan (APP) and active Purchase Requests.
3	User Training	Week 3	Training session for Admin, Action Personnel, and representative End-Users.
4	Parallel Run	Weeks 4-5	Running the system alongside the manual process to verify data accuracy.
5	Full Implementation	Week 6	Official switch to the digital system as the primary monitoring tool.

5.7 Roadmap for Version Control

In order to keep the system up-to-date and capable of handling an increased volume of work, a plan for subsequent version changes has been created, taking into account the suggestions obtained during the research.

- **Version 1.0 (Current Release):** Core features such as Milestone Tracking, Document Archiving, and Admin Dashboard.
- **Version 1.1 (Immediate Update):** Implementation of SMS notifications alongside the current system alerts to ensure personnel are notified even when away from their desks.
- **Version 2.0 (Planned Upgrade):**
 - **Price Monitoring Module:** A stock of past prices to be used as a benchmark in order to avoid the situations of prices being too high or the failure of the bidding process.
 - **Automated Quotation Generator:** A function to create Request for Quotation (RFQ) documents without any manual intervention using the information from the PR.

- Version 3.0 (Future Integration): To enable secure remote access for the mayor or department heads while being outside the city hall, the migration from a local server to a cloud-based environment is planned.

INTRODUCTION

The findings, conclusions, and recommendations from the preceding chapter's analysis of the data are summarized in this chapter. By identifying the goals that needed to be achieved, several limitations have been discovered.

VI. SUMMARY

The capstone project Procurement Monitoring System for Philippine Government Institution was designed and developed in the first semester of SY 2021- 2022. The developers were able to deliver a system that: (a) registers new procurement project and updates current milestones, (b) uploads and archives the different scanned forms of specific procurement milestones, (c) monitors the status of procurement project in terms of milestones and calendar timeline, (d) generate annual visual analytic reports on procurement projects, and (e) send notifications on completed procurement project to respective requesting entities.

VII. CONCLUSION

The system's essential components were effectively identified by the proponents, and the development phases were finished. Based on the beta testing conducted on October 5, 2022, and October 7, 2022, the processed and analyzed outcomes, and comments received by the system were overall found to be acceptable. This implies that the Procurement Monitoring System for Philippine Institution positively acknowledges that our system may have substantial impact in addressing their workflow needs using the system we have developed. Moreover, based on the result, it is also implied that the system could make some aspects of their task streamlined and organized. The continuous consultation, testing, and conclusions described in the preceding chapters allowed the researchers to successfully complete the objectives of this project.

7.1 Limitation of the Study

Despite the encouraging results, the research pointed out various limitations that set the boundaries for the present system:

- Local Network Constraint: The system is operating locally on a server (XAMPP). Although it is secure, it is only accessible from the office physically, so the officials who are off-site cannot monitor it via their mobile devices.
- Testing Scope: The system underwent testing with a purposive sample of five (5) key personnel. Although the sample was representative of the workflow, a more extensive rollout across several departments would be required to put the server's capacity under a heavy load during the peak procurement periods.
- Notification Method: The present version is dependent on system-based alerts; thus, it is necessary for users to be logged in in order to get updates. In other words, notifications via SMS or email from outside the system are not yet available.

7.2 Impact on Audit and Compliance

Besides the short-term operational enhancements, the network will greatly influence the agency's compliance with the regulations. The shift from scattered papers to a single digital archive means that the system is a direct enabler of the Department of Budget and Management (DBM) and Government Procurement Policy Board (GPPB) modernization initiatives.

The digital archiving feature guarantees that all Purchase Requests, Abstracts, and Purchase Orders are recorded permanently and can be accessed with ease at any time. This openness by far facilitates the reviews of the Commission on Audit (COA) by decreasing the number of "red flags" resulting from the absence of or inconsistency in data. In effect, the department of procurement becomes less of a clerical burden and more of a strategic, data-driven resource for the promotion of good governance through the use of this system.

VIII. RECOMMENDATIONS

Based on the study results and conclusions, the proponents of the study are very much in favor of the following improvements to the Procurement Monitoring System to not only increase its functionality but also extend its scope.

8.1 Operational Enhancements (Short-Term)

To meet users' urgent requirements and facilitate the BAC office routine, it is necessary to put first the implementation of the features below:

- Implement Automated SMS Notifications: Connect an SMS gateway API to deliver instant notifications to the Action Personnel and Requesting Entities. It guarantees that the stakeholders get the progress updates of the project (e.g., "PR Approved," "PO Ready for Pickup") which is a way of communication even if they are not logged into the system.
- Develop a Price Monitoring Module: Develop a separate database exclusively for recording historical price data. In this way, the BAC will be able to use the tool as a reference to compare the current bids with previous purchases, thus avoiding the situation of overpricing and making sure that the future procurement activities are carried out at the least cost.
- Add an Automated Quotation Generator: They plan to improve the system in such a way that it will be able to generate Request for Quotation (RFQ) forms automatically just from the information that is recorded in the Purchase Request. The time during which the staff is involved in the tedious repetition of typing out the technical specifications for the suppliers will thus be drastically cut down.

8.2 Strategic Integrations (Long-Term)

To bring the system in line with the national standards and make it scalable, the next developments over a longer period of time are suggested:

- Migration to Cloud-Based Hosting: Move the system out of a local XAMPP server and into a properly secured cloud setup. Authorized personnel like the City Mayor, Department Heads, etc., will thus be able to inspect reports and approve documents from anywhere, and the constraint of having to be in the office will be lifted.
- Integration with PhilGEPS APIs: Look into the option of connecting the local system to the Philippine Government Electronic Procurement System (PhilGEPS). Such a merger would facilitate the sending out of "Invitations to Bid" from the local dashboard to be automatically published, thus making it easier to follow the national transparency laws.
- Advanced Analytics and Forecasting: Use predictive analytics to estimate purchasing needs through procurement based on past trends. With this, the Budget Office would have the capacity to foresee the busiest periods and thus, distribute the funds in a more efficient way during the Annual Procurement Plan (APP) consolidation.

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