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# ProCoMon: A Web-based Project Procurement Management Plan (PPMP) Consolidation and Monitoring System for Nueva Vizcaya State University

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*Abstract: -* The major purpose of this study is to design and develop a web-based consolidation and monitoring system that can handle the delayed submission of a university's Annual Procurement Plan, which is managed by Nueva Vizcaya State University's Procurement Management Office. As a result of the identification of requirements and specifications, there is a need to design and develop a web-based system wherein research interviews, observations, and user stories are used to identify and analyze the study's methods, issues, and concerns. The Agile Unified Process was used as the research methodology, which managed changing user needs and involved the user in the software development process. AUP includes processes for each of the four phases: inception, elaboration, construction, and transition. As a result, the study lends a better consolidation and monitoring system that is more efficient and accurate in the formulation of an Annual Procurement Plan for the university.

*Keywords:* delayed submission, consolidation, monitoring, web-based system

## I. INTRODUCTION

Public procurement refers to the purchase of necessary items, assets, or projects through government initiatives.

Through electronic procurement (e-procurement), the World Bank collaborated with Albania to improve the public purchasing processes. On this platform, industry professionals can exchange views on optimizing e-procurement methods to increase procurement sector productivity (The World Bank Procurement Policy Review, 2012).

Strengthening public procurement methods in South African jurisdictions would enhance their operational effectiveness and aid consolidation. It is crucial to strengthen public purchasing practices, because they play a critical role in achieving national sustainability goals (International Monetary Fund. African Dept., 2023).

Although gifted with a top-notch legal structure supporting acquisitions, obstacles emerge when these regulations are applied domestically. In the realm of public purchases, the key principle of transparency is of paramount importance; thus, incorporating this attribute entails offering public access to relevant details through means devoid of confinement to intelligible files. Notwithstanding these obstacles, numerous groups persistently advocate for greater accessibility to procurement data, while simultaneously promoting responsibility within procurement procedures. Furnas (2013) observed that although significant progress has been made toward enhancing access to procurement information, hurdles remain that must be overcome through continued vigilance and cooperation among various interest groups.

Utilizing shrewdly, public procurement allows governments to guarantee that essential resources arrive afoot and on the budget. By facilitating internal government coordination and interagency teams, the policy helps build alliances; likewise, the inclusion of businesses, civic organizations, and community leaders produces fruitful relationships. According to OECD's findings, guidelines exist for countries seeking to properly align public purchasing plans with two crucial factors: achieving maximum financially worthwhile returns and simultaneously advancing environmental and societal goals (OECD, 2020).

The various stages include demand identification, vendor investigation, worth examination, issuance of a procurement request, and receipt of commodities/services upon awarding. Establishing a single point of contact

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facilitates smoother progression through each phase of the process. Accordingly, Natesan (2023) posited that more engaged individuals are equal to greater hazard and monetary worth.

Moreover, in Nueva Vizcaya State University, in one minute of the meeting opening bid dated September 30, 2020, prepared by the University Bids and Awards Committee (UBAC) Secretariat, on the part of other matters, it stated that Epson products delivered were not genuine, some specifications of pre-procurement of yearbooks and pictures of SY 2019-2020 were no longer applicable due to the pandemic, and programmed project items in 2019 were low in cost in 2020 (Pasi et al., 2020).

To address these common problems, a procurement plan's purpose is to improve the efficiency, effectiveness, and transparency of the procurement process. The document specifies how items or services are obtained and how suppliers will be handled during the project. It contains information such as the contract types that will be utilized, the expected delivery or implementation dates for the contracted items or services, the metrics that will be used to evaluate the vendor's performance, and an explanation of how the procurement process will be carried out (Brush, 2020).

Creating a procurement plan enables organizations to prevent surprises and last-minute decisions. This document aids managers in determining what to buy, when to buy it, and where to acquire it. A procurement strategy also enables project planners to analyze whether their expectations and criteria are reasonable and can be met within the project timetable.

