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STATE UNIVERSITY FACULTY PERFORMANCE-BASED EVALUATION SYSTEM WITH DATA GRAPH ANALYSIS

Jonathan L. Mandia [1]*, Jake R. Pomperada [2]*, and Dennis V. Madrigal [3]

[1]Technological University of the Philippines Visayas (TUP Visayas),
[2]Technological University of the Philippines Visayas (TUP Visayas),
[3]University of Negros Occidental – Recoletos (UNO-R)
*Correspodning author: jonathan_mandia@tup.edu.ph

Abstract. This study presents the design and development of a State University Faculty Performance-Based Evaluation System with Data Graph Analysis, aimed at addressing the limitations of traditional and semi-digital evaluation methods used in higher education institutions. Existing systems, such as manual evaluations and third-party tools like Google Forms, often suffer from inefficiency, limited data analysis, and issues in confidentiality and accessibility. The proposed system integrates a centralized database, secure two-factor authentication, dynamic questionnaires, automated report generation, and stakeholder-specific dashboards to streamline faculty evaluations. A key innovation is the incorporation of data graph analysis, enabling administrators to visualize performance trends, identify strengths and weaknesses, and make evidence-based decisions on faculty development, research, and extension activities. The system was evaluated using usability, reliability, interactivity, and security criteria, yielding excellent results based on stakeholder testing. By institutionalizing a secure, transparent, and data-driven evaluation process, this project provides a sustainable framework for enhancing faculty performance management and supporting continuous academic improvement in State Universities and Colleges. In addition, the system ensures compliance with data privacy requirements by securing sensitive information through advanced authentication and backup mechanisms. Its user-friendly interface and responsive design allow accessibility across multiple devices, promoting inclusivity among stakeholders such as students, peers, supervisors, and administrators. The generated visual reports serve as a valuable reference for policy formulation, strategic planning, and targeted faculty training. Furthermore, the project emphasizes the importance of shifting from compliance-based evaluation toward a culture of continuous improvement, accountability, and innovation. Overall, this capstone underscores the role of technology-driven evaluation systems in shaping quality assurance and academic excellence in higher education.

Keywords: *Faculty Performance-Based Evaluation, Data Graph Analysis, State University, Faculty Development, Data-Driven Decision, Higher Education, Evaluation System, Academic Performance, Educational Technology, Two-Factor Authentication*

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1. INTRODUCTION

Background of the Study. Faculty performance evaluation plays a critical role in ensuring the quality of education in higher learning institutions. Effective evaluation systems are essential because they provide administrators with evidence-based insights into teaching effectiveness, which in turn guide decision-making in areas such as faculty development, promotions, and overall academic excellence. With the growing emphasis on accountability and quality assurance, the need for robust and transparent evaluation mechanisms has become increasingly important in both local and global contexts (Khtere, 2020) [1].

Despite its importance, many institutions continue to rely on outdated or inefficient systems for performance evaluation. Challenges such as reliance on manual processes, vulnerability to human error, limited data privacy, and delays in feedback dissemination hinder the effectiveness of current approaches. In addition, while online tools such as Google Forms have been adopted in some universities, issues such as poor internet connectivity, low system literacy, and concerns over confidentiality remain prevalent. These limitations highlight the necessity of moving towards automated, data-driven systems that incorporate advanced technologies like data analytics to improve accuracy, timeliness, and overall impact (Wang et al., 2024) [2].

In the Philippine context, various State Universities and Colleges (SUCs) have started exploring technology-driven solutions to enhance their evaluation processes. For instance, institutions like Ilocos Sur Polytechnic State College have integrated data analytics into their Faculty Performance Evaluation System (FPES), which has improved accuracy and efficiency in assessing faculty performance (Cinizan, 2023). However, in some cases of State Universities and Colleges (SUCs), evaluations are still conducted through Google Forms. This setup has faced significant challenges such as slow internet connection, lack of awareness in system usage, and limitations in data analysis capabilities. These contextual realities demonstrate the pressing need for a more effective and locally adaptable solution [3].

