Decision Support System for Faculty Selection, Promotion, and Reclassification Using Predictive Analytics

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ABSTRACT

This study aims to design and develop a Decision Support System for Faculty Selection, Promotion, and Reclassification Using Predictive Analytics to replace the inefficiencies of manual processes in higher education institutions. Using logistic regression, the system evaluates faculty performance, tenure, and credentials to ensure fair, data-driven decisions. Guided by Agile Scrum, it was iteratively refined through stakeholder feedback. System testing, based on ISO 25010 standards, showed high ratings in functionality, performance, usability, reliability, security, and maintainability, with an overall weighted mean of 4.56, described as Highly Acceptable. User evaluation via the Technology Acceptance Model (TAM) also indicated strong acceptance, with an overall mean score of 4.45. Overall, the results confirm that the system not only meets international software quality standards but is also positively received by users, highlighting its potential to enhance transparency, accuracy, and data-driven decision-making in faculty selection, promotion, and reclassification.

Index Terms: Human Resource System, Predictive Analytics, Linear Regression, Agile Scrum

INTRODUCTION

The strategic importance of faculty within higher education institutions necessitates robust and equitable processes for their selection, promotion, and reclassification [1]. Traditional decision-making often relies on subjective evaluations, which can introduce biases and inconsistencies, thereby hindering institutional effectiveness and fairness [2]. This paper proposes the integration of predictive analytics into a comprehensive decision support system to enhance the objectivity, transparency, and efficiency of these critical human resource functions. This advanced system will leverage data-driven insights to forecast future faculty performance, identify optimal candidates, and streamline career progression pathways, fostering a more meritocratic academic environment [3] [4].

Despite the growing use of data-driven tools in higher education, several research gaps remain in the development of a Decision Support System for Faculty Selection, Promotion, and Reclassification using predictive analytics. Existing studies often focus on faculty selection and promotion but give limited attention to reclassification, which requires distinct evaluation criteria and processes [5]. Many current systems also lack real-time monitoring and feedback mechanisms, resulting in delays and inefficiencies in assessing faculty readiness for promotion or reclassification [6]. Additionally, institutional data is frequently fragmented and decentralized, leading to redundancy, inconsistency, and errors that hinder effective decision-making [6]. Another gap lies in transparency and fairness; predictive models may unintentionally embed bias, yet few works have examined fairness and accountability in this context [7]. In terms of methodology, most systems rely on traditional techniques such as regression, while the use of advanced or hybrid predictive models remains underexplored [5][8]. Moreover, there is limited literature on incorporating systematic stakeholder involvement—particularly from faculty, administrators, and HR—in defining and validating promotion and reclassification criteria, even though human-centered approaches are essential for alignment with institutional policies [9]. Finally, while some systems report usability, comprehensive evaluations using recognized frameworks such as ISO 25010 software quality standards and acceptance models like TAM are still lacking, leaving gaps in understanding user perceptions and system quality [6].

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In the Philippines, many higher education institutions are considering implementing HRIS solutions to improve their HR services and overall operational efficiency. This shift toward HRIS is in line with the growing recognition that efficient Human Resource Management (HRM) practices, supported by advanced HRM software, are essential for gaining a competitive edge and enhancing organizational success [3]. Human Resource Information Systems enable effective collection and storage of personnel data, covering essential components such as job hiring, performance management, and employee development, utilizing hardware, software, and electronic databases [4], [5].

To address these operational challenges, the study proposes the development of a Decision Support System (DSS) for Faculty Selection, Promotion, and Reclassification using Predictive Analytics. Unlike a generic HRIS, this system focuses on streamlining processes critical to academic institutions by automating data collection, faculty evaluation, and promotion workflows. Tailored modules such as the Faculty Information Module, Performance and Appraisal Module, Promotion and Reclassification Module, and Decision Support Dashboard are designed to meet institutional requirements. Advanced features, including predictive analytics for faculty ranking based on tenure, credentials, and performance indicators, as well as reporting tools for generating insights on faculty demographics, status, and career progression, will further enhance transparency and evidence-based decision-making. By implementing this system, higher education institution can overcome inefficiencies in manual evaluation, ensure fairness in faculty advancement, and strengthen data-driven HR practices, fostering continuous improvement and positioning the institution for long-term academic excellence.