The Nueva Vizcaya State University, specifically in the Procurement Management Office, is currently using an MS Excel spreadsheet to form the University's APP to be submitted to the DBM. The PMO manually encodes the goods and services contained within the submitted PPMPs of end-user units for consolidation. The required inputs in the creation of a PPMP are the account code, procurement program or project, amount, mode of procurement, and procurement schedule.
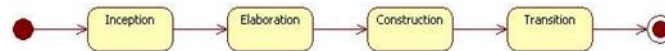


With this in mind, the researchers focused on how to develop a system that will benefit the Nueva Vizcaya State University, specifically for the Procurement Management Office in terms of consolidating and monitoring the submitted PPMPs.

*A. Conceptual Framework*

In this study, the researchers used the IPO Model or input-process-output pattern, which is a widely used approach in systems analysis and software engineering in describing the structure of an information processing program or other processes.
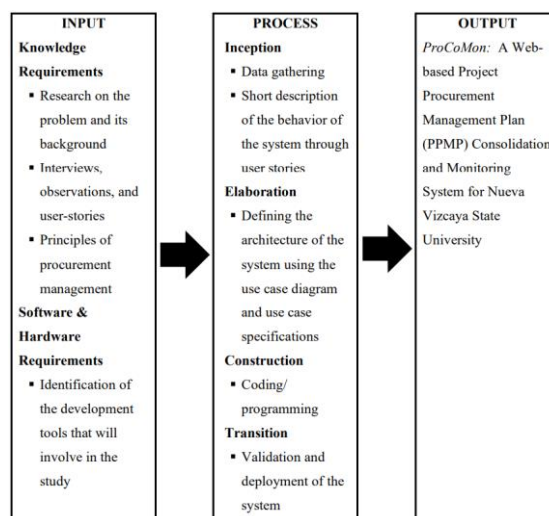


*Figure 1.* Research Paradigm

To develop *ProCoMon*, the researchers identified the knowledge through research interviews, observations, and user-stories, software, and hardware requirements as the basis for the development of the system such as a computer equipped with an operating system, web-server, web browser, text editor, scripting languages with its design pattern and database.

The concepts in Figure 1 provided instructions to the researchers on how the development process takes in the principles of procurement management. Section 3 of the IRR-A of the RA 9184 serves as a legal reference for government procurement standards. The following principles will govern government procurement: transparency, competitiveness, streamlining and use of technology in procurement, accountability, and public monitoring.

## II.    METHODOLOGY

In the development of *ProCoMon*, the researchers made use of the Agile Unified Process (AUP) as its research methodology. AUP is a Rational Unified Process (RUP) version that describes a quick and straightforward way to create business applications utilizing agile technology. Figure 2 below shows the workflows of the four phases of AUP: Inception, Elaboration, Construction, and Transition and has its goals and deliverables to be completed.

*Figure 2.* The Agile Unified Process Workflow

### A.    Inception Phase

The goal of this phase is to classify the project's main scope. In this phase, the researchers gathered data by conducting an interview and observing the activities that usually occurred during consolidation and monitoring. This was intended to thoroughly understand the present process in the consolidation and monitoring of submitted Project Procurement Management Plans, to identify the problems encountered in the process of the Annual Procurement Plan, and to provide corresponding solutions to the problems identified.

The researchers used user stories to show a short description of the behavior of the system from the perspective of the user.

### B.    Elaboration Phase

In the elaboration phase, the gathered data are converted into use-case diagrams, and the detailed specifications of each use-case are provided.

The objective of this phase is to define the architecture of a system that can fulfill all the requirements of the user. The researchers analyzed all gathered data and used them to provide the overall architecture and framework of the study.

### C.    Construction Phase

The goal of this phase is to construct a web-based application that meets user requirements. The researchers constructed a web-based application based on the constructed case diagram and used the case specifications from the previous phase.  In addition, the researchers used the PHP programming language as the front-end, MySQL as the back-end, and XAMPP as a local web server to develop the application.  Furthermore, this phase included product backlogs and acceptance testing.

### D.    Transition Phase

The primary goal of this phase is to validate and deploy a web-based application in the production environment.

### 1)    Implementation Plan

The deployment, installation, and transition of the system into an operating system are specified in the implementation plan. Throughout the design phase, a plan was formed, which was bound during the development phase. The implementation plan includes an overview of the system, a list of the key activities involved in the implementation, and an estimate of the overall resources required.