A review of the literature shows that while global and national studies emphasize the importance of modernizing faculty evaluation through data analytics and automation, there remains a research gap in the integration of comprehensive data graph analysis specifically tailored for SUs. Existing studies have focused on sentiment analysis, big data applications, and basic analytics; however, few have explored the application of real-time data visualization and graph analysis as a decision-making tool for administrators. Anecdotal evidence from faculty and administrators also supports this gap: many report that in current evaluation systems, feedback often arrives too late to guide improvement, the process feels opaque, and the data collected are seldom turned into actionable insights for faculty development. Patimo (2020) provides evidence from State Universities and Colleges in Eastern Visayas, noting that stakeholders often emphasize the need for evaluation systems that are useful, accurate, and feasible while also recounting difficulties with existing appraisal instruments and class observations. Such descriptive accounts serve as anecdotal evidence highlighting the limitations of current practices and reinforce the necessity of innovative, user-centered evaluation systems [4].

Therefore, this capstone project seeks to address these gaps by developing a Faculty Performance-Based Evaluation System with Data Graph Analysis for SU's. The rationale of the project lies in its potential to provide objective insights, strengthen data privacy, and institutionalize a more systematic evaluation process. Through this system, administrators will be empowered to make informed decisions, optimize faculty development initiatives, and uphold high academic standards, thereby contributing to the continuous improvement of higher education in the Philippines.

Purpose of the Study. The researcher intends to design, develop and implement a system that will help university give insights based on the standardized faculty performance evaluation, using data graph analysis to benchmark each faculty member's skill set. This will allow the administration to determine the needed requirements for their faculty rooster and for further faculty improvement in relevant training, research, and extension. The system helps the institution provide relevant information regarding anecdotal evidence and base their decisions on empirical data. This approach empowers the administration to make informed choices, optimize resource allocation, and implement targeted

interventions for areas that require improvement. It is also essential that all data be stored on the premises of the university to be secure and monitored by the University Information Technology Center (UITC) department.

To design, developed, and implement Faculty Performance Based Evaluation System with Data Graph Analysis for SUC's. The primary objective of this study is to design and implement the faculty performance evaluation from different university stakeholders. The stakeholders can evaluate all faculty roosters with the department online as long they are officially registered on the system. The system also aims to institutionalize the data instead of using third-party applications in which the university is not the owner of the database. Users can access the system using various internet-enabled devices such as desktop or laptop computers, smartphones, or tablets. This flexibility allows stakeholders to evaluate faculty members from any location with an internet connection. As a result, the system promotes convenience and encourages timely submission of evaluations. Furthermore, it supports a more inclusive and accessible evaluation process by accommodating different user preferences and device availability (Al-Fraihat et al., 2020) [5].

To enhance data-driven decision making among university professors and stakeholders. The system aims to enhance data-driven decision making among university professors and stakeholders. By integrating graph analysis visualization, the system will provide clear insights into faculty performance trends, enabling academic leaders to base decisions on evidence rather than intuition. This strengthens transparency and accountability within the institution. Furthermore, empowering stakeholders with access to reliable performance data ensures that professional development, resource allocation, and instructional improvements are guided by measurable outcomes. In this way, Ferrer (2022) emphasized that the evaluation process becomes not just a compliance activity but a strategic tool for continuous improvement in teaching and learning [6].

To promote transparency, accuracy of faculty performance evaluation. The proposed system is designed to monitor and manage performance evaluations submitted by various stakeholders, including students, peers, self-evaluators, program heads, and administrators. These evaluations are systematically stored in a database at the end of each term throughout the academic year. Registered stakeholders can assess faculty performance in their respective subjects through structured questionnaires. The system ensures consistent and organized data collection, enabling accurate performance tracking and analysis over time. Additionally, it promotes transparency and accountability in the evaluation process, supporting data-driven decisions for faculty development (Daluyon et al., 2024) [7].

To create an individual dashboard for all stakeholders. The system also intends to offer a comprehensive dashboard accessible to all university stakeholders, enabling them to monitor faculty evaluations conducted by students, peers, and deans. In the context of performance evaluation systems, dashboards enable stakeholders to monitor trends, track evaluation completion, and identify areas needing attention in real time. Kobi (2024) emphasized that effective dashboards provide visual clarity and support data-driven decision-making by displaying critical information at a glance. This feature ensures transparency and allows users to easily track evaluation progress and completion. By doing so, the system helps guarantee that all faculty members receive evaluations from the appropriate stakeholders, particularly from students enrolled in their subjects. Additionally, the dashboard supports timely feedback and helps identify any missing or incomplete evaluations, contributing to a more efficient and accountable assessment process [8].