METHODOLOGY

Methodology

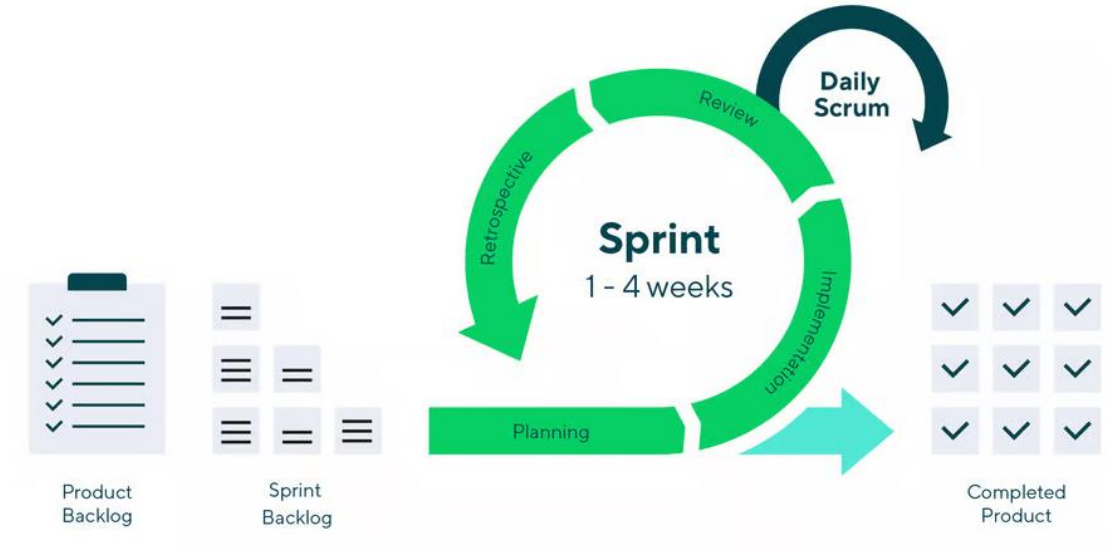

Figure 1. Agile Scrum Methodology

The development of the Decision Support System for Faculty Selection, Promotion, and Reclassification using Predictive Analytics employed the Agile Scrum methodology. This approach was chosen because of its flexibility, iterative process, and emphasis on stakeholder collaboration, which are essential for projects with evolving requirements such as faculty promotion and reclassification.

Development was carried out in sprints, where system features were planned, implemented, and tested in short cycles. Regular stakeholder feedback ensured that modules, such as data integration, predictive analytics, and decision dashboards, were refined continuously to meet institutional policies and user needs. Unlike traditional linear models, Scrum allowed adjustments at any stage, reducing risks and improving system quality.

Agile Scrum was selected because it supports dynamic requirements, encourages active stakeholder participation, ensures incremental delivery of functional components, and maintains quality through iterative

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testing. This methodology ensured that the system was user-centered, adaptable, and aligned with institutional goals.

Conceptual Framework

The conceptual framework of this study is anchored on the Input–Process–Output (IPO) model, which illustrates the flow of requirements, activities, and outcomes in developing the Decision Support System for Faculty Selection, Promotion, and Reclassification using Predictive Analytics.

The Input component consists of three categories. First, the knowledge requirements include business processes, sample documents, institutional policies, and predictive models such as logistic regression, which provide the foundation for decision-making rules. Second, the software requirements cover technologies such as PHP, PDO, jQuery, Apache, MySQL, and Bootstrap, which are essential for developing a dynamic, web-based system. Third, the *hardware requirements* include servers, client computers, tablets, and mobile devices that ensure accessibility, deployment, and scalability of the system across platforms.

