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## International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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# PRotracker: A Web-based Automated System for Enhancing Procurement Efficiency at NEMSU- Cantilan

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**ABSTRACT:** This study addressed the limitations of the manual procurement process at NEMSU–Cantilan, which often resulted in processing delays and inconsistent transaction recording. To address these issues, the researchers developed PRoTracker, a web-based procurement automation system designed to streamline procurement activities. Developed using the Agile Model, the system features online Purchase Request submission, automated Request for Quotation generation, digital supplier bidding, TWG and BAC evaluation, Purchase Order creation, and real-time tracking. Evaluation based on ISO/IEC 25010 standards showed high user satisfaction, indicating that PRoTracker improves efficiency, transparency, and accountability in campus procurement operations.

**KEYWORDS:** Procurement Automation System, Agile Methodology, Digital Procurement, ISO/IEC 25010, Workflow Automation.

## I. INTRODUCTION

At the North Eastern Mindanao State University – Cantilan Campus, the traditional manual methods used in managing procurement transactions have proven to be inefficient and prone to errors. These processes rely heavily on paper-based documents, manual record-keeping, and disconnected workflows across multiple offices, which often result in processing delays, inconsistent transaction records, and a lack of transparency. Such inefficiencies make it difficult for administrators to monitor procurement activities effectively, track the status of requests, and ensure accountability among the Office Heads, Procurement Office, Supply Office, Technical Working Group (TWG), and Bids and Awards Committee (BAC). The absence of a centralized and automated procurement system further increases administrative workload and the risk of human error.

The development of **PRoTracker** directly addresses these challenges by streamlining the procurement process through a web-based automation platform. By enabling online submission of Purchase Requests, automated generation of Requests for Quotation and Purchase Orders, real-time tracking, and centralized data management, the system enhances coordination among all involved offices. This modernization not only simplifies procurement workflows and reduces processing time but also improves transparency and accountability by providing accurate, real-time records. Ultimately, the significance of this study lies in its ability to integrate procurement operations into a single digital platform, supporting informed decision-making and promoting efficient, transparent, and accountable procurement practices at NEMSU–Cantilan.

## II. LITERATURE REVIEW

An analytical review of existing literature on procurement automation and digital purchasing systems was conducted to situate the present study within contemporary academic and operational frameworks. As organizational procurement



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environments grow increasingly complex, many institutions are transitioning from manual, spreadsheet-based methods toward integrated web-based procurement systems. For public institutions such as NEMSU–Cantilan Campus, ensuring transparency, efficiency, and accountability in procurement transactions is critical. The optimal approach for these organizations involves replacing fragmented and error-prone manual tools with centralized digital platforms capable of real-time tracking, approval workflows, and data validation. Although prior studies have addressed inefficiencies and delays in procurement operations, gaps remain in system implementations that fully align with the procedural and administrative requirements of institutional procurement units.

Thameera (2024) [1] WE examined the transition of a manufacturing organization from manual tools, including Microsoft Excel, to a web-based procurement information system. The study revealed that reliance on spreadsheets resulted in frequent errors, inconsistent records, and inefficiencies in inventory control. By adopting a digital procurement platform, the organization achieved streamlined transaction processing, reduced data inaccuracies, and improved inventory visibility. These findings support the relevance of automated procurement systems such as ProTracker, which aim to replace manual documentation with a structured web-based environment that enhances operational performance. In 2025, [2] Wijaya, Jatmikowati, and Suharnoko investigated the implementation of e-procurement systems in Bakorwil III Malang, Indonesia. Their study emphasized that while e-procurement policies are designed to promote transparency and efficiency in public sector spending, successful implementation is often constrained by limited user training, weak communication mechanisms, and insufficient leadership support. The authors highlighted organizational readiness as a decisive factor in system effectiveness. These findings reinforce the need for procurement systems like ProTracker to prioritize usability, institutional alignment, and administrative support to ensure sustained adoption within government and educational institutions.

Kumar (2022) [3] focused on the role of automation in procurement processes, presenting empirical evidence from large-scale enterprises. The study documented a 35% reduction in procurement errors at Siemens and reported annual savings of approximately \$1 billion at IBM following the adoption of automated procurement solutions. The research demonstrated that automation significantly reduces approval cycle times, enhances data accuracy, and generates measurable cost efficiencies. These outcomes underscore the potential of systems like ProTracker to improve procurement performance through automation and standardized workflows.

Similarly, Gamido (2022) [4] explored the implementation of web-based direct procurement systems and their influence on organizational process integration. The study found that digital procurement tools improve coordination across departments, strengthen supplier relationships, and contribute to higher product quality and organizational competitiveness. This highlights the strategic value of web-based procurement platforms, supporting the design objectives of ProTracker in facilitating integrated and efficient procurement operations within institutional settings.

Finally, Tabangay and Siddayao (2024) [5] presented a case study on the adoption of SAP Ariba, an enterprise-level procurement platform that enabled large-scale digital transformation. Their findings showed that the system reduced procurement cycle times, improved supplier collaboration, and delivered substantial cost savings. The study demonstrated how comprehensive procurement platforms can drive innovation and efficiency across supply chains. These insights affirm the relevance of developing localized procurement systems such as ProTracker, which seek to deliver similar benefits within the operational scope and budgetary context of academic institutions.

**Table 1. Summary of Relevant Literatures**

No	Paper Title	Author Name	Key Points	Remarks
1	Web based Procurement Information Systems in Manufacturing Organizations	Thameera (2024)	Manual spreadsheet-based procurement leads to errors, inefficiencies, and poor inventory control.	Validates the effectiveness of web-based procurement systems but is limited to private manufacturing contexts.