To provide two-way factor authentication for security. The proposed system will implement two-factor authentication (2FA) using Short Message Service (SMS) to enhance security and prevent unauthorized access or tampering. By the use of an Application Program Interface (API) of SEMAPHORE, the system can send authentication access code via registered mobile number. Users will be required to enter their unique ID and registered mobile number to receive a one-time access code via SMS. This access code serves as a secondary verification step to confirm the user's identity before allowing access to the evaluation process. By adding this extra layer of protection, the system ensures that only authorized stakeholders can perform evaluations, thereby maintaining the integrity and

confidentiality of the data. Two-factor authentication (2FA) enhances system security by requiring users to provide two different types of credentials typically something they know (like a password) and something they have (such as a code sent via SMS) before granting access. This layered security approach significantly reduces the risk of unauthorized access and data breaches. Kim et al., (2025) noted that, 2FA is a widely recommended method for strengthening authentication mechanisms in both public and private sector systems [9].

To Generate Report and Insights using Graph Analysis. The database of the system will be the basis for creating a data graph analysis to give insights on all significant aspects of the performance of the faculty during the evaluation process and give necessary training or programs to the faculty to enhance their skill sets with industry-relevant standards. Once the data is institutionalized, this data can be used later on for integration into different data forms, such as data science and machine learning.

Project Scope. In state universities, instructors play a pivotal role in shaping and developing the skills of their students. Their responsibilities go beyond simply teaching they are tasked with delivering learning materials and conducting hands-on demonstrations in a manner that meets both academic and industry standards. Because of this, the quality and effectiveness of instructors are central to the institution's overall success. To support this, a comprehensive system has been developed, aiming to enhance and provide valuable insights into the performance and professional growth of faculty members. This system is designed to empower institutions in their pursuit of continuous improvement in instruction and faculty development. It focuses on several key areas that contribute to the institution's mission:

First, the system offers an online feature accessible to various state university stakeholders, including students, faculty, program heads or supervisors, and administrators. This inclusive approach ensures that all relevant participants are part of the evaluation and development process.

Second, a dynamic and unified survey questionnaire is integrated into the system. Administrators can easily create, update, or modify survey items that are tailored for student evaluations, peer reviews, self-assessments, and assessments by program heads or supervisors. This flexibility ensures that the evaluation process remains relevant and reflective of current educational and professional expectations.

Third, the system facilitates the online evaluation of faculty members across all departments. This centralized method simplifies data collection and ensures consistency in performance assessments.

To ensure full participation, the system includes a monitoring and notification feature. This sends reminders and alerts on their dashboard to students, peers, evaluators, supervisors, and administrators, encouraging timely completion of evaluations and minimizing oversight.

Furthermore, the system provides insightful visual data through graph-based performance analysis. These analytics reveal trends and patterns in faculty performance based on the survey indicators, allowing for data-driven decision-making.

Another key feature is the streamlined dashboard tailored for each stakeholder. Faculty members, in particular, benefit from this personalized interface that enables them to view their evaluations, progress, and areas for improvement in a clear and organized manner.

Finally, the system supports institutional planning and policy-making by generating detailed reports for both the Research and Development department and the Human Resource Development office. These reports serve as essential tools for identifying opportunities for professional development, strategic improvement and intervention.

In summary, this system is a valuable asset for state universities, aiming not only to monitor and assess faculty performance but also to foster a culture of excellence, accountability, and growth among educators.

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2. PRODUCT DESCRIPTION

The Faculty Performance-Based Evaluation System of State Universities aims to effectively monitor the performance of the faculty to ensure that the skill sets and training are being addressed to the student and other stakeholders. This is to streamline the faculty's performance regarding the deliverables, learning materials, and tools or equipment. In addition, using the data graph analysis of the system, the administration can identify or have an insight regarding the materials, tools, and equipment needed during the assessment or training.