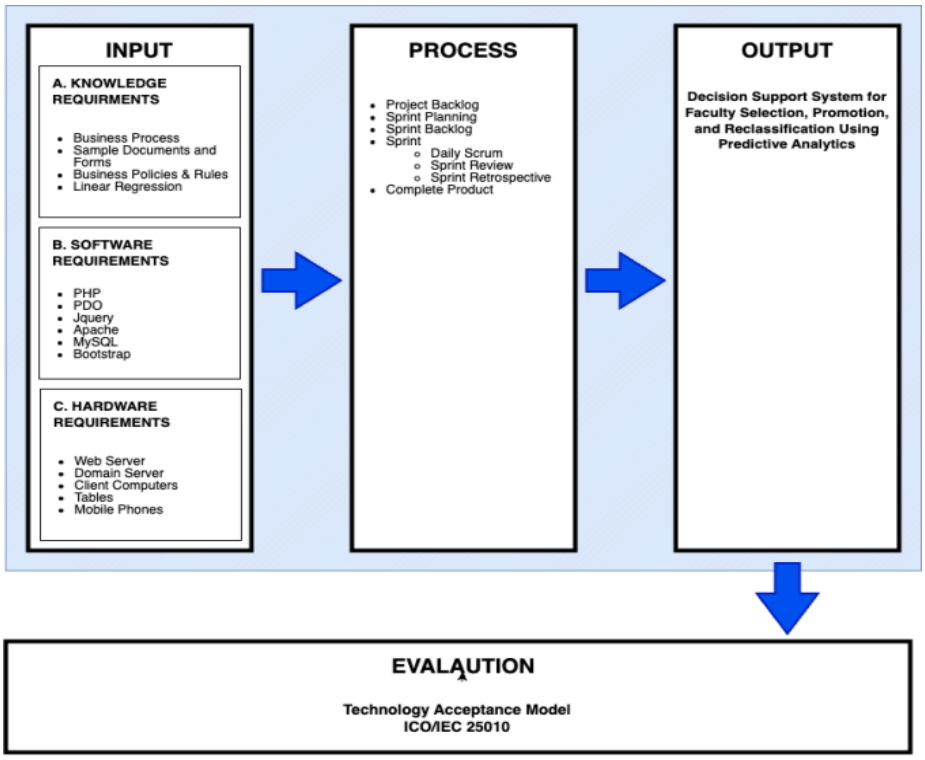

Figure 2. Conceptual Framework of the Study

The Process represents the development methodology, guided by the Agile Scrum framework Activities include preparing the project backlog, sprint planning, and sprint backlog creation, followed by iterative sprint cycles. Each sprint involves daily scrums for coordination, sprint reviews for stakeholder feedback, and retrospectives for continuous improvement. This iterative process ensures that system functionalities, such as faculty profiling, performance evaluation, and predictive ranking, are incrementally refined until the complete product is delivered.

The Output is the fully developed Decision Support System which integrates predictive analytics to enhance transparency, fairness, and efficiency in faculty selection, promotion, and reclassification. This system aims to streamline institutional workflows, improve data accuracy, and support evidence-based decision-making.

Finally, the Evaluation phase ensures that the system is both functional and acceptable to end-users. Two frameworks are applied: the ISO/IEC 25010quality model, which measures functionality, usability, reliability, security, and maintainability, and the Technology Acceptance Model (TAM), which assesses user perceptions of usefulness and ease of use.

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Logistic Regression Algorithm

The researcher employed a linear regression algorithm to predict which faculty members are potential candidates for promotion or reclassification. Linear regression was selected because it is one of the most effective and widely used predictive modeling techniques for analyzing relationships between variables. In this study, faculty performance indicators such as teaching effectiveness, years of service, educational attainment, research output, extension services, and professional development serves as independent variables, while promotion or reclassification status is treated as the dependent variable.

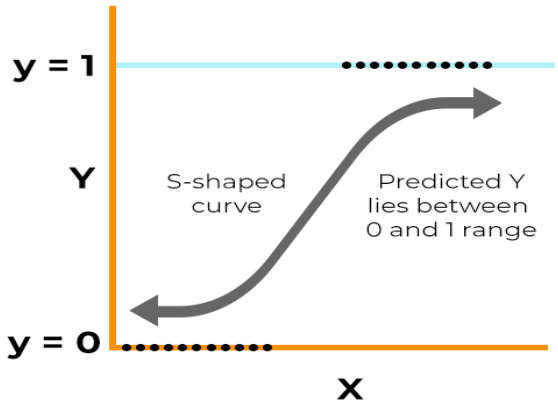

Figure 3. Key Assumptions for Implementing Logistic Regression

Figure 3 presents a standard logistic model plot. When the weighted sum is substituted for X, the resulting values are transformed to fall within the range of 0 to 1. This scaling is achieved through the exponential function, which ensures that the output never drops below 0 or exceeds 1. In this model, large negative input values are compressed toward 0, while large positive input values are pushed toward 1, effectively mapping any real number into a probability range.