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2	Implementation of E-procurement System in Public Institution	Wijaya, Jatmikowati, & Suharnoko (2025)	E-procurement improves transparency, but adoption is hindered by limited training and weak organizational support.	Highlights the importance of institutional readiness and leadership in system success.
3	Automation in Procurement Processes: Emperical evidence	Kumar (2022)	Automated procurement reduces errors, shortens approval cycles, and generates substantial cost savings.	Demonstrates strong efficiency gains but focuses primarily on large multinational corporations.
4	Web-Based Direct Procurement Systems and Organizational Integration	Gamido (2022)	Digital procurement enhances departmental coordination and improves procurement quality outcomes	Establishes the strategic value of web-based procurement for organizational competitiveness.
5	Digital Transformation Through Enterprise Procurement Platforms (SAP Ariba)	Tabangay & Siddayao (2024)	Enterprise procurement platforms reduce cycle times and strengthen supplier collaboration.	Emphasizes large-scale systems, which may exceed the scope and resources of academic institutions.

In summary, the reviewed literature affirms that while procurement policies and procedures are well-defined, their execution is often constrained by manual processes, fragmented tools, and limited system integration. Existing studies consistently highlight the benefits of automation, transparency, and centralized procurement platforms, yet also reveal gaps in adaptability for smaller public institutions. ProTracker addresses these limitations by providing a streamlined, web-based procurement system tailored to the operational needs of NEMSU–Cantilan Campus, supporting efficient procurement tracking, improved coordination, and accountable procurement governance.

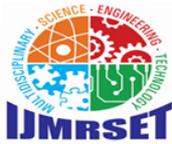
### III. METHODOLOGY

**Research Design** The researchers utilized a Descriptive Developmental Research method, guided by the Agile Model of the Software Development Life Cycle (SDLC). This approach prioritized an iterative workflow, allowing for continuous refinement based on user feedback. Rather than using experimental variables, the study focused on the systematic creation of a specialized software solution and evaluated its performance through standardized metrics within the actual administrative environment of the university.

**Instrument** To assess the quality of the developed system, a survey based on the ISO/IEC 25010 Software Quality Model was employed. The evaluation tool used a five-point Likert scale to gather data on several critical software attributes, including Functional Suitability, User Interface/Usability, Reliability, and Data Security. Each item in the questionnaire was specifically tailored to measure how effectively the system digitizes and manages institutional records compared to traditional methods.

**Data Collection and Participants** Data was gathered from a purposive sample of 50 respondents within the NEMSU–Cantilan community. The participant pool consisted of 10 procurement administrators, 10 Supply Office administrators, 10 Information Technology practitioners, 10 Information Technology experts, 5 members of the Bids and Awards Committee (BAC), 2 Technical Working Group (TWG) members, 2 suppliers, and 1 office head. Before completing the evaluation, all participants were given a comprehensive walkthrough and live demonstration of the ProTracker system.

**Data Analysis** The quantitative data gathered from the evaluation were analyzed using the following statistical treatments:



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1. Weighted Mean: Calculated to identify the average performance rating for each quality characteristic defined by the ISO standard.
2. Qualitative Interpretation: Mean scores were categorized into descriptive levels (e.g., 4.21 – 5.00 as "Strongly Agree") to determine institutional acceptance.
3. Performance Verification: Systematic testing of scanning speed and data synchronization capabilities.
4. Security Audit: A review of login protocols and encryption to ensure data protection.

### IV. RESULTS AND DISCUSSION

The analysis of the system performance and user feedback indicates that ProTracker successfully fulfills the technical and administrative requirements of the university. By transitioning from physical ledgers to a digital environment, the institution has established a more transparent method for procurement monitoring.

**Metric Based Evaluation:** Data collected using the ISO/IEC 25010 framework shows exceptional results. The system attained a total mean of 4.53, which translates to a verbal interpretation of Strongly Agree. This score confirms that the software surpasses the necessary benchmarks for functional quality and institutional adoption.

**Reliability and Data Integrity:** The categories for Security (4.65) and Reliability (4.56) emerged as the strongest attributes. These figures demonstrate that the system is capable of maintaining consistent uptime and ensuring that procurement histories are protected from unauthorized tampering or data leaks.

**Process Optimization:** Feedback from administrative staff highlighted a significant reduction in documentation time. By utilizing automated technology, the administrative burden of manual data entry is eliminated. The automated alerts provide a direct communication link, ensuring that departments are immediately informed of their records without the delays typical of paper-based systems.

**User Acceptance:** The rating for Functional Suitability (4.46) proves that the specific features of ProTracker are highly relevant to the daily operations of the campus. Respondents agreed that the tracking identification and the centralized dashboard are effective tools for managing campus resources

**Table 2. Performance Evaluation System Tabulation**

Table	Quality Characteristic	Mean	Verbal Interpretation
1	Functional Suitability	4.46	Strongly Agree
2	Performance Efficiency	4.47	Strongly Agree
3	Usability	4.6	Agree
4	Compatibility	4.46	Strongly Agree
5	Reliability	4.56	Strongly Agree
6	Security	4.65	Strongly Agree
<b>Over - All Mean</b>		<b>4.53</b>	<b>Strongly Agree</b>

### V. CONCLUSION

The development of ProTracker marks a significant move toward digital procurement governance at NEMSU–Cantilan Campus. The system addressed key issues in traditional procurement processes, including fragmented records, processing delays, and limited transaction tracking, by providing a centralized web-based platform for accurate and timely monitoring.

The positive evaluation results indicate that ProTracker is ready for institutional use. Favorable feedback from procurement and administrative stakeholders reflects readiness for digital adoption, supporting improved transparency, accountability, and efficiency in campus procurement operations.



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