Product Perspective and General Features. The faculty skill sets affect the student's overall learning based on what is industry-relevant pertaining to the knowledge that the instructor imparts to the student. It also affects the overall performance of each department so that the administration can assess and decide based on the insight they can find on the data graph. The following are the functions are the key features of the proposed system:

Centralized Database Management System. The proposed system enables the storage of all data in one repository. Primarily, the user can access the system online to start the evaluation one tap away from their devices, provided they are connected to the internet.

Robust Security Framework. This framework is the backbone of the system's security and implements secure user-level management. It will ensure the confidentiality and integrity of every stakeholder's data as part of the Data Privacy Act (Republic Act No. 10173, 2012) [10].

User-Friendly Interface (UI). The proposed system has been meticulously designed to provide an intuitive and user-friendly interface. This ensures that interaction, navigation, and utilization are efficiently performed by any of the stakeholders' levels of use of the system.

Dynamic Questionnaire. The proposed system enables the inserting and updating of a questionnaire regarding the faculty performance evaluation. This ensures that all necessary questions are relevant to the subject matter and teaching standards of the university.

Data Graph Analysis. Using the system, the administration can identify problems based on the insights provided by the data from the faculty performance evaluation. The data graph helps them decide if there is a need for improvement in the deliverables, equipment, tools, and skills program for the university's faculty (Benosa & Onate, 2023) [11].

Short Message Service (SMS). This method adds an additional layer of verification, making unauthorized access more difficult even if the primary password is compromised. It is a common and accessible option for improving digital security across various platforms (Aparicio, Martinez & Cardeñoso, 2023) [12].

Generation of Reports. Report generation in faculty evaluation systems enables timely and accurate feedback for faculty and administrators, highlighting trends and areas for improvement. The Faculty Performance Evaluation System Platform with Data Graph Analysis includes report generation capabilities to produce evaluation summaries and development plans for faculty, such as student evaluation summaries, individual faculty performance ratings, departmental performance ratings, log event summaries, and anecdotal comments. This system was shown to streamline administrative processing and enhance data reliability, reducing errors compared to manually prepared reports (Alix et al., 2022) [13].

Data Analytics. Data analytics enables State Universities to extract actionable insights from faculty evaluation data, enabling administrators to monitor performance trends over time and identify areas needing support or improvement. Santillan (2024) describes how a Web-based Faculty Evaluation System (WFES) in the Philippines collects student feedback, peer observations, and self-reflections, then applies data analysis to highlight patterns and generate reports for faculty development and instructional planning. Through such systems, inefficiencies like delays in feedback or bias in peer review can be mitigated, as quantitative metrics complement qualitative inputs. This enhanced visibility fosters evidence-based decisions, promoting more equitable and systematic evaluation practices [14].

Operating Environment. In developing the system, the researcher enumerates all the necessary technical requirements (software and hardware) to proceed with the development of the

system. This is to ensure that the system will address the compatibility issues. The following are the operating environment and technical requirements of the system:

Table 1
Software Specification

Software Component	Minimum Requirement
Operating System	Windows 11 or higher
Web Server	Apache
Database Management System	MariaDB, MySQL
Programming Language	PHP 7.3 or higher
Front-End	HTML/CSS/JavaScript
Web Browser	Google Chrome, Mozilla Firefox, Microsoft Edge, Brave, etc.

Software Environment. The software environment table details the software dependencies and compatibility requirements for running the system. This includes the operating system, web server, database management system, and other software components necessary for the system's operation.

Table 2
Hardware Specification (PC/Laptop)

Hardware Component	Minimum Requirement
Processor	Intel Core i5 or i7 processor (2.4 GHz or higher) or Higher
RAM	8GB or higher
Storage Space	1TB SSD/M.2/NvMe
Screen Resolution	1366 × 768 (HD)/1920 × 1080 (Full HD)

Hardware Environment. The hardware environment table outlines the minimum hardware requirements for running the system effectively. This includes specifications such as processor, RAM, storage space, and display resolution.

Table 3
Handheld Devices Specification (Android/iOS)

Hardware Component	Minimum Requirement
Processor	Dual-core 1.2 GHz or higher
RAM	8GB or higher
Storage Space	At least 128 GB free for cache and browser app
Display	4.5-inch screen with 720p resolution
Network Connectivity:	3G minimum (4G/5G/LTE or Wi-Fi recommended for speed and stability)

Handheld Devices. Handheld devices are portable electronic gadgets designed for convenience and mobility, allowing users to perform various computing tasks while on the go. These include smartphones, tablets, personal digital assistants (PDAs), and handheld gaming consoles. They typically feature touchscreens, wireless connectivity (Wi-Fi or cellular data), and the ability to run applications or access the internet.