## III. RESULTS AND DISCUSSION

### A. *Methods, issues, and concerns with Procurement Management System*

The researchers used interviews, observations, and user stories as the primary data-gathering technique and found that the Procurement Management Office of the Nueva Vizcaya State University is using a traditional method for consolidation and monitoring, as shown in the figure below.
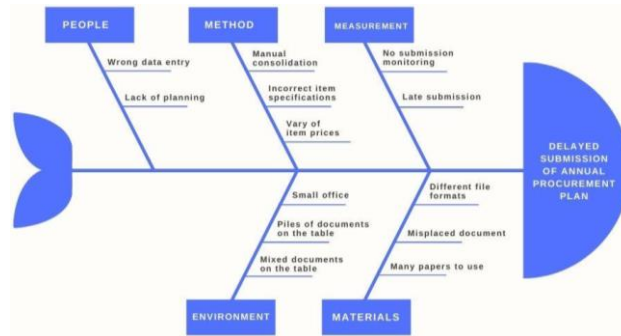


*Figure 3.* Ishikawa diagram for *ProCoMon*

The Ishikawa diagram depicts the current problems encountered by the researchers. Based on interviews, observations, and user stories, the main problem faced by the Procurement Management Office is the delayed submission of the Annual Procurement Plan of the university. Figure 4 describes the process of financial and procurement planning at Nueva Vizcaya State University in preparation for the Annual Procurement Plan (APP). Every fiscal year or by October 30 of the following year, the end-user unit heads prepare and submit the Project Procurement Management Plan (PPMP) of their respective units, colleges, or offices, as well as conduct a market survey with complete and clear specifications of the goods and supplies to be purchased. The PPMPs will be forwarded to the Budget Office for certification of fund availability and verification that they are in line with the GAA fund. The PPMPs are consolidated by the BAC secretariat or procurement officer. The approved APP is submitted to the PS-DBM on or before November 30 of the ensuing year and will be forwarded to the Office of the Board Secretary for Board approval.



*Figure 4.* Process in the conduct of financial and procurement planning at the Nueva Vizcaya State University

The researchers has identified the cause of the delay in submission of the Annual Procurement Plan of the university with its processes such as manual consolidation, incorrect item specifications placed by the end-users, and varying item prices from different end-users and different file formats submitted. The Procurement Management Office is a small office with piles of documents on the table, which results in mixed documents to others, and sometimes documents are misplaced. Moreover, the office has no submission monitoring, and the end-user units are already submitted. In addition, the end-user units encountered incorrect data entry and lack of planning, which usually did not meet the specified date of submission.

### B. *Systems Requirements and Specifications*

Using the information gathered during the interviews, observations, and user stories designed to accomplish a specific goal within a product. The system's goal included four (4) users: the procurement officer, budget officer, TWG members, and heads of end-user units. As the system administrator, the procurement officer has the greatest level of authorization, whereas the budget officer, TWG members, and end-user unit heads have the lowest level of authorization, such that the administrator has complete control and rights over the system. The budget officer has the privilege of managing the funds allocated to every end-user unit. TWG members manage procurement

and non-procurement service item lists. The end-user unit heads add items to the PPMP and submit them for consolidation.

Furthermore, the web application deployed and connected the web pages to the database using the XAMPP web server. A computer must have an operating system and browser that supports PHP version 8, HTML, and JavaScript to use the system. Moreover, the web application will be uploaded along with a subdomain of NVSU's website. The figure below shows the process and network architecture for accessing a page.

Moreover, the researchers used the Astah tool to design and create a use-case diagram of *ProCoMon*: A Web-based Project Procurement Management Plan Consolidation and Monitoring System for Nueva Vizcaya State University. The researcher prepared the use case specifications or essential use case found in Appendix D, which serves as a guide to develop the web application and match the user's requirements and specifications.

*C.        Web-based consolidation and monitoring system*

The application was developed using the use case diagram and the corresponding specifications stated in the previous objective, which can be found in Appendix E. Additionally, the researcher used an entity-relationship diagram to design a web application database. Web languages such as HyperText Markup Language (HTML) and Cascading Style Sheets (CSS) with the support of Bootstrap for the visual design of the application. Moreover, JavaScript was used to code the functions of the application, Sublime Text 3 was used as a coding text editor, and PHP programming language PHP Laravel was used as a web application framework with expressive and elegant syntax in compliance with the industry-standard web development framework to create scalable and extensible projects.