RESULT AND DISCUSSION

Logistic Regression Model

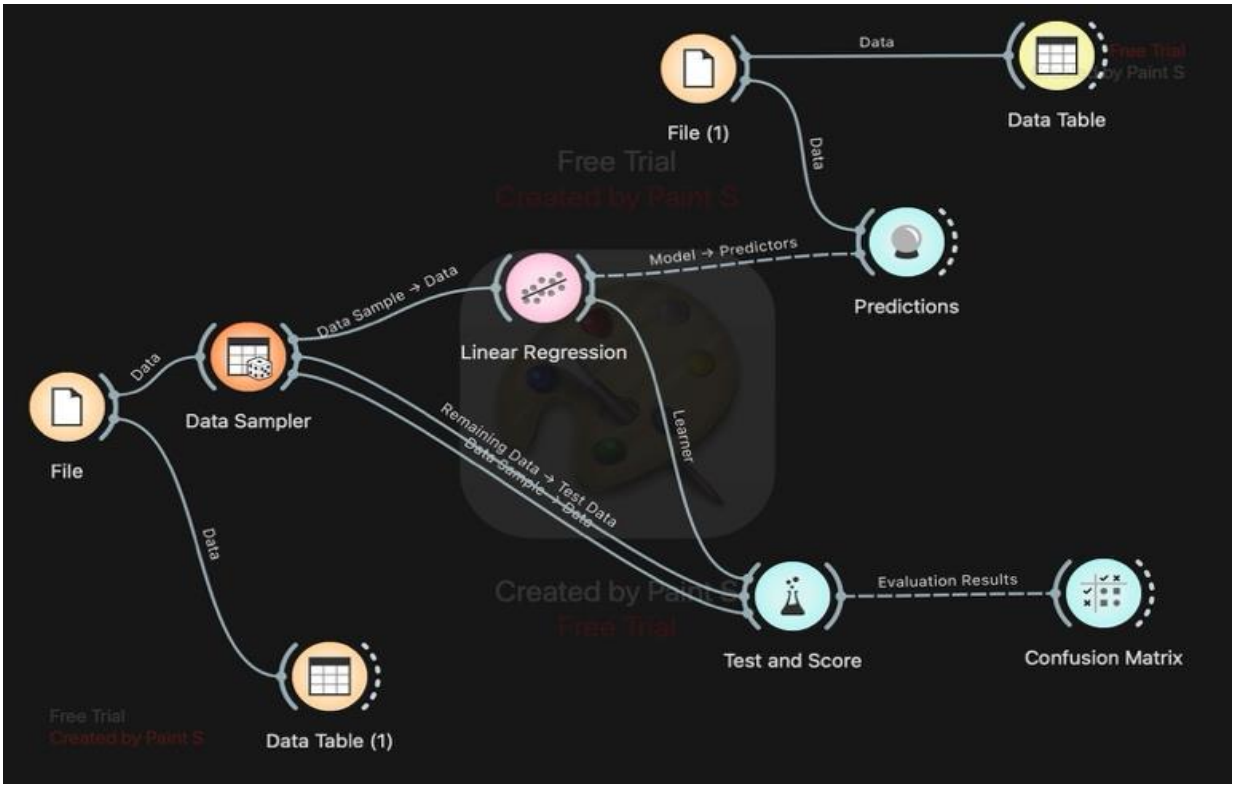

Figure 4. Logistic Regression Modelling Using Orange Visual

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The dataset for this study was obtained from the Human Resource Department of Colegio de Sta. Teresa de Avila, a private higher education institution in Brgy. Kaligayahan, Novaliches, Quezon City. It consisted of 288 records containing past faculty performance data, academic qualifications, research outputs, teaching evaluations, and other relevant factors that influence career progression.

Historical data served as the foundation for developing the predictive model, enabling the system to uncover patterns and relationships among variables. By analyzing these trends, the model generates insights into faculty performance and potential, supporting objective, data-driven decisions in faculty selection, reclassification, and promotion. To ensure practical applicability, the researchers used Orange, a user-friendly yet powerful data mining tool, which provided both efficiency in model development and interpretability of results for institutional decision-making.