Design and Implementation Constraints. The researcher anticipates several challenges in implementing the proposed system. One major concern is the low level of computer literacy among users, as many lack sufficient knowledge of basic software and application usage, which could hinder effective system adoption. Additionally, there may be limited support from the administration and other constituents due to the absence of established guidelines or standardized processes for transitioning to a digital evaluation system. Another significant barrier is user resistance, as some individuals may prefer manual operations and show reluctance to embrace change or learn the new system, despite its potential to enhance the efficiency and accuracy of faculty evaluations Cieslak et al., (2024) [15].

Assumptions. The proposed system is designed with several assumptions to ensure it meets the necessary requirements from development to implementation. First, the system will be compatible with various platforms, including personal computers and mobile phones, as long as these devices can connect to the internet. Second, it incorporates a responsive design to ensure seamless access across multiple web browsers such as Microsoft Edge, Google Chrome, and Mozilla Firefox. Lastly, the system will enable administrators to easily interpret insights through real-time data visualization, utilizing dynamic graphs generated directly from the database. These features aim to support accessibility, usability, and effective decision-making, aligning with best practices in system design and user experience Segun-Falade et al., (2024) [16].

Dependencies. In connection with system assumptions, the system relatively and primarily needs to be connected online. Only those stakeholders of the SU's can use the system, which can be monitored only by the system administrator. The user interface is provided by the developer to deliver the flow of the evaluation process to the different departments. The researcher ensures that the proposed system is deployed on different devices so that users can complete the evaluation survey using their credentials once they logged-in.

3. SYSTEM FEATURES

System Decomposition. State University Colleges Faculty Performance-Based Evaluation System contains a hierarchy chart that breaks down the entities that will be affected by the proposed system. The system decomposition chart of the proposed system allows one to understand the flow of the whole process of the system Zhou et al., (2024). The system will collect all the data on the faculty evaluation to generate reports and create a data graph analysis to provide insights after the data collection is done. Lastly, the user level is provided to ensure that every user has restrictions to the system so that the privileges of every user are limited according to their functions and roles [17].

System Functionalities. The SUC's Faculty Performance-Based Evaluation System is a crucial tool for educational institutions to assess, monitor, and enhance the performance of their faculty members. It encompasses a range of features designed to evaluate various aspects of faculty performance, foster professional development, and ultimately contribute to the overall quality of education provided by the university. These are the essential functionalities of the system it includes: 1) User's Credentials Login: On this function, student must log in with their registered user credentials, then the system will send a SMS to their registered mobile number that contains an auto-generated number in order to proceed with evaluating their respective subject professors from different departments. This will ensure that the system will validate the user's credentials and put an additional layer of security before proceeding with the system. 2) Data Collection/Data Graph Analysis: This will be the start of collecting their data from the question bank. Different questions related to students, peers, self, program head, and college dean will be monitored and collated to transform into meaningful data graph analysis. 3) Reports: This function will generate meaningful and accurate results from the

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collected data. It contains all the information about the faculty evaluated by the different stakeholders of the university. The report will be consolidated and then disseminated to all faculty in different departments. 4) User-Level: To delegate the role of each user, the proposed system implements a user-level function to manage the user privileges of all users who will be using the system. This is to ensure that the functions of its entity will not be compromised even if the process is done simultaneously. Effective role-based access control (RBAC) is critical in multi-user environments to enforce the principle of least privilege and maintain the integrity of operations. By defining roles and assigning permissions accordingly, the system limits users to only those actions necessary for their specific responsibilities, reducing the attack surface and potential for insider threats. Additionally, user-level privilege management supports system scalability and adaptability as organizational needs evolve, facilitating administrative control without excessive overhead Marquis (2024). 5) Faculty Evaluation Process: The faculty evaluation process functions to assess the performance of faculty members based on teaching, research, extension, and professional development. It collects feedback from students, peers, and administrators, analyses results through set criteria, and generates reports to identify strengths and weaknesses. The process ensures accountability, supports faculty development, and guides decisions on promotion, intervention, and training needs [18].