The most essential characteristic of the Laravel framework is that it adheres to the development standards. A good and valid example is the use of the model-view-controller (MVC) architectural design that ensures clarity between logic and presentation from the controller's perspective, resulting in improved overall functionality and performance, greater documentation coherence, and more.

The MVC architecture contains various useful built-in features, such as a comprehensive authentication system, Eloquent ORM (Object Relational Mapping), faster database migration, and pagination, which the researcher implemented in the developed project.

The developed system (fig. 5) has the following functions such as login, verify email and password, view user list, add user, updated user details, inactivate the user, view division category list, add division category, update division category details, delete division category, view end-user unit list, add end-user unit, update end-user unit details, delete end-user unit, view item category list, add category, update category details, delete category,  view procurement mode list, update procurement mode details, add procurement mode, delete procurement mode, view unit of measurement list, update unit of measurement details, delete unit of measurement, system backup, set submission deadline, update submission deadline details, print approved PPMP, monitor PPMP submission, print APP, view item list, add item to the list, update item details, delete item to the list, take action on the item received, manage budget allocation, allocate budget, update budget allocation details, delete allocated budget, view budget allocation list, submit item, submit PPMP, add item to PPMP, view dashboard, and logout.
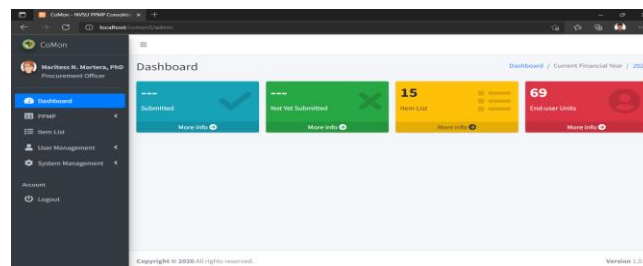


*Figure 5.* The developed system

To utilize the above-mentioned features, as well as get access to the system and verify the user's identity, the user must have an NVSU corporate email account, which may be obtained through the management information systems office.

The researchers conducted the tests to discover the problems, bugs, and errors within the application. Integration testing is to be tested out to see the problems that arise when different functionalities interact with each other to build the overall application. Compatibility testing, to test if the application is compatible with different browsers. System testing was also conducted by the researcher in finding if there are issues with the hardware and the software thus to assure that the application is working appropriately. Acceptance testing was done to test the application and is ready to be deployed. System testing results are found in Appendix H as evidence to ensure that the required tasks can handle it.

The developed system's consolidation feature automatically combines different items from various PPMPs and saves them in a single place, while the monitoring feature could identify end-user units that had submitted or had not yet submitted their respective PPMPs.

## IV. CONCLUSION

In line with the results of the study, the Procurement Management Office of Nueva Vizcaya State University is in the manual process of consolidating and monitoring the submitted Project Procurement Management Plan by the end-user units, which led to a delay in submitting the Annual Procurement Plan of the University.

Methods, issues, and concerns regarding the project procurement management system were identified and analyzed to acknowledge the system requirements and specifications of a web-based consolidation and monitoring system.

Moreover, the use case diagram with its corresponding use case specifications or essential use case helped the researcher identify the functionalities in developing the design of the application. The following functionalities were designed: login, user account management, system management, item lists, and PPMP to generate individual PPMP and APP. In addition, to develop the Project Procurement Management Plan Consolidation and Monitoring System or ProCoMon, the researchers used the Agile Unified Process (AUP) as the software development model. In the development of the application, the researcher used the PHP programming language and made use of the PHP Laravel web framework, HTML and CSS for web design, and MySQL as the back-end of the system.

Furthermore, to meet the overall objective of the study, the researcher conducted integration testing to test problems for functionalities, compatibility testing for the compatibility of the system with different browsers, system testing if there were issues with the hardware and software, and acceptance testing to test the application and ready to be deployed.

The developed system aimed to allow better consolidation and monitoring of submitted PPMPs, which can be used to be more efficient and accurate in the formulation of an Annual Procurement Plan compared to a manual system.

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