Before model construction, the dataset underwent data cleansing. An imputation technique was applied to handle missing values and outliers by replacing them with the mean of each variable. Afterward, the dataset was divided into two subsets: 80% for training and 20% for testing, ensuring a reliable evaluation of the model's performance.

Model development was carried out using Orange Visual Programming, which offers a graphical, drag-and-drop interface for designing machine learning workflows. The Linear Regression algorithm was employed to train the model using the training set, allowing the system to learn from historical data and generate accurate predictions, as shown in Figure 4.

Table I Confusion Matrix Generated by the Model

Predicted	**Actual**			
		Positive	Negative	Total
	Positive	150	39	**189**
	Negative	18	81	**99**
	Truth Overall	**168**	**120**	**288**

The results show that the Linear Regression model is highly effective, with an overall accuracy of 80.21%. It has excellent recall (89.29%), meaning it rarely misses actual candidates, and high precision (79.37%), meaning it makes very few false predictions. However, the specificity is slightly lower (67.50%), which suggests there is some room to improve in correctly classifying non-candidates.

User Acceptance Test Result

Table II User Acceptance Test Results

Factors	**Weighted Mean**	**Verbal Interpretation**
Perceived Usefulness	4.36	Strongly Agree
Perceived Ease of Use	4.28	Strongly Agree
Attitude Towards Use	4.67	Strongly Agree
Behavioral Intentional Use	4.84	Strongly Agree
Overall Weighted Mean	**4.55**	**Strongly Agree**

The results of the User Acceptance Test, as shown in Table II, indicate that the system was highly accepted by the respondents, with an overall weighted mean of 4.55 (Strongly Agree). All evaluation factors received strong positive feedback, with the highest rating on Behavioral Intentional Use (4.84), suggesting that users are highly willing to adopt and continue using the system. This is followed by Attitude Towards Use (4.67) and Perceived Usefulness (4.36), showing that users find the system both beneficial and favorable to use. Perceived Ease of Use (4.28), while the lowest among the factors, still falls under "Strongly Agree," confirming that the system is

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user-friendly. Overall, the findings demonstrate that the system is effective, easy to use, and has strong potential for sustained adoption.

System Evaluations Test Result

Table III System Evaluation Test Results

Factors	**Weighted Mean**	**Verbal Interpretation**
Functional Suitability	4.60	Strongly Agree
Performance Efficiency	4.50	Strongly Agree
Compatibility	4.60	Strongly Agree
Usability	4.52	Strongly Agree
Reliability	4.45	Strongly Agree
Security	4.73	Strongly Agree
Maintainability	4.60	Strongly Agree
Portability	4.50	Strongly Agree
Overall Weighted Mean	**4.56**	**Strongly Agree**

The results of the System Evaluation Test presented in Table III show that the system achieved an overall weighted mean of 4.56 (Strongly Agree), indicating excellent performance across all ISO/IEC 25010 quality characteristics. The highest rating was given to Security (4.73), reflecting strong confidence in the system's ability to protect data and ensure safe operations. Functional Suitability, Compatibility, and Maintainability (4.60 each) were also highly rated, suggesting that the system effectively meets its intended purpose, works well across environments, and can be maintained efficiently. Other factors, such as Usability (4.52), Performance Efficiency (4.50), Portability (4.50), and Reliability (4.45), also received strong agreement, further validating the system's robustness, efficiency, and user-friendliness. Overall, these results confirm that the system adheres to high-quality standards and is well-suited for deployment and long-term use.

CONCLUSIONS

The developed Decision Support System for Faculty Selection, Promotion, and Reclassification using Predictive Analytics proved to be a reliable decision-support tool for the HR Department, effectively identifying faculty members for promotion or reclassification. Evaluation through ISO/IEC 25010 showed strong performance across functionality, usability, security, and maintainability (overall mean = 4.56, Strongly Agree), while the Technology Acceptance Model (overall mean = 4.55, Strongly Agree) confirmed positive user perception, ease of use, and strong intent for continued adoption. These results affirm that the system meets international quality standards, is well-accepted by users, and enhances transparency, accuracy, and data-driven decision-making in HR operations.

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