Figure 1
Use Case Diagram

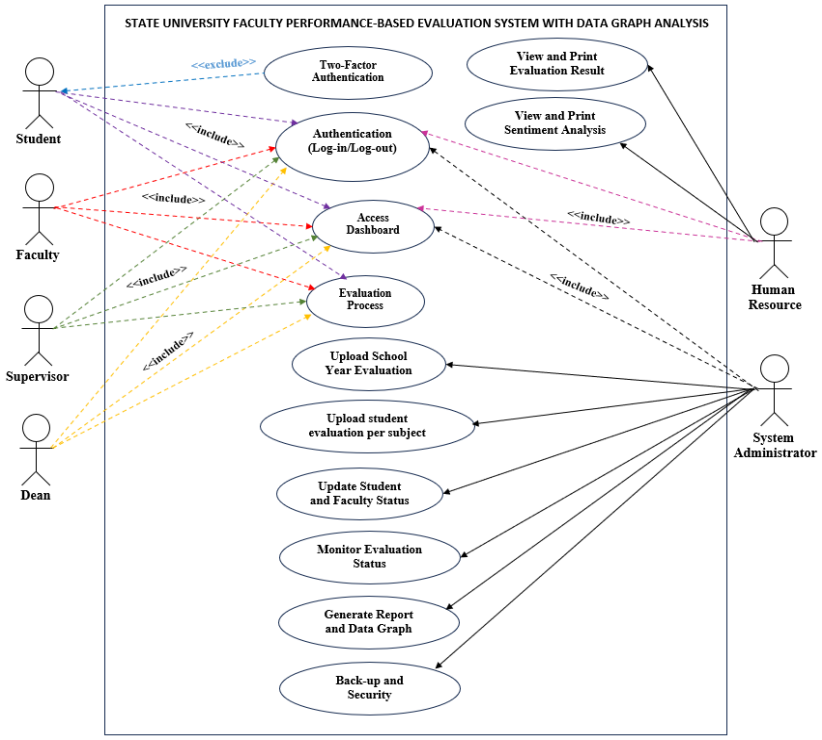

Figure 1 shows the use case diagram of the system. It illustrates here the different actors who will use the system. It also shows here the same functions of the user regarding the evaluation process such as the student, faculty, supervisor and dean. The human resource department functions can view the need information regarding the evaluation result and sentiment analysis after the data has been collected. The system administrator role is to monitor and facilitate the updating and uploading of evaluation components such as evaluation school year, student subject, faculty status, evaluation status, generation of report, data graph analysis, and back-up and security.

4. EXTERNAL INTERFACE REQUIREMENTS

User Interface. The Faculty Performance-Based Evaluation System with Data Graph Analysis is designed with a user-friendly interface that ensures smooth navigation for faculty, students, and administrators. Its intuitive layout simplifies the evaluation process, making it easy to input, manage, and access data without requiring advanced technical skills. The system prioritizes accessibility and efficiency, reducing errors and saving time while promoting a more seamless experience for all users (Caballero et al., 2023). At the core of the system is a dynamic dashboard that presents real-time insights through responsive data graph analysis. This feature allows stakeholders to instantly visualize evaluation results, track performance trends, and identify areas for improvement. Its responsiveness ensures compatibility across devices such as desktops, tablets, and smartphones, enabling stakeholders to conveniently access data anytime and anywhere. This combination of usability, interactive dashboards, and responsive design makes the evaluation process more transparent, efficient, and data-driven [19].

Hardware Interface. In the context of power hardware-in-the-loop (HIL) testing, interface accuracy plays a critical role in ensuring fidelity between simulated and physical systems. A study employing a modified damping impedance methodology demonstrated that careful calibration of hardware interfaces significantly enhances the precision of control algorithms, leading to improved system stability and reliability.

Software Interface. The software interface of a faculty performance-based evaluation system plays a critical role in facilitating interaction between users and the underlying system processes. Designed to be user-friendly and intuitive, the interface typically includes dashboards, forms, and interactive visualizations that enable administrators, faculty, and evaluators to input, analyze, and review performance data. By leveraging responsive design, the proposed system interface can adapt to various devices, ensuring accessibility whether users are on a desktop, tablet, or mobile device. The software interface integrates key features to support comprehensive faculty performance-based performance evaluations. Faculty members can securely log in to complete self-assessments, and track their progress over time. Administrators and evaluators access dedicated panels to review submitted data, generate performance reports, and compare metrics across departments or individuals. Additionally, visual aids like charts, graphs, and indicators make complex data easier to interpret, providing actionable insights to guide decision-making (Benosa & Onate, 2023) [20].

Communication Interface. One of the factors that will surely delivers the effectiveness of the proposed system is to have a seamless data communication on the system, devices, and users. Since the faculty performance-based evaluation system will be online, it is essential that it can be access on different platforms to initiate the process of evaluation. It is also essential to secure the privacy of all stakeholders when they are online. The proposed system is centralized into on stationary server in premise of the university and equipped with software protocol facilitating data exchange over networks like HTTP for web communication or TCP/IP for internet-based connectivity.

5. OTHER NONFUNCTIONAL REQUIREMENTS

Safety and Security Requirement. The implementation of a Performance-Based Evaluation System for faculty members is essential for fostering academic excellence and professional growth. However, such systems must prioritize safety and security requirements to ensure the integrity, confidentiality, and accuracy of the evaluation process. These often involve sensitive data, including faculty performance metrics, student feedback, and institutional benchmarks, making them vulnerable to potential breaches. By embedding security measures such as implementing Two-Factor Authentication (2FA), initialized credentials and access control protocols, institutions can safeguard this data from unauthorized access and ensure compliance with data protection regulations (Al Sherideh et al. 2023) [21]. Additionally, secure data storage and transmission mechanisms are vital to maintaining trust and transparency within academic institutions. The system also has back up capability to ensure the safety and availability of information in case of system failures, cyberattacks, or accidental data loss. The University Information Technology (UITC) regularly backups create duplicate copies of the database, which can be stored on secure, on-premise servers or on a secured cloud. The system

implement automated backup adds an extra layer of data security, protecting sensitive information from unauthorized access or corruption.

Software Quality Attributes and Metrics. In this section, all measures are discussed, and other criteria are presented to explain the relationship of these features of the system. Each feature is mentioned State University Faculty Performance-Based Evaluation System with Data Graph Analysis, which has a corresponding software quality attribute and ensures that these are clear and detectable to the users. Boehm's software quality model was used to identify the different attributes that correspond to the different features of the system. The respondents rated all the attributes as easy, cost-effective to obtain, consistent, and validated for accuracy and reliability.

Testing Requirements. Product testing was done to ensure the system's functionalities are achievable. The developer must do testing on the target users. There are no perfect systems or applications. Therefore, to detect the defects or errors in the application, the application must be tested. The following test are: 1) Unit Testing: It is a testing method in which the developer tests each individual module to see whether there is a problem. 2) Integration testing is a testing process where individual software modules are combined and evaluated as a group. 3) Testing the system was done by the different State University stake holders to check if the system was implemented correctly.

6. PROJECT MANAGEMENT

Hardware Recommendation. During the development of the system, the developer carefully considered the necessary peripherals to ensure the product delivers optimal performance to its users. Hardware requirements are typically evaluated based on performance, efficiency, and output quality, as these are key factors in the successful operation of the system. The developer outlines the minimum hardware specifications and remains open to future upgrades to meet evolving user needs.

With the appropriate hardware support, the product can operate smoothly and effectively. To help users maximize the program's capabilities, the developer provides a set of recommended computer hardware requirements. The following section presents the suggested hardware specifications that are most compatible with the system.

Table 4
Hardware Specification

Computer Requirements: (Admin or Server)	
Processor	**Intel Core i5 or i7 processor with at least 5.3 GHz clock speed or higher**
RAM/Memory	**At least 32GB of RAM or higher**
Hard Drive	**1 TB SSD/M.2/NvMe**
Mobile Phone	
Processor	**Dual-core 1.2 GHz or higher**
Internal Storage	**Minimum 128 GB**
RAM	**Minimum 8GB**
Display	**4.5-inch screen with 720p resolution**
Network Connectivity:	**3G minimum (4G/5G/LTE or Wi-Fi recommended for speed and stability)**

Software Recommendation. To support the functions and operations that the system is meant to do, the developer has considered certain computer software. The proponent recommends the appropriate software throughout the implementation phase so that the product can run properly. To address the issue of system compatibility, the list of highly recommended software specifications is provided below.

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Table 5
Software Specification

Computer Requirements: (Admin or Server)	
Operating System	**Windows 10/11, Ubuntu Server**
Database	**MySQL**
Hard Drive	**Edge/Chrome/Mozilla/Safari or any available Web browser**
Mobile Phone	
Operating System	**Android/iOS**
Version	**Android 8.1 (Oreo) / iOS 7 (2013)**

User Classes and Characteristics. Since it is essential to classify users based on their qualifications, peopleware as a key component of the computer system must be carefully considered in this study. To fully optimize the system's functionality, users are expected to possess adequate computer literacy and understanding. There will be six groups of users of the system, namely the student, faculty, supervisor, deans, human resource and system administrator; the developer stated below the detailed discussion about the sets of qualifications to use the product. These are the classes and its characteristics: 1) Student: This user class whose characteristics significantly influence system utilization. Their ratings play a vital role in assessing a faculty member's performance across different subjects. Equally important is gathering their feedback, which provides anecdotal evidence that the course deliverables have been properly introduced, explained, and demonstrated. 2) Faculty: Faculty users rely on the system to review evaluation results, reflect on their teaching effectiveness, and identify areas for professional growth. 3) Supervisor: They are expected to have advanced knowledge in academic standards, evaluation criteria, and institutional policies to ensure fair and objective assessments. 4) Deans: This user class is characterized by advanced decision-making responsibilities, necessitating the ability to interpret complex data trends, compare performance across departments, and identify areas that require intervention or recognition. 5) Human Resources: This user class is characterized by its focus on administrative accuracy, confidentiality, and compliance with institutional policies. 6) System Administrator: This role requires advanced technical expertise in database management, user account control, system configuration, and troubleshooting to ensure smooth operations.

Time Management. Time management in the Faculty Performance-Based Evaluation System with Data Graph Analysis ensures that evaluation activities are carried out efficiently and within designated schedules. The system administrator will load all necessary data in order to delegate the evaluation in its specific School Year and Term. By streamlining data collection, processing, and analysis through automated features, the system minimizes delays and reduces the manual workload of administrators. Graphical reports provide quick insights, allowing faculty and supervisors to make timely decisions and adjustments. This structured approach to managing evaluation tasks not only enhances productivity but also promotes accuracy and consistency in assessing faculty performance.

Communication, Coordination, and Team Composition. To ensure smooth implementation and utilization, effective communication, coordination, and team composition are essential in the Faculty Performance-Based Evaluation System with Data Graph Analysis should be observed. Clear communication channels among faculty, supervisors, administrators, and technical staff foster transparency and mutual understanding of evaluation objectives. Proper coordination allows different stakeholders to align their roles, from data gathering to analysis and decision-making. Moreover, having a well-structured team composed of evaluators, system administrators, and support personnel ensures that responsibilities are clearly defined and tasks are executed efficiently. Together, these elements create a collaborative environment that strengthens the system's reliability and effectiveness in enhancing faculty performance assessment.

7. SUMMARY

The Faculty Performance-Based Evaluation System with Data Graph Analysis is designed to address the shortcomings of traditional and semi-digital evaluation methods in higher education, particularly within State Universities and Colleges in the Philippines. The study emphasizes the importance of secure, transparent, and data-driven evaluation systems to replace outdated practices such as manual processes or limited online tools like Google Forms, which often face issues of inefficiency, low digital literacy, and weak data privacy. The proposed system integrates key features such as a centralized database, user-friendly interface, dynamic questionnaires, SMS-based two-factor authentication, report generation, dashboards for stakeholders, and graph-based performance analysis to provide timely and evidence-based insights. The system workflow is built around secure logins, structured data collection from multiple stakeholders, automated reporting, and role-based user privileges, all of which ensure transparency, accountability, and accuracy in faculty performance evaluation. Ultimately, the project aims to institutionalize a comprehensive and technology-driven framework that empowers administrators to make informed decisions, supports professional development, and strengthens the overall quality of education.

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